Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/AIA/424 (04-14)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Herriot Tabuteau	Nonprovisional Application Number (if known):	
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently $0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.

2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, **or** the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /Yuefen Zhou/	Date 2017-11-21
Name (Print/Typed) Yuefen Zhou	Practitioner Registration Number 73398

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

☑ *Total of 1 forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	NERIDRONIC ACID FOR TREATING COMPLEX REGIONAL PAIN SYNDROME

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Herriot Tabuteau Date (Optional): _____

Signature: /Herriot Tabuteau/

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	A3226.10005US49
	Application Number	
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Herriot		Tabuteau	

Residence Information (Select One) ● US Residency Non US Residency Active US Military Service

City	New York	State/Province	NY	Country of Residence	US

Mailing Address of Inventor:

Address 1	25 Broadway, 9th Floor		
Address 2			
City	New York	State/Province	NY
Postal Code	10004	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	97149		
Email Address	Docket@mabr.com	Add Email	Remove Email

Application Information:

Title of the Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome		
Attorney Docket Number	A3226.10005US49	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	17	Suggested Figure for Publication (if any)	

PTO/AIA/14 (11-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	A3226.10005US49
	Application Number	
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	97149		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	15/703891	2017-09-13

PTO/AIA/14 (11-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	A3226.10005US49
	Application Number	
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15/703891	Continuation of	15/360886	2016-11-23	9770457	2017-09-26
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15/360886	Continuation in part of	15/217773	2016-07-22	9623038	2017-04-18
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15/217773	Continuation of	14/967224	2015-12-11	9408861	2016-08-09
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14/967224	Continuation of	14/604524	2015-01-23	9211257	2015-12-15
Prior Application Status	Abandoned				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
14/604524	Continuation in part of	14/536526	2014-11-07		
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14/536526	Continuation in part of	14/446184	2014-07-29	9006279	2015-04-14
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14/446184	Division of	14/288716	2014-05-28	8835650	2014-09-16
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
14/288716	Claims benefit of provisional	61/933608	2014-01-30		
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14/536526	Continuation in part of	14/279229	2014-05-15	9034889	2015-05-19
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14/279229	Continuation of	14/063979	2013-10-25	8802658	2014-08-12

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	A3226.10005US49
	Application Number	
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	

Prior Application Status	Abandoned		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14/063979	Continuation in part of	13/894274	2013-05-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/803721	2013-03-20
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/767647	2013-02-21
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/767676	2013-02-21
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/764563	2013-02-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/762225	2013-02-07
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/655541	2012-06-05
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/655527	2012-06-05
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/654383	2012-06-01

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	A3226.10005US49
	Application Number	
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/654292	2012-06-01
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/647478	2012-05-15
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/894274	Claims benefit of provisional	61/646538	2012-05-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
15/360886	Continuation in part of	PCT/US2015/032739	2015-05-27
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2015/032739	Continuation of	PCT/US2014/050427	2014-08-08
Prior Application Status	Abandoned		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2014/050427	Continuation of	14/279241	2014-05-15
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15/703891	Continuation in part of	15/647140	2017-07-11	9820999	2017-11-21

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
15/647140	Claims benefit of provisional	62/378140	2016-08-22

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

PTO/AIA/14 (11-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	A3226.10005US49
	Application Number	
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	A3226.10005US49
	Application Number	
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	A3226.10005US49
	Application Number	
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	ANTECIP BIOVENTURES II LLC		
Mailing Address Information For Applicant:			
Address 1	630 FIFTH AVENUE, SUITE 2000		
Address 2			
City	NEW YORK	**State/Province**	NY
Country	US	Postal Code	10111
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (11-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	A3226.10005US49
	Application Number	
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	A3226.10005US49
	Application Number	
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	

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Neridronic Acid for Treating Complex Regional Pain Syndrome

Inventor: Herriot Tabuteau

CROSS-REFERENCE TO RELATED APPLICATIONS

[1] This application is a continuation of U.S. Pat. App. No. 15/703,891, filed September 13, 2017; which is a continuation of U.S. Pat. App. No. 15/360,886, filed November 23, 2016, now U.S. Pat. No. 9,770,457; which is a continuation-in-part of U.S. Pat. App. No. 15/217,773, filed July 22, 2016, now U.S. Pat. No. 9623038; which is a continuation of U.S. Pat. App. No. 14/967,224, filed December 11, 2015, now U.S. Pat. No. 9,408,861; which is a continuation of U.S. Pat. App. No. 14/604,524, filed on January 23, 2015, now U.S. Pat. No. 9,211,257; which is a continuation-in-part of U.S. Pat. App. No. 14/536,526, filed on November 7, 2014, now abandoned; which is a continuation-in-part of U.S. Pat. App. No. 14/446,184, filed on July 29, 2014, now U.S. Pat. No. 9,006,279; which is a divisional of U.S. Pat. App. No. 14/288,716, filed May 28, 2014, now U.S. Pat. No. 8,835,650; which claims the benefit of U.S. Prov. Pat. App. No. 61/933,608, filed January 30, 2014; U.S. Pat. App. No. 14/536,526 is also a continuation-in-part of U.S. Pat. App. No. 14/279,229, filed May 15, 2014, now U.S. Pat. No. 9,034,889; which is a continuation of U.S. Pat. App. No. 14/063,979, filed October 25, 2013, now U.S. Pat. No. 8,802,658; which is a continuation-in-part of U.S. Pat. App. No. 13/894,274, filed May 14, 2013, now abandoned; which claims the benefit of U.S. Prov. Pat. App. Nos. 61/803,721, filed March 20, 2013; 61/767,647, filed February 21, 2013; 61/767,676, filed February 21, 2013; 61/764,563, filed February 14, 2013; 61/762,225, filed February 7, 2013; 61/655,541, filed June 5, 2012; 61/655,527, filed June 5, 2012; 61/654,383, filed June 1, 2012; 61/654,292, filed June 1, 2012; 61/647,478, filed May 15, 2012, and 61/646,538, filed May 14, 2012; and U.S. Pat. App. No. 15/360,886 is also a continuation-in-part of International Pat. App. No. PCT/US2015/032739, filed May 27, 2015; which is a continuation of International Pat. App. No. PCT/US2014/050427, filed August 08, 2014, which is a continuation of U.S. Pat. App. No. 14/279,241, filed May 15, 2014, now abandoned; U.S. Pat. App. No. 15/703,891 is also a continuation-in-part of U.S. Pat. App. No. 15/647,140, filed July 11, 2017, now U.S. Pat. No. 9,820,999; which claims the benefit of U.S. Prov. Pat. App. No. 62/378,140, filed August 22, 2016; any of the above applications, U.S. patents issued from, or U.S. publications of any of the above applications are incorporated by references in their entirety.

SUMMARY

[2] Bisphosphonate compounds are potent inhibitors of osteoclast activity, and are used clinically to treat bone-related conditions such as osteoporosis and Paget's disease

of bone; and cancer-related conditions including multiple myeloma, and bone metastases from solid tumors. They generally have low oral bioavailability.

[3] Patchy osteoporosis and bone marrow edema may result from osteoclast hyperactivity. Zoledronic acid is a potent inhibitor of bone resorption and osteoclast activity. Nitrogen containing bisphosphonates, such as zoledronic acid, also inhibit the mevalonate pathway in the osteoclast thereby interrupting normal osteoclast function.

[4] It has been discovered that oral dosage forms of bisphosphonate compounds, such as zoledronic acid, can be used to treat or alleviate pain or related conditions.

[5] Some embodiments include a method of enhancing the oral bioavailability of zoledronic acid comprising orally administering a dosage form containing zoledronic acid in the disodium salt form.

[6] Some embodiments include a dosage form comprising zoledronic acid in the disodium salt form, wherein the bioavailability, in a mammal, of zoledronic acid in the disodium salt form is greater than the bioavailability of zoledronic acid in the diacid form would be in the same dosage form.

[7] Some embodiments include a dosage form comprising zoledronic acid in an acid or a salt form, such as the disodium salt form, wherein the dosage form contains an amount of zoledronic acid in the disodium salt form that provides an area under the plasma concentration curve of zoledronic acid of about 4 ng•h/mL to about 2000 ng•h/mL to a human being to which the dosage form is administered.

[8] Some embodiments include a dosage form comprising zoledronic acid in the disodium salt form, wherein the disodium salt form is present in a lower molar amount than would be present if the zoledronic acid were in the diacid form; and wherein the zoledronic acid in the disodium salt form has an improved bioavailability as compared to the zoledronic acid in the diacid form to the extent that the lower molar amount of the disodium salt in the dosage form does not reduce the amount of zoledronic acid delivered to the plasma of a mammal.

[9] Although an oral dosage form with enhanced bioavailability with respect to the bisphosphonate compound can be used, the treatment can also be effective using an oral dosage form that includes a bisphosphonate compound, such as zoledronic acid, wherein the bioavailability of the bisphosphonate is unenhanced, or is substantially unenhanced.

[10] Some embodiments include a method of relieving inflammatory pain comprising administering an oral dosage form containing zoledronic acid to a mammal in need

thereof, wherein the mammal experiences significant pain relief more than 3 hours after administration of the dosage form.

[11] Some embodiments include a method of relieving pain associated with an arthritis comprising administering an oral dosage form containing zoledronic acid to a human being in need thereof.

[12] Some embodiments include a method of treating complex regional pain syndrome comprising administering an oral dosage form containing zoledronic acid to a mammal in need thereof.

[13] Some embodiments include an oral dosage form comprising zoledronic acid, wherein the oral bioavailability of zoledronic acid is substantially unenhanced. For example, in some embodiments, the oral bioavailability in the dosage form is about 0.01% to about 4%.

[14] Some embodiments include a pharmaceutical product comprising more than one unit of an oral dosage form described herein. In some embodiments, each unit of the oral dosage form contains about 1 mg to about 50 mg of zoledronic acid.

[15] Some embodiments include a method of relieving inflammatory pain comprising administering an oral dosage form containing zoledronic acid to a mammal in need thereof.

[16] In some embodiments, the mammal receives a total monthly dose of zoledronic acid that is about 800 mg/m^2 or less.

[17] In some embodiments, the dosage form contains about 10 mg/m^2 to about 20 mg/m^2 based upon the body surface area of the mammal.

[18] Some embodiments include a method of relieving inflammatory pain comprising orally administering zoledronic acid to a mammal in need thereof.

[19] In some embodiments, about 300 mg/m^2 to about 600 mg/m^2 of zoledronic acid is administered per month, based upon the body surface area of the mammal.

[20] In some embodiments, about 50 mg/m^2 to about 600 mg/m^2 of zoledronic acid is administered per month, based upon the body surface area of the mammal.

[21] Some embodiments include administering an osteoclast inhibitor, such as a bisphosphonate, including zoledronic acid, neridronic acid, etc. to inhibit the development of pain, unweighting, and edema when administered early such as when a precipitating event such as fracture occurs, wherein the precipitating event is associated with CRPS.

[22] Some embodiments include administering an osteoclast inhibitor, such as a bisphosphonate, including zoledronic acid, neridronic acid, etc. to reverse established allodynia and unweighting when administered at least 4 weeks after a precipitating event such as fracture that is associated with CRPS.

BRIEF DESCRIPTION OF DRAWINGS

[23] FIG. 1 is a plot of pain compression thresholds in a rat model of inflammatory pain using three different doses of zoledronic acid. Measurements were taken at baseline (BL) and at various time points after dosing on the days indicated.

[24] FIG. 2A is a graph depicting reversal of arthritis pain for two different doses of zoledronic acid in a rat model of arthritis pain.

[25] FIG. 2B is a graph depicting pain thresholds for two different doses of zoledronic acid in a rat model of arthritis pain.

[26] FIG. 3 is a graph summarizing the results for vehicle and zoledronic acid treated rats in a rat model of complex regional pain syndrome.

[27] FIG. 4 depicts hindpaw pain thresholds for vehicle and zoledronic acid treated rats in a rat model of complex regional pain syndrome.

[28] FIG. 5 depicts weight bearing for vehicle and zoledronic acid treated rats in a rat model of complex regional pain syndrome.

[29] FIG. 6 depicts paw thickness change for vehicle and zoledronic acid treated rats in a rat model of complex regional pain syndrome.

[30] FIG. 7 depicts the aqueous solubility of disodium zoledronate tetrahydrate as compared to the diacid form of zoledronic acid.

[31] FIG. 8 depicts the plasma concentration of zoledronic acid in dogs over time after administration of 150 mg of the disodium salt form of zoledronic acid and the diacid form of zoledronic acid.

[32] FIG. 9 depicts the compressibility of dosage forms containing zoledronic acid in the disodium salt form as compared to the diacid form.

[33] FIG. 10 depicts the change in VAS pain score compared to placebo at three months with zoledronic acid treatment in patients with osteoarthritis of the knee, bone marrow lesions, and different degrees of joint space narrowing.

[34] FIG. 11 depicts the change in VAS pain score compared to baseline at three months with zoledronic acid treatment in patients with osteoarthritis of the knee, bone marrow lesions, and different degrees of joint space narrowing.

[35] FIG. 12 depicts the change in VAS pain score compared to placebo at three months with zoledronic acid treatment in different subgroups of patients with osteoarthritis of the knee and bone marrow lesions.

[36] FIG. 13 depicts the change in BML lesion size compared to placebo at six months with zoledronic acid treatment in patients with osteoarthritis of the knee, bone marrow lesions, and different degrees of joint space narrowing.

[37] FIG. 14 depicts hindpaw pain thresholds for vehicle and zoledronic acid treated rats in a rat model of complex regional pain syndrome.

[38] FIG. 15 depicts weight bearing for vehicle and zoledronic acid treated rats in a rat model of complex regional pain syndrome.

[39] FIG. 16 depicts hindpaw pain thresholds for rats administered zoledronic acid at the time of fracture as compared to rats administered zoledronic acid four weeks after fracture.

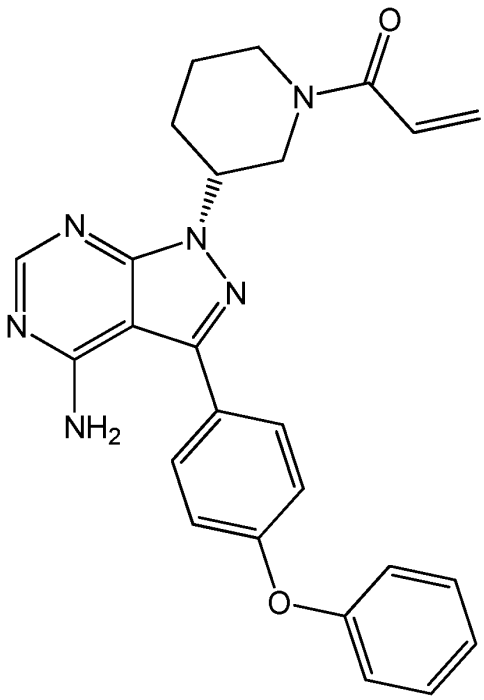
DETAILED DESCRIPTION

[40] Inhibitors of osteoclast activity include bisphosphonate compounds such as pamidronate or pamidronic acid, neridronate or neridronic acid, olpadronate or olpadronic acid, alendronate or alendronic acid, incadronate or incadronic acid, ibandronate or ibandronic acid, risedronate or risedronic acid, cimadronate or cimadronic acid, zoledronate or zoledronic acid, etidronate or etidronic acid, clodronate or clodronic acid, tiludronate or tiludronic acid, etc.

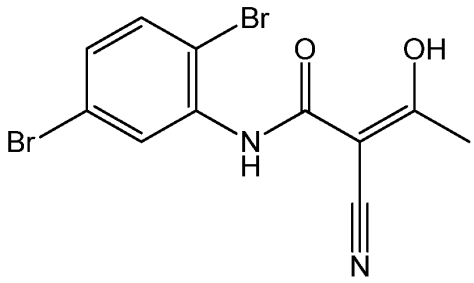
[41] RANK/RANKL antagonists may be inhibitors of osteoclast activity. RANK/RANKL antagonists include but are not limited to OPG (osteoprotegerin) or a variant thereof, an anti-RANKL antibody such as denosumab, a monoclonal anti-RANKL antibody, a small interfering RNA, a microRNA, a precursor molecule, a ribozyme, an antisense nucleic acid, or an aptamer targeting RANKL. Antibodies such as AB-25E9, small molecules, small interfering RNAs, microRNAs, precursor molecules, ribozymes, antisense nucleic acids, or aptamers that target the cell-surface protein Siglec-15 may be osteoclast inhibitors.

[42] Some Bruton's tyrosine kinase (BTK) inhibitors may be inhibitors of osteoclast activity. BTK inhibitors can include ONO-4059; ibrutinib; Benzo[*b*]thiophene-2-carboxamide, *N*-[3-[6-[[4-[(2*R*)-1,4-dimethyl-3-oxo-2-piperazinyl]phenyl]amino]-4,5-dihydro-4-

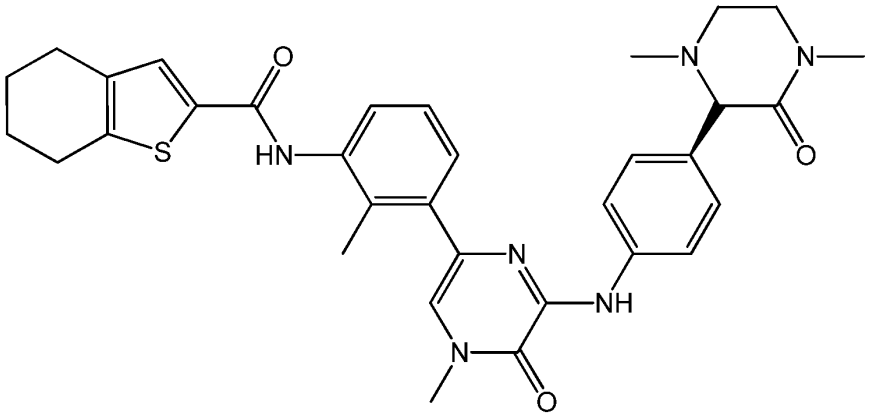
methyl-5-oxo-2-pyrazinyl]-2-methylphenyl]-4,5,6,7-tetrahydro- (GDC-0834); RN-486; Benzamide, 4-(1,1-dimethylethyl)-*N*-[3-[8-(phenylamino)imidazo[1,2-*a*]pyrazin-6-yl]phenyl]- (CGI-560); Benzamide, *N*-[3-[4,5-dihydro-4-methyl-6-[[4-(4-morpholinylcarbonyl)phenyl] amino]-5-oxo-2-pyrazinyl]-2-methylphenyl]-4-(1,1-dimethylethyl)- (CGI-1746CAS Registry No. 910232-84-7); HM-71224; 2-Propenamide, *N*-[3-[[5-fluoro-2-[[4-(2-methoxyethoxy)phenyl] amino]-4-pyrimidinyl]amino]phenyl]- (CC-292, CAS Registry No. 1202757-89-8); 2-Pyridinecarboxamide, 4-[4-[[5-fluoro-4-[[3-[(1-oxo-2-propen-1-yl)amino]phenyl]amino]-2-pyrimidinyl]amino]phenoxy]-*N*-methyl- (CNX-774, CAS Registry No. 1202759-32-7), AVL-101 (CAS Registry No. 1552307-34-2), AVL-291 (CAS Registry No. 1552307-35-3), and AVL-292 (CAS Registry No. 1552307-36-4), [*N*-(2-chloro-6-methylphenyl)-2-(6-(4-(2-hydroxyethyl) piperazin-1-yl)-2-methylpyrimidin-4-ylamino)thiazole-5-carboxamide] (dasatinib), alpha-cyano-beta-hydroxy-beta-methyl-*N*-(2,5-bromophenyl) propenamide (LFM-A13), and ONO-WG-307.



Ibrutinib



LFM-A13



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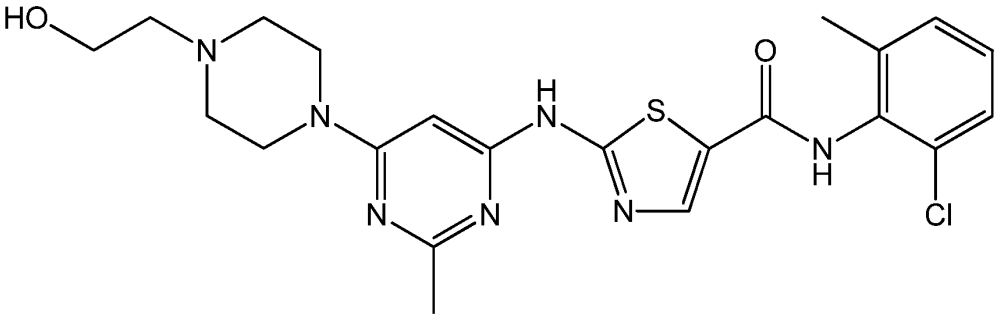
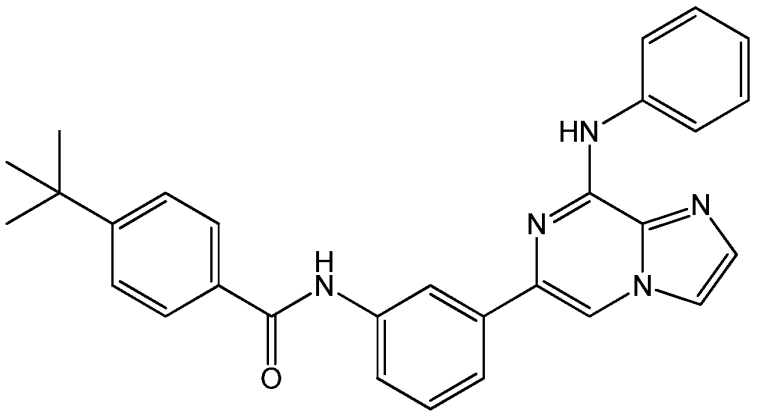
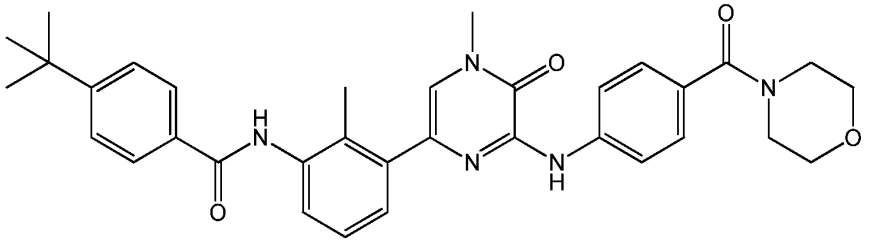


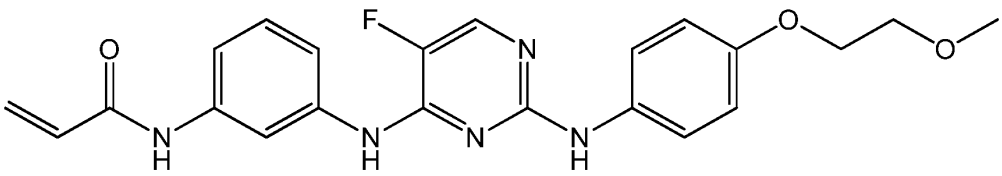
Dasatinib



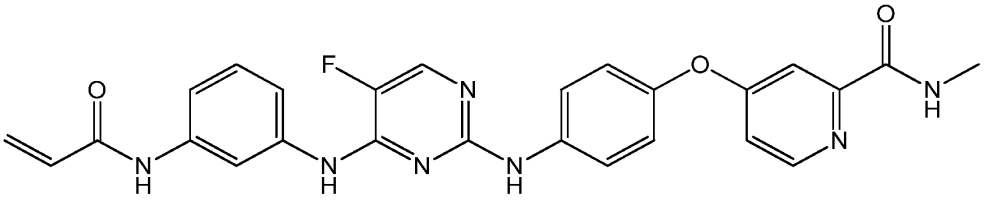
CGI-560



CGI-1746



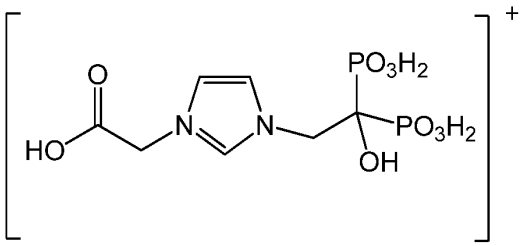
CC-292



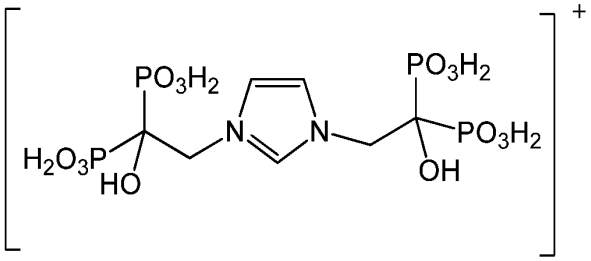
CNX-774

[43] Inhibitors of osteoclast activity may be used for a number of medical purposes, such as treatment of undesirable conditions or diseases, including pain relief. This may be accomplished in many instances by administration of oral dosage forms. Generally, an oral dosage form comprising a bisphosphonate such as zoledronic acid is administered orally to a mammal, such as a human being, at least once, to treat a disease or condition, or to relieve pain.

[44] The compounds containing Ion 1 or Ion 2 may also be osteoclast inhibitors:



Ion 1



Ion 2

[45] The term “treating” or “treatment” broadly includes any kind of treatment activity, including the diagnosis, cure, mitigation, or prevention of disease in man or other

animals, or any activity that otherwise affects the structure or any function of the body of man or other animals.

[46] An oral dosage form of a bisphosphonate such as zoledronic acid may be used to treat, or provide relief of, any type of pain including, but not limited to, inflammatory pain, arthritis pain, complex regional pain syndrome, lumbosacral pain, musculoskeletal pain, neuropathic pain, chronic pain, cancer-related pain, acute pain, postoperative pain, etc. In some instances, pain relief may be palliative, or pain relief may be provided independent of improvement of the disease or condition or the underlying cause of the disease or condition. For example, although the underlying disease may not improve, or may continue to progress, an individual suffering from the disease may experience pain relief. In some embodiments, enhanced bioavailability of the zoledronic acid may be achieved in treating one of these conditions by administering a dosage form comprising zoledronic acid in the form of a disodium salt. This may allow a reduced molar amount of the disodium salt to be used as compared to what would be used with the diacid form.

[47] In some embodiments, the mammal being treated is not suffering from bone metastasis. In some embodiments, the mammal being treated is not suffering from cancer. In some embodiments, the mammal being treated is not suffering from osteoporosis.

[48] For example, zoledronic acid or another bisphosphonate may be administered orally to relieve musculoskeletal pain including low back pain, and pain associated with rheumatoid arthritis, juvenile rheumatoid arthritis, osteoarthritis, erosive osteoarthritis, sero-negative (non-rheumatoid) arthropathies, non-articular rheumatism, peri-articular disorders, axial spondyloarthritis including ankylosing spondylitis, Paget's disease, fibrous dysplasia, SAPHO syndrome, transient osteoarthritis of the hip, vertebral crush fractures, osteoporosis, etc. In some embodiments, enhanced bioavailability of the zoledronic acid may be achieved in treating one of these conditions by administering a dosage form comprising zoledronic acid in the form of a disodium salt. This may allow a reduced molar amount of the disodium salt to be used as compared to what would be used with the diacid form.

[49] An osteoclast inhibitor, such as a bisphosphonate, e.g. zoledronic acid, may also be used to treat bone fractures or to enhance the healing of bone fractures. In some embodiments, a human being that is treated for CRPS, suffered from a precipitating injury such as a bone fracture associated with the CRPS at least 4 weeks, at least 8 weeks, at least 12 weeks, at least six months, or at least 1 year before first administering an osteclast inhibitor, such as a bisphosphonate, including zoledronic acid, neridronic acid, etc. Examples of a precipitating event include a fracture, a cutting injury, a scratch, a puncture injury, etc.

[50] In some embodiments, zoledronic acid or another bisphosphonate may also be administered orally to relieve neuropathic pain, including diabetic peripheral neuropathy, post-herpetic neuralgia, trigeminal neuralgia, monoradiculopathies, phantom limb pain, and central pain. Other causes of neuropathic pain include cancer-related pain, lumbar nerve root compression, spinal cord injury, post-stroke pain, central multiple sclerosis pain, HIV-associated neuropathy, and radio-therapy or chemo-therapy associated neuropathy. In some embodiments, enhanced bioavailability of the zoledronic acid may be achieved in treating one of these conditions by administering a dosage form comprising zoledronic acid in the form of a disodium salt. This may allow a reduced molar amount of the disodium salt to be used as compared to what would be used with the diacid form.

[51] In some embodiments, zoledronic acid or another bisphosphonate may be administered orally to relieve inflammatory pain including musculoskeletal pain, arthritis pain, and complex regional pain syndrome. In some embodiments, enhanced bioavailability of the zoledronic acid may be achieved in treating one of these conditions by administering a dosage form comprising zoledronic acid in the form of a disodium salt. This may allow a reduced molar amount of the disodium salt to be used as compared to what would be used with the diacid form.

[52] Examples of musculoskeletal pain include low back pain; and pain associated with vertebral crush fractures, fibrous dysplasia, osteogenesis imperfecta, Paget's disease of bone, transient osteoporosis, and transient osteoporosis of the hip.

[53] Arthritis refers to inflammatory joint diseases that can be associated with pain. Examples of arthritis pain include pain associated with osteoarthritis, erosive osteoarthritis, rheumatoid arthritis, juvenile rheumatoid arthritis, sero-negative (non-rheumatoid) arthropathies, non-articular rheumatism, peri-articular disorders, neuropathic arthropathies including Charcot's foot, axial spondyloarthritis including ankylosing spondylitis, and SAPHO syndrome.

[54] In some embodiments, a human being that is treated for a disease or condition, such as an inflammatory condition, e.g. arthritis or CRPS, by an osteoclast inhibitor, such as a bisphosphonate, e.g. an oral dosage form of zoledronic acid, has an age of at least 18 years, at least 50 years (including a male of at least 50 years), a postmenopausal female, about 10 years to about 90 years, about 20 years to about 80 years, about 30 years to about 75 years, about 40 years to about 70 years, about 1 year to about 16 years, or about 80 years to about 95 years. In some embodiments, the human being is a male at least 50 years of age or a postmenopausal female, with knee osteoarthritis (OA) and bone marrow lessions (BMLs), having moderate or worse knee pain.

[55] In some embodiments, a human being that is treated for a disease or condition, such as an inflammatory condition, e.g. arthritis, low back pain, or CRPS, by an osteoclast inhibitor, such as a bisphosphonate, e.g. an oral dosage form of zoledronic acid, has suffered from the inflammatory condition for at least 1 month, at least 2 months, at least 3 months, at least 6 months, or at least 1 year.

[56] In some embodiments, the arthritis affects a knee, an elbow, a finger, a wrist, a shoulder, an ankle, the spine, or a hip.

[57] For treatment of arthritis or joint pain, such as knee pain, in some embodiments the person being treated has OARSI Grade 0, or Kellgren and Lawrence Grades 0 or 1, joint space narrowing.

[58] In some embodiments, the person has lesions, such as bone marrow lesions. In some embodiments the person being treated for bone marrow lesions has normal joint space knee pain, OARSI Grade 0, or Kellgren and Lawrence Grades 0 or 1, joint space narrowing.

[59] In some embodiments, the person has baseline pain intensity of 5 or greater measured using the 0-10 numerical rating scale (NRS), or 50 mm or greater using the 100 mm visual analog scale (VAS). In some embodiments the person being treated for pain has normal joint space knee pain, OARSI Grade 0, or Kellgren and Lawrence Grades 0 or 1, joint space narrowing.

[60] Bone marrow lesions (BMLs) include regional bone marrow signal intensity alterations on magnetic resonance imaging (MRI). BMLs can be present in the knee and can be an important feature of osteoarthritis of the knee. BMLs have also been described in other rheumatic conditions such as rheumatoid arthritis, osteonecrosis, ankylosing spondylitis, and transient osteoporosis of the hip and are often referred to as bone marrow edema (BME).

[61] In some embodiments, a person being treated for arthritis, such as with zoledronic acid, has osteoarthritis of the knee associated with bone marrow lesions.

[62] In some embodiments, an inhibitor of osteoclast activity can be used to treat bone marrow lesions.

[63] In some embodiments, an inhibitor of osteoclast activity can be used to treat bone marrow lesions of the knee, shoulder, ankle, wrist, hand, fingers, spine, or hip.

[64] Commonly used measures of pain intensity include the visual analog scale (VAS) and the numerical rating scale (NRS). With the VAS approach, patients rate the severity of their pain by marking a point on a 10-cm (or 100 mm) VAS (0=no pain and 10=worst possible pain). With the NRS approach, patients rate the severity of their pain by verbally responding

to a 10-point NRS (0=no pain and 10=worst possible pain). VAS and NRS scores have been shown to be strongly correlated (slope of regression line, 1.01), indicating that a score on the 10-cm VAS is equivalent to the same score on 10-point NRS (Bijur PE et al. *Acad Emerg Med* 2003; 10:390-392). For example, a VAS score of 5 cm (or 50 mm) is equivalent to an NRS score of 5. Knee pain in a person with a VAS score of 5 cm or 50 mm or higher, or an NRS score of 5 or higher, may be referred to herein as moderate to severe knee pain.

[65] In some embodiments, the patient suffering from pain, inflammation, a similar condition, or any of the conditions described herein, has an NRS of 5 or greater, or a VAS of 5 cm or greater. In some embodiments, the patient has an NRS of 4 or greater, or a VAS of 4 cm or greater. In some embodiments, the patient has an NRS of 6 or greater, or a VAS of 6 cm or greater. In some embodiments, the patient has an NRS of 7 or greater, or a VAS of 7 cm or greater. In some embodiments, the patient has an NRS of about 1, about 2, about 3, about 4, about 5, about 6, about 7, about 8, about 9, or about 10. In some embodiments, the patient has a VAS of about 1 cm, about 2 cm, about 3 cm, about 4 cm, about 5 cm, about 6 cm, about 7 cm, about 8 cm, about 9 cm, or about 10 cm.

[66] For knee pain or pain associated with bone marrow lesions, in some embodiments, treatment with a nitrogen-containing bisphosphonate such as zoledronic acid may decrease the visual analog (VAS) pain score measured using a 100 mm scale, by at least about 5 mm, at least about 8 mm, at least about 10 mm, at least about 15 mm, up to about 50 mm, or up to about 100 mm. In some embodiments, the VAS score, may be decreased by at least about 5 mm, at least about 8 mm, at least about 10 mm, at least about 15 mm, up to about 50 mm, or up to about 100 mm, as compared to a placebo.

[67] Treatment with a nitrogen-containing bisphosphonate such as zoledronic acid may decrease the numerical rating scale (NRS) pain score measured using a 0-10 scale, by at least about 0.1, at least about 0.5, at least about 0.8, at least about 1, at least about 1.5, up to about 5, or up to about 10. In some embodiments, the NRS score may be decreased by at least about 0.1, at least about 0.5, at least about 0.8, at least about 1, at least about 1.5, up to about 5, or up to about 10, as compared to a placebo.

[68] In some embodiments, an inhibitor of osteoclast activity can be used to reduce the size of bone marrow lesions. The area of the lesions may be measured as the total area of all lesions or as the area of any one lesion. In some embodiments, the total area includes the medial tibial area, the medial femoral area, the lateral tibial area, and the lateral femoral area. In some embodiments the bone marrow lesion in located in the patella.

[69] In some embodiments, the use of an inhibitor of osteoclast activity achieves a reduction in the total area of the bone marrow lesions of at least about 240 mm^2. In some

embodiments, the reduction in total area is at least about 220 mm^2, at least about 200 mm^2, at least about 150 mm^2, at least about 100 mm^2, or at least about 50 mm^2. In some embodiments, the reduction in size of bone marrow lesions represents a reduction relative to baseline of at least about 10%, at least about 20%, at least about 30%, at least about 40%, at least about 50%, at least about 60%, at least about 70% at least about 80%, at least about 90%, or about 100%. In some embodiments, the reduction in area of bone marrow lesions represents an improvement relative to placebo of at least about 10%, at least about 20%, at least about 30%, at least about 40%, at least about 50%, at least about 60%, at least about 70%, at least about 80%, at least about 90%, at least about 100%, at least about 120%, at least about 150%, at least about 170%, at least about 200%, at least about 250%, at least about 300%, at least about 350%, at least about 400%, or at least about 450%. In some embodiments, the use of an inhibitor of osteoclast activity inhibits an increase in the size of the bone marrow lesions over time.

[70] Joint space narrowing (JSN) is typically graded using the Osteoarthritis Research Society International (OARSI) atlas criteria, or the Kellgren and Lawrence (K/L) system. The OARSI atlas criteria grades JSN using a 0-3 scale with Grade 0 indicating an absence of JSN, and Grades 1, 2 and 3 indicating mild, moderate, and severe JSN, respectively (Altman and Gold, *Osteoarthritis Cartilage* 2007;15(Suppl A):A1-A56). The K/L system grades JSN using a 0-4 scale with Grade 0 indicating an absence of JSN, Grade 1 indicating doubtful JSN, and grades 2, 3 and 4 indicating minimal, moderate, and severe JSN, respectively (Kellgren and Lawrence , *Ann Rheum Dis* 1957;16:494–502). Based on these criteria, OARSI Grade 0 (absence of JSN), approximates K/L Grades 0-1 (absence of, or doubtful presence of JSN). Knee pain in a person having OARSI Grade 0 or K/L Grade or 1 JSN in the knee where the pain occurs may be referred to herein as a "normal joint space knee pain."

[71] In some embodiments for patients having OARSI Grade 0 or K/L Grades 0-1 JSN, the use of an inhibitor of osteoclast activity achieves a reduction in the total area of the bone marrow lesions of at least about 240 mm^2. In some embodiments, the reduction in total area is at least about 220 mm^2, at least about 200 mm^2, at least about 150 mm^2, at least about 100 mm^2, or at least about 50 mm^2. In some embodiments, the reduction in size of bone marrow lesions represents a reduction relative to baseline of at least about 10%, at least about 15%, at least about 20%, at least about 25%, at least about 30%, at least about 35%, at least about 40%, at least about 45%, at least about 50%, at least about 60%, at least about 70% at least about 80%, at least about 90%, or about 100%. In some embodiments, the reduction in area of bone marrow lesions represents an improvement relative to placebo of at least about 10%, at least about 20%, at least about 30%, at least about 40%, at least about 50%, at least

about 60%, at least about 70%, at least about 80%, at least about 90%, at least about 100%, at least about 120%, at least about 150%, at least about 170%, at least about 200%, at least about 250%, at least about 300%, at least about 350%, at least about 400%, or at least about 450%. In some embodiments, the use of an inhibitor of osteoclast activity inhibits an increase in the size of bone marrow lesions over time.

[72] In some embodiments for patients having OARSI Grades 1-2 or K/L Grades 2-4 JSN, the use of an inhibitor of osteoclast activity achieves a reduction in the total area of the bone marrow lesions of at least about 100 mm^2. In some embodiments, the reduction in total area is at least about 50 mm^2, at least about 60 mm^2, at least about 80 mm^2, at least about 85 mm^2, at least about 90 mm^2, at least about 100 mm^2, at least about 105 mm^2, at least about 110 mm^2, or at least about 115 mm^2. In some embodiments, the reduction in size of bone marrow lesions represents a reduction relative to baseline of at least about 10%, at least about 20%, at least about 30%, at least about 40%, at least about 50%, at least about 60%, at least about 70% at least about 80%, at least about 90%, or about 100%. In some embodiments, the reduction in area of bone marrow lesions represents an improvement relative to placebo of at least about 10%, at least about 20%, at least about 30%, at least about 40%, at least about 50%, at least about 60%, at least about 70%, at least about 80%, at least about 90%, at least about 100%, at least about 115%, at least about 125%, at least about 135%, at least about 150%, at least about 170%, at least about 200%, at least about 250%, at least about 300%, at least about 350%, at least about 400%, or at least about 450%. In some embodiments, the use of an inhibitor of osteoclast activity inhibits an increase in the size of bone marrow lesions over time.

[73] In some embodiments, an inhibitor of osteoclast activity, such as a nitrogen-containing bisphosphonate, including e.g. zoledronic acid, minodronic acid, etc., is used to treat fibromyalgia.

[74] According to some embodiments, administration of an inhibitor of osteoclast activity achieves a reduction in pain that lasts at least about one month, two months, three months, four months, six months, or even at least about twelve months. According some embodiments, administration of an inhibitor of osteoclast activity achieves a reduction in pain that is observed at greater than three hours, at about one day, at about two to about five days, at about one week, at about two weeks, at about three weeks, at about one month, at about five weeks, at about six weeks, at about seven weeks, at about two months, at about nine weeks, at about ten weeks, at about eleven weeks, at about three months, at about four months, at about six months, or at about twelve months after administration of the inhibitor of osteoclast activity.

[75] According some embodiments, administration of an inhibitor of osteoclast activity achieves a reduction in pain that is observed at greater than three hours, but at or before one week, two weeks, three weeks, four weeks, five weeks, six weeks, seven weeks, eight weeks, nine weeks, ten weeks, eleven weeks, twelve weeks, four months, five months, or six months.

[76] According some embodiments, administration of an inhibitor of osteoclast activity achieves a reduction in pain that is observed at greater than three hours with a duration of no more than about three months, no more than about four months, no more than about five months, or no more than about six months.

[77] According to some embodiments, after the administration of an inhibitor of osteoclast activity, the area of bone marrow lesions relative to the size prior to administration remains reduced for up to three months, four months, five months, six months, or even up to twelve months or more. According to some embodiments, after the administration of an inhibitor of osteoclast activity, the area of bone marrow lesions relative to the size prior to administration is reduced at about three months, at about four months, at about five months, at about six months, or at about twelve months.

[78] According to some embodiments, after administration of an inhibitor of osteoclast activity, the size of Modic changes or VESCs relative to the size prior to administration remains reduced for up to three months, four months, five months, six months, or even up to twelve months or more. According to some embodiments, after the administration of an inhibitor of osteoclast activity, the size of Modic changes or VESCs relative to the size prior to administration is reduced at about three months, at about four months, at about five months, at about six months, or at about twelve months.

[79] In some embodiments, an osteoclast inhibitor, such as a nitrogen-containing bisphosphonate, e.g. zoledronic acid, ibandronic acid or minodronic acid, may be administered to relieve complex regional pain syndrome, such as complex regional pain syndrome type I (CRPS-I), complex regional pain syndrome type II (CRPS-II), CRPS-NOS, or another type of CRPS.

[80] In some embodiments, zoledronic acid or another bisphosphonate may be administered orally to relieve complex regional pain syndrome, such as complex regional pain syndrome type I (CRPS-I), complex regional pain syndrome type II (CRPS-II), CRPS-NOS, or another type of CRPS. CRPS is a type of inflammatory pain. CRPS can also have a neuropathic component.

[81] Complex regional pain syndrome is a debilitating pain syndrome. It is characterized by severe pain in a limb that can be accompanied by edema, and autonomic, motor and sensory changes.

[82] In some embodiments, an osteoclast inhibitor, such as a nitrogen-containing bisphosphonate, e.g. zoledronic acid or minodronic acid, may be used to reduce the use of non-steroidal anti-inflammatory drug (NSAIDs), opioids, or other pain medications, for a patient suffering from pain, inflammation, a similar condition, or any condition described herein. For example, use of NSAIDs, opioids, or other pain medications may be reduced by at least about 5%, at least about 10%, at least about 15%, at least about 20%, at least about 25%, at least about 30%, at least about 35%, at least about 40%, at least about 45%, at least about 50%, at least about 60%, at least about 70%, at least about 80%, or at least about 90%, up to about 100%, as compared to the use of NSAIDs, opioids or other pain medications without administration of the osteoclast inhibitor. Use of the opioids, NSAIDs, or other pain medications may be reduced by at least about 5%, at least about 10%, at least about 15%, at least about 20%, at least about 25%, at least about 30%, at least about 35%, at least about 40%, at least about 45%, at least about 50%, at least about 60%, at least about 70%, at least about 80%, or at least about 90%, up to about 100%, as compared to the use of NSAIDS, opioids, or other pain medications at baseline.

[83] The reduction in the use of NSAIDs, opioids, or other pain medications may be observed at about one week, about two weeks, about three weeks, about one month, about two months, about three months, about four months, about five months, about six months, about seven months, about eight months, about nine months, about 10 months, about 11 months, or about one year or more, after the administration of osteoclast inhibitor.

[84] With respect to use of oral zoledronic acid in a disodium salt form or in an acid form for relieving pain associated with an inflammatory condition or Paget's disease of bone, relief of pain can be short-term, e.g. for a period of hours after administration of the dosage form, and/or relief of pain can be long-term, e.g. lasting for days, weeks, or even months after oral administration of zoledronic acid. In some embodiments, a mammal, such as a human being, experiences significant pain relief at least about 3 hours, at least about 6 hours, at least about 12 hours, at least about 24 hours, at least about 48 hours, at least about one week, at least about 2 weeks, or at least about 3 weeks after administration of an oral dosage form comprising zoledronic acid. In some embodiments, a mammal, such as a human being, experiences significant pain relief during at least part of the time from about 3 hours to about 2 weeks, about 3 hours to about 3 weeks, about 3 hours to about 24 hours, about 6 hours to about 2 weeks, or about 6 hours to about 24 hours, about 3 days to about 2 weeks, about 6 days to about 2 weeks, after administration of an oral dosage form comprising

zoledronic acid. In some embodiments, a human being treated has significant pain relief at one month, three months, six months, nine months, one year, 5 years, or longer, after administration of the most recent dose of an osteoclast inhibitor such as zoledronic acid.

[85] With respect to the treatment of any condition recited herein, in some embodiments a first oral dosage form comprising zoledronic acid is administered and a second oral dosage form comprising oral zoledronic acid is administered. The timing of the administration of the two dosage forms may be such that, with respect to the first oral dosage form, the second oral dosage with respect to the first oral dosage form, the second oral dosage form is administered at 5 x T_{max} or greater (e.g., if T_{max} is 1 hour, at 5 hours or later), at least 10 x T_{max} or greater, at least about 15 x T_{max} or greater, at least about 20 x T_{max} or greater, at least about 50 x T_{max} or greater, or at least about 200 x T_{max} or greater, wherein T_{max} is the time of maximum plasma concentration for the first oral dosage form.

[86] Some embodiments include treatment of a condition recited herein, such as inflammatory pain, arthritis, or complex regional pain syndrome, wherein the treatment comprises either: administering only one dosage form to a mammal to treat the condition, or administering a first dosage form to the mammal, followed by administering a second dosage form to the mammal. If two or more dosage forms are administered, the second oral dosage form is administered before the maximum pain relieving effect of the first oral dosage form is achieved, or before a peak in the pain relieving effect of the first oral dosage form is experienced by a mammal, receiving the dosage form. In some embodiments, the second oral dosage form is administered before an observable pain relieving effect is achieved. In some embodiments, the second dosage form is administered about 12 hours to about 60 days, about 24 hours to about 28 days, about 24 hours to about 7 days, about 24 hours to about 14 days, or about 24 hours to about 21 days, after the first dosage form is administered.

[87] Some embodiments include treatment of a condition recited herein, such as inflammatory pain, arthritis, or complex regional pain syndrome, wherein the treatment comprises administering a first dosage form to the mammal, followed by administering a second dosage form to the mammal, wherein the second dosage form is administered after the maximum pain relieving effect of the first oral dosage form is achieved, and the second oral dosage form is administered while the mammal is still experiencing pain relief from the first oral dosage form, or while the pain relieving effect from the first oral dosage form is observable. In some embodiments, the second dosage form is administered about 12 hours to about 60 days, about 24 hours to about 28 days, about 24 hours to about 7 days, about 24 hours to about 14 days, or about 24 hours to about 21 days, after the first dosage form is administered.

[88] Zoledronic acid or another bisphosphonate may also be administered orally to relieve cancer-related pain, including pain associated with multiple myeloma and bone metastases from solid tumors. In some embodiments, zoledronic acid is used to treat pain that is not cancer-related pain. For example, zoledronic acid may be used to treat pain that is not associated with multiple myeloma, bone metastasis from solid tumors, hypercalcemia of malignancy, giant cell tumor of bone, blood cancers or leukemias, or solid tumors or cancers. In some embodiments, enhanced bioavailability of the zoledronic acid may be achieved in treating one of these conditions by administering a dosage form comprising zoledronic acid in the form of a disodium salt. This may allow a reduced molar amount of the disodium salt to be used as compared to what would be used with the diacid form.

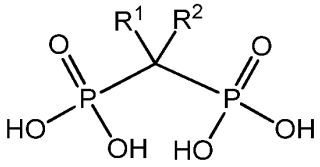
[89] In addition to relieving pain, oral administration of zoledronic acid or another bisphosphonate may also be useful to treat diseases or conditions that may or may not include a pain component. For example, zoledronic acid or another bisphosphonate may be useful to treat any of the pain conditions or types of conditions listed above, including treatment that does not simply relieve the pain of those conditions, and treatment that is carried out in such a way that the condition is treated without pain relief occurring. In addition to any pain relief zoledronic acid or another bisphosphonate may or may not provide, zoledronic acid or another bisphosphonate may be used to treat a disease or condition such as a metabolic disease or condition; an inflammatory disease or condition, including an inflammatory disease or condition that is not associated with pain; a cancer disease or condition; a neurological disease or condition; etc. In some embodiments, enhanced bioavailability of the zoledronic acid may be achieved in treating one of these conditions by administering a dosage form comprising zoledronic acid in the form of a disodium salt. This may allow a reduced molar amount of the disodium salt to be used as compared to what would be used with the diacid form.

[90] In some embodiments, oral administration of zoledronic acid or another bisphosphonate may also be useful to treat complex regional pain syndrome, rheumatoid arthritis, osteoarthritis, erosive osteoarthritis, axial spondyloarthritis including ankylosing spondylitis, acute vertebral crush fracture, fibrous dysplasia, SAPHO syndrome, osteoporosis, transient osteoporosis, or transient osteoporosis of the hip. In some embodiments, enhanced bioavailability of the zoledronic acid may be achieved in treating one of these conditions by administering a dosage form comprising zoledronic acid in the form of a disodium salt. This may allow a reduced molar amount of the disodium salt to be used as compared to what would be used with the diacid form.

[91] In some embodiments, oral administration of zoledronic acid or another bisphosphonate may also be useful to treat hypercalcemia of malignancy, multiple myeloma, bone metastases from solid tumors, Paget's disease of bone, giant cell tumor of bone, blood

cancers or leukemias, or solid tumors or cancers. In some embodiments, enhanced bioavailability of the zoledronic acid may be achieved in treating one of these conditions by administering a dosage form comprising zoledronic acid in the form of a disodium salt. This may allow a reduced molar amount of the disodium salt to be used as compared to what would be used with the diacid form.

[92] Some nitrogen-containing bisphosphonates may be represented by Formula A:



Formula A

[93] With respect to Formula A, R^1 is F, Cl, Br, H, or OH. In some embodiments, R^1 is OH.

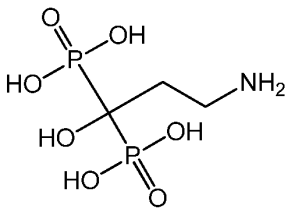
[94] With respect to Formula A, R^2 is aminoalkyl, such as aminoethyl, aminopropyl, aminopentyl, dimethylaminoethyl, methylpentylaminoethyl, etc; or optionally substituted heterocyclyl alkyl, such as optionally substituted imidazolylmethyl, optionally substituted pyridinymethyl, etc. In some embodiments R^2 is optionally substituted imidazolylalkyl.

[95] Unless otherwise indicated, when a compound or chemical structural feature such as heterocyclyl alkyl is referred to as being "optionally substituted," it includes a feature that has no substituents (i.e. unsubstituted), or a feature that is substituted, meaning that the feature has one or more substituents. The term "substituent" has the broadest meaning known to one of ordinary skill in the art, and includes a moiety that replaces one or more hydrogen atoms in a parent compound or structural feature. The term "replaces" is merely used herein for convenience, and does not require that the compound be formed by replacing one atom with another. In some embodiments, a substituent may be any ordinary organic moiety known in the art, which may have a molecular weight (e.g. the sum of the atomic masses of the atoms of the substituent) of 15 g/mol to 50 g/mol, 15 g/mol to 100 g/mol, 15 g/mol to 150 g/mol,15 g/mol to 200 g/mol, 15 g/mol to 300 g/mol, or 15 g/mol to 500 g/mol. In some embodiments, a substituent comprises, or consists of: 0-30, 0-20, 0-10, or 0-5 carbon atoms; and 0-30, 0-20, 0-10, or 0-5 heteroatoms, wherein each heteroatom may independently be: N, O, P, S, Si, F, Cl, Br, or I; provided that the substituent includes one C, N, O, P, S, Si, F, Cl, Br, or I atom. In some embodiments, substituents can independently have a molecular weight of about 15 Da to about 600 Da and can consist of 2 to 5 chemical elements, wherein

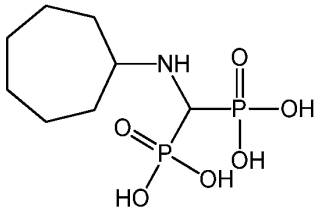
the chemical elements are independently C, H, O, N, P, S, Si, F, Cl, or Br. In some embodiments, a substituent is optionally substituted alkyl, –O-alkyl (e.g. $–OCH_3$, $-OC_2H5$, $-OC_3H_7$, $-OC_4H_9$, etc.), -S-alkyl (e.g. $–SCH_3$, $-SC_2H_5$, $-SC_3H_7$, $-SC_4H_9$, etc.), -NR'R", –OH, -SH, -CN, $-CF_3$, $-NO_2$, perfluoroalkyl, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted amine or a halogen, wherein R' and R" are independently H or optionally substituted alkyl. Wherever a substituent is described as "optionally substituted," that substituent can be substituted with the above substituents.

[96] For convenience, the term "molecular weight" is used with respect to a moiety or part of a molecule to indicate the sum of the atomic masses of the atoms in the moiety or part of a molecule, even though it may not be a complete molecule.

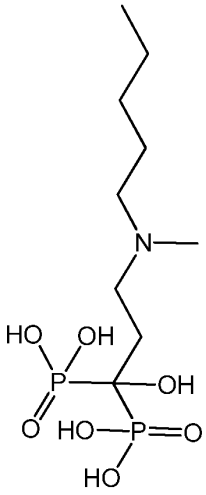
[97] Examples of nitrogen-containing bisphosphonates include but are not limited to pamidronic acid, incadronic acid, ibandronic acid, risedronic acid, minodronic acid, cimadronic acid, neridronic acid, alendronic acid, olpadronic acid, zoledronic acid, etc.



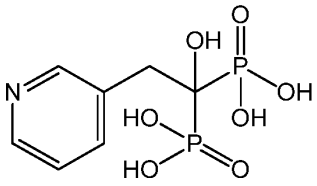
pamidronic acid



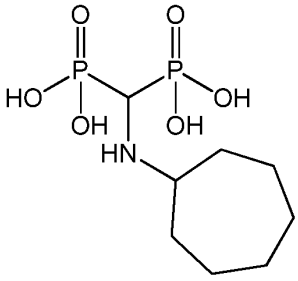
incadronic acid



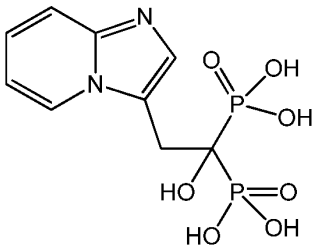
ibandronic acid



risedronic acid

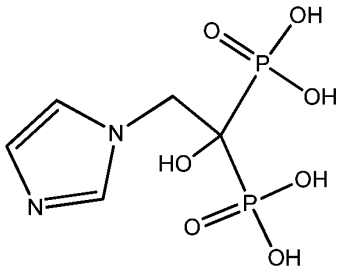


cimadronic acid



minodronic acid

[98] Zoledronic acid has the structure shown below, and is also referred to as zoledronate.



Zoledronic acid

[99] Unless otherwise indicated, any reference to a compound herein, such as zoledronic acid, by structure, name, or any other means, includes pharmaceutically acceptable salts, such as the disodium salt; alternate solid forms, such as polymorphs, solvates, hydrates, etc.; tautomers; or any other chemical species that may rapidly convert to a compound described herein under conditions in which the compounds are used as described herein. Unless otherwise indicated, a phrase such as "administering a bisphosphonate," "administering an osteoclast inhibitor," "administering zoledronic acid," includes administering any form of the bisphosphonate, osteoclast inhibitor, zoledronic acid, etc., such as those recited above.

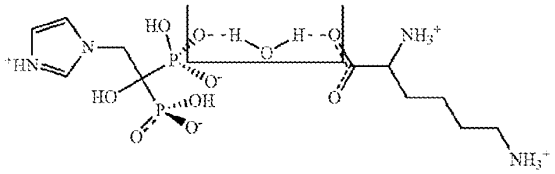
[100] In some embodiments, zoledronic acid is administered in a dosage form comprising a salt form, such as a salt of a dianion of zoledronic acid. In some embodiments, zoledronic acid is administered in a dosage form comprising a disodium salt form of zoledronic acid. In some embodiments, zoledronic acid is administered in a sodium salt form, such as a monosodium salt, a disodium salt, a trisodium salt, etc. In some circumstances, use of the disodium salt may be desirable. For example, the disodium salt is much more soluble in water than the diacid form. As a result, in some processes, the disodium salt can be easier to work with than the diacid form. Additionally, the sodium salt may be more bioavailable and/or more rapidly absorbed when taken orally as compared to the diacid form.

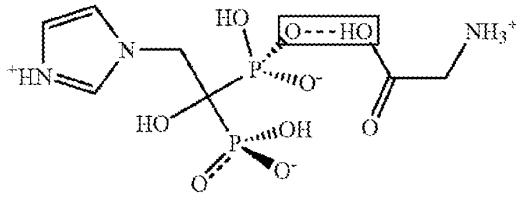
[101] In some embodiments, a RANK/RANKL antagonists or an osteoclast inhibitor, such as zoledronic acid or neridronic acid may be in the form of a molecular complex. For example, molecular complexes of zoledronic acid include cocrystals, salts, solvates such as hydrates and mixed solvates of an acid or a salt form, and mixtures containing such materials. Molecular complexes of zoledronic acid may be in amorphous forms or polymorphs.

[102] Of particular interest are compositions, or complexes comprising zoledronic acid or neridronic acid and the standard amino acids or natural existing amino acids, such as

alanine, arginine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, valine, etc. Some examples of useful molecular complexes include, but are not limited to, complexes of zoledronic acid or neridronic acid with sodium cation, ammonium, ammonia, L-lysine, DL-lysine, nicotinamide, adenine, glycine, and Selenocysteine.

[103] Zoledronic acid may also be in a form represented by one of the structural depictions below.





[104] Zoledronic acid in a salt or an acid form may be present in a molecular complex having strong X-ray powder diffraction peaks in one of the following positions:

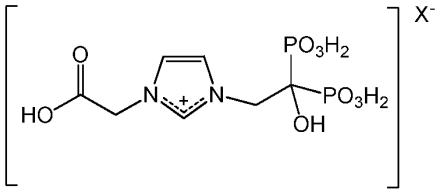
Form	strong X-ray powder diffraction peaks (°2θ ± 0.2)
zoledronic acid, sodium zoledronate and water complex	about 8.1, about 13.3, about 21.5, about 24.6, and about 25.6
ammonium zoledronate salt and water complex	about 11.0, about 14.6, about 15.4, about 19.9, and about 29.4
zoledronic acid, L-lysine, and water complex	about 9.0, about 14.4, about 18.1, about 26.0, and about 29.6
zoledronic acid, DL-lysine, and water complex	about 9.1, about 14.7, about 18.0, about 21.2, and about 26.0
zoledronic acid, DL-lysine, ethanol, and water complex	about 8.8, about 9.7, about 17.6, about 23.1, and about 26.5
zoledronic acid, nicotinamide, and water complex	13.1, about 15.2, about 21.0, about 23.9, and about 26.5
zoledronic acid, adenine, and water complex	about 13.6, about 15.9, about 19.7, about 27.9, and about 29.5
zoledronic acid and glycine complex	about 10.2, about 17.8, about 19.9, about 22.9, and about 28.1

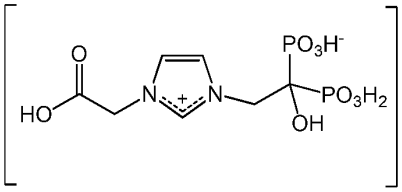
Form	strong X-ray powder diffraction peaks (°2θ ± 0.2)
zoledronic acid diammonia, and water complex	about 12.2, about 13.0, about 14.1, about 17.1, and about 19.3
zoledronic acid, DL-lysine, and water complex	about 8.3, about 11.8, about 12.3, about 15.8, and about 20.8
zoledronic acid, L-lysine, and water complex	about 9.6, about 10.7, about 14.3, about 21.4, and about 23.5
zoledronic acid, DL-lysine, and water complex	about 9.7, about 10.8, about 14.4, about 18.9, and about 21.4
zoledronic acid, DL-lysine complex	7.2, about 14.0, about 18.3, about 19.1, about 20.7, about 24.6, and about 34.4
zoledronic acid, DL-lysine complex	6.6, about 11.0, about 14.2, about 18.3, about 19.7, about 22.7, and about 27.6

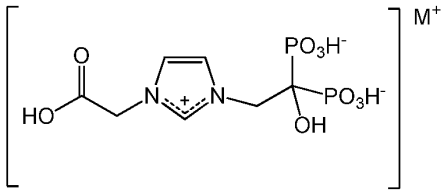
[105] Solid forms of zoledronic acid such as complexes of zoledronic acid with sodium, ammonium, ammonia, L-lysine, DL-lysine, nicotinamide, adenine and glycine may be prepared by methods such as dry or solvent-drop grinding (liquid assisted grinding), heating or solvent evaporation of their solution in single or mixed solvent systems, slurry suspension, supercritical fluids or other techniques known to a person skilled in the art.

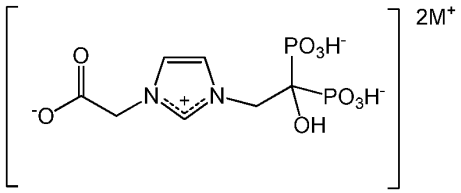
[106] For example, zoledronic acid and nicotinamide may be complexed by dissolving both compounds in water:ethyl acetate (1:1 v/v) and allowing the solvents in the mixture to evaporate to form crystalline material.

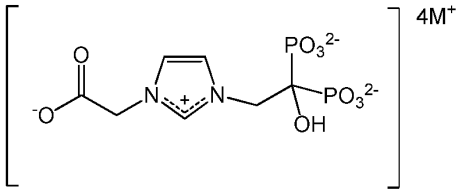
[107] In some embodiments, a zoledronic acid complex may have an excess at least one coformer (e.g. the component other than zoledronic acid) to the zoledronic acid complexes, which may be the same as the coformer in the complex, a different coformer, or a mixture thereof. In some embodiments, the excess coformer may be a standard or natural amino acid.Examples of compounds in salt forms containing Ion 1 are shown below:





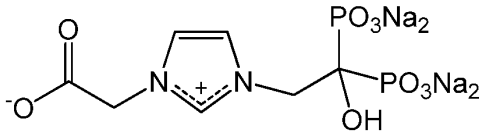






wherein X^- is any suitable anion, e.g. F^-, Br^-, Cl^-, I^-, OH^-, acetate, etc.; and M^+ is any suitable cation, e.g. Na^+, K^+, NH_4^+, etc. Many other salt forms are also possible.

[108] In some embodiments, a compound containing Ion 1 may be further represented by a formula,



.

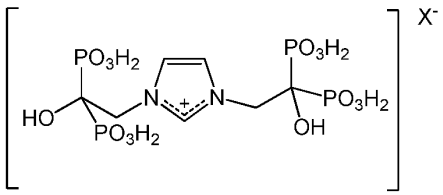
[109] In some embodiments, a compound containing Ion 1 may be in a hydrate form.

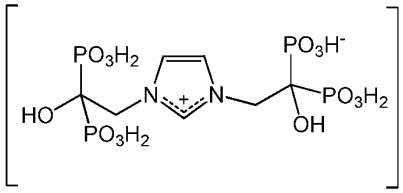
[110] In some embodiments, a compound containing Ion 1 is administered in a dosage form comprising a salt form, such as a zwitterionic form, or a salt of a cation, a monoanion, a dianion, a trianion, etc.

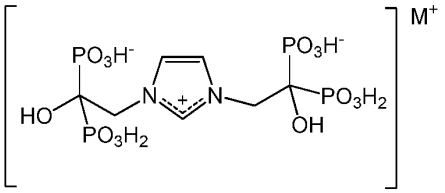
[111] A compound containing Ion 1 can be present in any amount, such as less than about 100% w/w, less than about 50% w/w, less than about 20% w/w, less than about 10% w/w, less than about 1% w/w, less than 0.1% w/w, less than about 0.07% w/w, less than about 0.05% w/w, less than about 0.04% w/w, less than about 0.03% w/w, less than about 0.02% w/w; and/or greater than 0% w/w, at least about 0.00000001% w/w, at least about

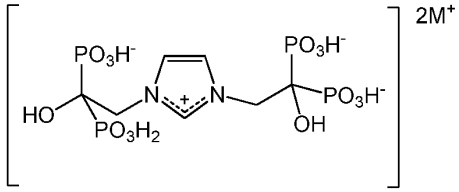
0.000001% w/w, or at least about 0.00001% w/w, based upon the total amount of zoledronic acid, a compound containing Ion 1, and a compound containing Ion 2 present in the composition.

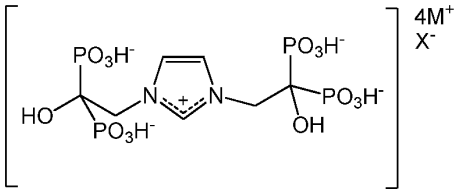
[112] Examples of salts of compounds containing Ion 2 are shown below:

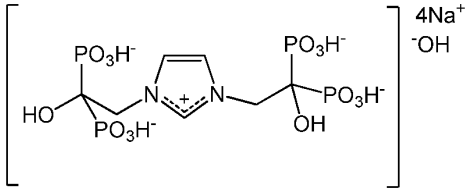






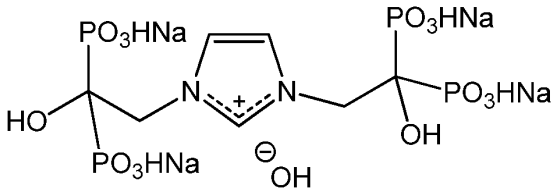






wherein X^- is any suitable anion, e.g. F^-, Br^-, Cl^-, I^-, OH^-, acetate, etc.; and M^+ is any suitable cation, e.g. Na^+, K^+, NH_4^+, etc. Many other salt forms are also possible.

[113] In some embodiments, a salt of a compound containing Ion 2 may be further represented by a formula,



[114] In some embodiments, a compound containing Ion 2 may be in a hydrate form.

[115] In some embodiments, a compound containing Ion 2 is administered in a dosage form comprising a salt form, such as a zwitterionic form, or a salt of a cation, a monoanion, a dianion, a trianion, etc..

[116] A compound containing Ion 2 can be present in any amount, such as less than about 100% w/w, less than about 50% w/w, less than about 20% w/w, less than about 10% w/w, less than about 1% w/w, less than about 0.3%, less than about 0.2%, less than 0.1% w/w, less than about 0.08% w/w, less than about 0.07% w/w, less than about 0.05% w/w, less than about 0.04% w/w, less than about 0.03% w/w, less than about 0.02% w/w; and/or greater than 0% w/w, at least about 0.00000001% w/w, at least about 0.000001% w/w, or at least about 0.00001% w/w, based upon the total amount of zoledronic acid, a compound containing Ion 1, and a compound containing Ion 2 present in the composition.

[117] In some embodiments, a compound containing Ion 1 and a compound containing Ion 2 are present in an amount that is less than 0.1% w/w.

[118] In some embodiments, the administration of an osteoclast inhibitor, such as a nitrogen-containing bisphosphonate, including, e.g. zoledronic acid, minodronic acid, etc., to a patient or mammal in need thereof affects Modic changes (MCs). For example, any of the above compounds could be used to treat Modic changes, or vertebral endplate signal changes (VESC) and bone marrow changes visible using magnetic resonance imaging (MRI), or neck pain or back pain associated with Modic changes.

[119] Modic changes, as used herein, includes its ordinary meaning in the art and refers to pathological vertebral endplate and bone marrow changes visible using magnetic resonance imaging (MRI). Modic changes may also be referred to as vertebral endplate signal changes (VESC). Modic changes, can be classified into various types including type 1 (M1), type 2 (M2), and type 3 (M3) lesions or changes, any of which may be treated using an osteoclast inhibitor, such as a nitrogen-bisphosphonate, including, e.g. zoledronic acid, minodronic acid, etc. Different types of Modic changes may occur in the same patient, for example type 1 and type 2 Modic changes (M1/2). In some cases, M1 changes are related to lower back pain than other types of Modic change.

[120] VESCs may be found in patients with different types of low back pain including but not limited to spondylitis, trauma, spondyloarthropathies including ankylosing spondylitis, Schmorl's nodes, fracture, tumor, and spinal cord infarction. Lesions in ankylosing spondylitis include osteitis and spondylodiscitis, which can be detected using MRI or another medical imaging instrument.

[121] Modic changes may be found in the cervical, thoracic, lumbar, and sacral spine. Modic changes may be found at various spinal levels such as at C1/2, C2/3, C3/4, C4/5, C5/6, C6/7, C7/T1, T1/2, T2/3, T3/4, T4/5, T5/6, T6/7, T7/8, T8/9, T9/10, T10/11, T11/12, T12/L1, L1/2, L2/3, L3/4, L4/5, L5/S1, etc., any of which may be treated using an osteoclast

inhibitor, such as a nitrogen-bisphosphonate, including, e.g. zoledronic acid, minodronic acid, etc.

[122] In some embodiments, the Modic change being treated is located at L2/3. In some embodiments, the Modic change being treated is located at L3/4. In some embodiments, the Modic change being treated is located at L4/5. In some embodiments, the Modic change being treated is located at L5/S1.

[123] In some embodiments, the Modic change being treated is located at C3/4. In some embodiments, the Modic change being treated is located in at C4/5. In some embodiments, the Modic change being treated is located in at C5/6. In some embodiments, the Modic change being treated is located in at C6/7.

[124] In some embodiments, the Modic change being treated is located at T5/6. In some embodiments, the Modic change being treated is located in at T6/7. In some embodiments, the Modic change being treated is located in at T7/8. In some embodiments, the Modic change being treated is located in at T8/9. In some embodiments, the Modic change being treated is located at T9/10.

[125] In some embodiments, the patient being treated has predominantly M1. In some embodiments, the patient being treated has predominantly M1/M2. In some embodiments, the patient being treated has predominantly M2. In some embodiments, the patient being treated has predominantly M3.

[126] In some embodiments, the worst type of lesion that the patient being treated has is M1. In some embodiments, the worst type of lesion that the patient being treated has is M1/2. In some embodiments, the worst type of lesion that the patient being treated has is M2.

[127] In some embodiments, the patient being treated has Modic changes at more two or more levels. In some embodiments the patient being treated has Modic changes at three or more levels. In some embodiments greater pain relief is obtained when treating a patient with Modic changes at two levels, or three or more levels, than is obtained when treating a patient with Modic changes at a single level or at two levels.

[128] In some embodiments greater pain relief is obtained when treating a patient with Modic changes at two levels than is obtained when treating a patient with Modic changes at a single level.

[129] In some embodiments greater pain relief is obtained when treating a patient with Modic changes at three or more levels than is obtained when treating a patient with Modic changes at a single level.

[130] In some embodiments greater pain relief is obtained when treating a patient with Modic changes three or more levels than is obtained when treating a patient with Modic changes at two levels.

[131] In some embodiments, the inhibitor of osteoclast activity may be used to effect a reduction in the levels of pro-inflammatory cytokines in the patient with low back pain or any other type of pain or condition recited herein. In some embodiments greater pain relief may be obtained in patients with greater baseline levels of pro-inflammatory cytokines when treated with an inhibitor of osteoclast activity, such as a nitrogen-containing bisphosphonate, including e.g. zoledronic acid, minodronic acid, etc. In some embodiments, greater pain relief may be obtained in patients who experience a reduction or a greater reduction in the levels of pro-inflammatory cytokines when treated with an inhibitor of osteoclast activity, such as a nitrogen-containing bisphosphonate, including e.g. zoledronic acid, minodronic acid, etc. Pro-inflammatory cytokines include but are not limited to IL-1, IL-2, IL-3, IL-6, IL-8, IL-10, IL-12, tumor necrosis alpha (TNF-alpha), interferon gamma, etc.

[132] In some embodiments, the use of an inhibitor of osteoclast activity, such as a nitrogen-containing bisphosphonate, including e.g. zoledronic acid, minodronic acid, etc., to a patient or mammal in need thereof, achieves a reduction relative to baseline in the size of Modic changes or VESCs of at least about 5%, at least about 10%, at least about 15%, at least about 20%, at least about 25%, at least about 30%, at least about 40%, at least about 50%, at least about 60%, at least about 70% at least about 80%, at least about 90%, or about 100%. In some embodiments, the reduction the size of Modic changes or VESCs represents an improvement relative to placebo of at least about 10%, at least about 15%, at least about 20%, at least about 25%, at least about 30%, at least about 40%, at least about 50%, at least about 60%, at least about 70%, at least about 80%, at least about 90%, at least about 100%, at least about 120%, at least about 150%, at least about 170%, at least about 200%, at least about 250%, at least about 300%, at least about 350%, at least about 400%, or at least about 450%. In some embodiments, the use of an inhibitor of osteoclast activity inhibits an increase in the size of Modic changes or VESCs over time.

[133] The oral bioavailability of zoledronic acid may be enhanced by orally administering the zoledronic acid in the disodium salt form. For example, the bioavailability of zoledronic acid may be improved by at least about 10%, at least about 20%, at least about 30%, at least about 50%, and/or up to about 100%, or up to about 200%, as compared to administration of zoledronic acid in the diacid form.

[134] Because of the improved bioavailability of the disodium salt a dosage form may contain, or a mammal, such as a human being, may receive, on a molar basis, less of

the disodium salt form of zoledronic acid than would otherwise be administered of the diacid form of zoledronic acid. For example, a dosage form may contain, or a mammal may receive, at least about 10 mole% less, at least about 20 mole% less, at least about 40 mole% less, at least about 50 mole% less, and/or up to about 90 mole% less or 95 mole% less, of the disodium salt form as compared the amount of the diacid form of zoledronic acid that would otherwise be administered, such as a molar amount that would be administered of zoledronic acid in the diacid form in order to achieve the same plasma levels of zoledronic acid.

[135] In some embodiments, a dosage form contains, or a mammal (such as a human being) is administered, an amount of the disodium salt form, on a molar basis, that has a value of about $0.8n_d$ to about $1.2n_d$ or about $0.9n_d$ to about $1.1n_d$, wherein:

$$n_d = (b_a/b_d)(n_a)$$

wherein b_a is the bioavailability of the diacid form, b_d is the bioavailability of the disodium salt form, and n_a is the number of moles of the diacid that would be administered in a dosage form containing the diacid form of zoledronic acid. For example, if the diacid form has a bioavailability (b_a) of 0.01 and the disodium salt form has a bioavailability (b_d) of 0.015, and a dosage form would normally contain 0.001 moles of the diacid, n_d would be (0.01/0.015)(0.001 moles), or about 0.00067 moles. In some embodiments, the disodium salt is administered in an amount that has a value of about n_d.

[136] With respect to oral dosage forms comprising a reduced molar amount of the disodium salt of zoledronic acid as compared to the diacid form of zoledronic acid, in some embodiments, the bioavailability of the zoledronic acid in the disodium salt form is sufficiently high that, if the drug is administered to a mammal, at least as much zoledronic acid is present in the blood of the mammal as would be present if zoledronic acid were administered in the diacid form.

[137] With respect to oral dosage forms comprising the disodium salt form of zoledronic acid, in some embodiments, the disodium salt form is present in a lower molar amount than would be present if the zoledronic acid were in the diacid form; and the zoledronic acid in the disodium salt form has an improved bioavailability as compared to the zoledronic acid in the diacid form to the extent that the lower molar amount of the disodium salt in the dosage form does not reduce the amount of zoledronic acid delivered to the plasma of a mammal.

[138] Some oral dosage forms comprising zoledronic acid have a dose of zoledronic acid and a configuration suitable for a particular species of mammal, e.g. dog, rat, human, etc. Such a dosage form may have zoledronic acid present in an amount that results in a desired range for an area under the plasma concentration curve (AUC) of zoledronic acid

in that particular species of mammal. For example the dose of zoledronic acid and a configuration of the oral dosage form may result in an AUC of zoledronic acid of about 1 ng·h/mL to about 700 ng·h/mL, about 3 ng·h/mL to about 30 ng·h/mL, about 3 ng·h/mL to about 10 ng·h/mL, about 50 ng·h/mL to about 700 ng·h/mL, about 130 ng·h/mL to about 180 ng·h/mL, about 300 ng·h/mL to about 450 ng·h/mL, about 300 ng·h/mL to about 350 ng·h/mL, about 300 ng·h/mL to about 310 ng·h/mL, about 340 ng·h/mL to about 350 ng·h/mL, about 370 ng·h/mL to about 420 ng·h/mL, about 380 ng·h/mL to about 390 ng·h/mL, about 405 ng·h/mL to about 415 ng·h/mL, about 140 ng·h/mL to about 160 ng·h/mL, about 140 ng·h/mL to about 150 ng·h/mL, about 150 ng·h/mL to about 160 ng·h/mL, about 140 ng·h/mL, 142 ng·h/mL, about 155 ng·h/mL, about 305 ng·h/mL, 304 ng·h/mL, about 345 ng·h/mL, 343 ng·h/mL, about 385 ng·h/mL, 384 ng·h/mL, about 410 ng·h/mL, or any AUC in a range bounded by, or between, any of these values, upon administration of the oral dosage form to a mammal.

[139] Unless otherwise indicated, the AUC refers to the AUC calculated to the last measured concentration ($AUC_{(0-t)}$) and extrapolated to infinity ($AUC_{(0-inf)}$).

[140] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may have zoledronic acid present in an amount that results in a C_{max} of zoledronic acid of about 0.2 ng/mL to about 300 ng/mL, about 0.5 ng/mL to about 5 ng/mL, about 5 ng/mL to about 300 ng/mL, about 5 ng/mL to about 50 ng/mL, about 20 ng/mL to about 50 ng/mL, about 30 ng/mL to about 50 ng/mL, about 50 ng/mL to about 200 ng/mL, about 50 ng/mL to about 150 ng/mL, about 80 ng/mL to about 120 ng/mL, about 90 ng/mL to about 100 ng/mL, about 50 ng/mL to about 200 ng/mL, about 40 ng/mL, about 95 ng/mL, about 97 ng/mL, or any C_{max} in a range bounded by, or between, any of these values, upon administration of the oral dosage form to a mammal.

[141] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that administration of the oral dosage form to the particular species of mammal results in a T_{max} of zoledronic acid of about 0.4 hr to about 1 hr, about 0.5 hr, or about 0.75 hr, or any T_{max} in a range bounded by, or between, any of these values.

[142] In some embodiments, the zoledronic acid in the disodium salt form is present in an amount such that the oral dosage form provides an area under the plasma concentration curve of zoledronic acid of about 4 ng•h/mL to about 2000 ng•h/mL to the mammal each time the zoledronic acid in the disodium salt is administered.

[143] In some embodiments, the zoledronic acid, including zoledronic acid in an acid or a salt form, e.g the disodium salt form, is present in an amount such that the oral

dosage form provides an area under the plasma concentration curve of zoledronic acid of about 100 ng•h/mL to about 2000 ng•h/mL, about 100 ng•h/mL to about 1000 ng•h/mL, about 500 ng•h/mL to about 1000 ng•h/mL, or about 500 ng•h/mL to about 700 ng•h/mL in the mammal to which the dosage form is administered. This amount may be suitable for administration of the oral dosage form about every 3 to 4 weeks.

[144] In some embodiments, the zoledronic acid, such as zoledronic acid in an acid form or a salt form, such as the disodium salt form, is present in an amount such that the oral dosage form provides an area under the plasma concentration curve (AUC) of zoledronic acid of about 20 ng•h/mL to about 700 ng•h/mL, about 50 ng•h/mL to about 500 ng•h/mL, about 50 ng•h/mL to about 400 ng•h/mL, about 50 ng•h/mL to about 300 ng•h/mL, about 50 ng•h/mL to about 200 ng•h/mL, about 50 ng•h/mL to about 100 ng•h/mL, about 130 ng•h/mL to about 150 ng•h/mL, about 130 ng•h/mL to about 140 ng•h/mL, about 150 ng•h/mL to about 200 ng•h/mL, about 200 ng•h/mL to about 300 ng•h/mL, about 250 ng•h/mL to about 300 ng•h/mL, about 300 ng•h/mL to about 400 ng•h/mL, about 400 ng•h/mL to about 500 ng•h/mL, about 350 ng•h/mL to about 400 ng•h/mL, about 450 ng•h/mL to about 500 ng•h/mL, about 130 ng•h/mL to about 160 ng•h/mL, about 405 ng•h/mL to about 450 ng•h/mL, about 100 ng•h/mL to about 500 ng•h/mL, about 100 ng•h/mL to about 400 ng•h/mL, about 100 ng•h/mL to about 300 ng•h/mL, about 100 ng•h/mL to about 200 ng•h/mL, about 125 ng•h/mL to about 500 ng•h/mL, about 125 ng•h/mL to about 400 ng•h/mL, about 125 ng•h/mL to about 300 ng•h/mL, about 125 ng•h/mL to about 200 ng•h/mL, or about 200 ng•h/mL to about 300 ng•h/mL, in the mammal to which the dosage form is administered. This amount may be suitable for weekly administration of the oral dosage, or for administration of 3 to 5 individual dosages during a month. The individual dosages could be given at regular intervals, given during the first week, or at any other schedule that provides 3 to 5 dosages during the month.

[145] In some embodiments, the zoledronic acid is present in an amount such that the oral dosage form provides an area under the plasma concentration curve of zoledronic acid of about 4 ng•h/mL to about 100 ng•h/mL, about 10 ng•h/mL to about 50 ng•h/mL, about 10 ng•h/mL to about 30 ng•h/mL, 20 ng•h/mL to about 700 ng•h/mL, about 50 ng•h/mL to about 500 ng•h/mL, about 50 ng•h/mL to about 400 ng•h/mL, about 50 ng•h/mL to about 300 ng•h/mL, about 50 ng•h/mL to about 200 ng•h/mL, about 100 ng•h/mL to about 500 ng•h/mL, about 100 ng•h/mL to about 400 ng•h/mL, about 100 ng•h/mL to about 300 ng•h/mL, about 100 ng•h/mL to about 200 ng•h/mL, about 125 ng•h/mL to about 500 ng•h/mL, about 125 ng•h/mL to about 400 ng•h/mL, about 125 ng•h/mL to about 300 ng•h/mL, about 125 ng•h/mL to about 200 ng•h/mL, or about 200 ng•h/mL to about 300 ng•h/mL in the mammal to which the dosage form is administered. This amount may be suitable for daily administration of the

oral dosage form. In some embodiments, the dosage form may be administered for 2, 3, 4, 5, 6, 7, 8, 9, or 10, 5 to 10, or 6 to 10 consecutive days.

[146] In some embodiments, the zoledronic acid, such as zoledronic acid in an acid form or a salt form, such as the disodium salt form, is present in an amount such that the oral administration of the dosage form in a fasted state results in an area under the plasma concentration curve (AUC) of zoledronic acid of about 50 ng•h/mL to about 500 ng•h/mL, about 50 ng•h/mL to about 100 ng•h/mL, about 100 ng•h/mL to about 200 ng•h/mL, about 130 ng•h/mL to about 180 ng•h/mL, about 130 ng•h/mL to about 150 ng•h/mL, about 130 ng•h/mL to about 140 ng•h/mL, about 140 ng•h/mL to about 150 ng•h/mL, about 150 ng•h/mL to about 200 ng•h/mL, about 200 ng•h/mL to about 300 ng•h/mL, about 250 ng•h/mL to about 300 ng•h/mL, about 300 ng•h/mL to about 400 ng•h/mL, about 300 ng•h/mL to about 350 ng•h/mL, about 400 ng•h/mL to about 500 ng•h/mL, about 350 ng•h/mL to about 400 ng•h/mL, about 450 ng•h/mL to about 500 ng•h/mL, about 130 ng•h/mL to about 160 ng•h/mL, about 405 ng•h/mL to about 450 ng•h/mL, measured over a 24 hour period.

[147] In some embodiments, molecular complex comprising neridronic acid is administered in an amount that results in an AUC of neridronic acid, measured over the entire course of treatment, of about 10,000-30,000 ng·h/mL about 30,000-100,000 ng·h/mL about 30,000-50,000 ng·h/mL, about 30,000-40,000 ng·h/mL, about 40,000-50,000 ng·h/mL, about 50,000-60,000 ng·h/mL, about 60,000-70,000 ng·h/mL, about 50,000-70,000 ng·h/mL, about 70,000-80,000 ng·h/mL, about 80,000-90,000 ng·h/mL, about 90,000-100,000 ng·h/mL, about 70,000-100,000 ng·h/mL, about 100,000-200,0000 ng·h/mL, about 200,000-300,0000 ng·h/mL, about 300,000-400,0000 ng·h/mL, about 400,000-500,0000 ng·h/mL, or any AUC in a range bounded by any of these values.

[148] In some embodiments, an osteoclast inhibitor, a bisphosphonate, or a RANK/RANKL antagonist, such as zoledronic acid, etc., is administered at an interval of about once, twice, or thrice daily, or every 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, or 14 days; or 15, 16, 17, 18, 19, 20, or 21 days; or 22, 23, 24, 25, 26, 27, 28, 29, 30, or 31 days; or 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, or 45; or 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, or 60 days; or 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, or 90 days; or 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, or 120 days.

[149] Oral administration of zoledronic acid, particularly oral administration of the disodium salt form of zoledronic acid, can result in more sustained plasma levels of the drug as compared to parenteral modes of administration, such intravenous or subcutaneous. For

example, the amount of zoledronic acid in the plasma can be significantly higher for oral administration of the disodium salt about 24 hours or 48 hours, or longer, after administration. In some embodiments, oral zoledronic acid has a 24 hour sustained plasma level factor of about 1 or higher, such as about 1 to about 10, about 1 to about 5, about 3 to about 5, or about 3 to about 4. In some embodiments, an orally administered dosage form of zoledronic acid has a 24 hour sustained plasma level factor or a 48 hour sustained plasma level factor that is higher, such as at least 1.2 times, at least about 2 times, at least about 5 times, about 1.2 times to about 20 times, about 2 times to about 15 times, about 5 times to about 10 times, or about 8 to about 15 times that of intravenously administered zoledronic acid. A "sustained plasma level factor," p_f, is determined by the equation:

$$p_f = 1000 \, (C_t/C_{max})$$

wherein C_{max} is the maximum plasma concentration of zoledronic acid after it is administered and C_t is the plasma concentration of zoledronic acid at the time of interest, such as 24 hours. For parenteral administration, the C_{max} can be about the C_0, or the concentration right after injection of the entire amount of the drug into the body. Sustained plasma level factors can also be obtained for other times, such as 48 hours, by using the plasma concentration of zoledronic acid for C_t in the equation above. For example, if the maximum plasma level of zoledronic acid after administration is 1000 ng/mL and the plasma level of zoledronic acid at 24 hours is 1 ng/mL, the 24 hour sustained plasma level factor is 1.

[150] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the zoledronic acid has a 12 hour sustained plasma level factor of about 12 to about 50, about 20 to about 40, about 25 to about 30, about 30 to about 35, about 35 to about 40, about 33, about 30, about 35, or any 12 hour sustained plasma level factor in a range bounded by, or between, any of these values, for the particular species of mammal.

[151] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the zoledronic acid has a 24 hour sustained plasma level factor of about 10 to about 30, about 10 to about 20, about 10 to about 15, about 12 to about 15 or 16, about 15 to about 20, about 14, about 12, about 15, or any 24 hour sustained plasma level factor in a range bounded by, or between, any of these values, for the particular species of mammal.

[152] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the zoledronic acid has a 36 hour sustained plasma level factor of about 6 to about 20, about 8 to about 15, about 9 to about 12 or 13, about 8 to about 10, about 11 to about 13, about 9,

about 13, or any 24 hour sustained plasma level factor in a range bounded by, or between, any of these values, for the particular species of mammal.

[153] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the zoledronic acid has a 48 hour sustained plasma level factor of about 5 to about 20, about 6 to about 15, about 7 or 8 to about 12 or 13, about 8 to about 10, about 11 to about 13, about 8, about 12, or any 48 hour sustained plasma level factor in a range bounded by, or between, any of these values, for the particular species of mammal.

[154] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the zoledronic acid has a 72 hour sustained plasma level factor of about 4 to about 20, about 5 to about 10, about 5 or 6 to about 10 or 11, about 5 to about 6, about 9 to about 10, about 6, about 10, or any 72 hour sustained plasma level factor in a range bounded by, or between, any of these values, for the particular species of mammal.

[155] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the particular species of mammal has a plasma concentration of zoledronic acid at 12 hours that is about 0.5 ng/mL to about 5 ng/mL, about 1 ng/mL to about 3 ng/mL, about 1 ng/mL to about 2 ng/mL, about 2 ng/mL to about 3 ng/mL, about 3 ng/mL to about 4 ng/mL, about 1.2 ng/mL, about 2.6 ng/mL, about 3.2 ng/mL, or any plasma concentration in a range bounded by, or between, any of these values.

[156] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the particular species of mammal has a plasma concentration of zoledronic acid at 24 hours that is about 0.2 ng/mL to about 2 ng/mL, about 0.5 ng/mL to about 1.5 ng/mL, about 0.5 ng/mL to about 1 ng/mL, about 1 ng/mL to about 1.5 ng/mL, about 0.5 ng/mL, about 1.0 ng/mL, about 1.4 ng/mL, or any plasma concentration in a range bounded by, or between, any of these values.

[157] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the particular species of mammal has a plasma concentration of zoledronic acid at 36 hours that is about 0.1 ng/mL to about 2 ng/mL, about 0.2 ng/mL to about 1.5 ng/mL, about 0.2 ng/mL to about 0.5 ng/mL, about 0.5 ng/mL to about 1 ng/mL, about 1 ng/mL to about 1.3 ng/mL, about 0.3 ng/mL, about 0.8 ng/mL, about 1.1 ng/mL, or any plasma concentration in a range bounded by, or between, any of these values.

[158] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the particular species of mammal has a plasma concentration of zoledronic acid at 48 hours that is about 0.1 ng/mL to about 2 ng/mL, about 0.2 ng/mL to about 1.5 ng/mL, about 0.2 ng/mL to about 0.5 ng/mL, about 0.5 ng/mL to about 0.9 ng/mL, about 0.9 ng/mL to about 1.3 ng/mL, about 0.3 ng/mL, about 0.7 ng/mL, about 1.1 ng/mL, or any plasma concentration in a range bounded by, or between, any of these values.

[159] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the particular species of mammal has a plasma concentration of zoledronic acid at 72 hours that is about 0.2 ng/mL to about 1 ng/mL, about 0.2 ng/mL to about 1.5 ng/mL, about 0.1 ng/mL to about 0.3 ng/mL, about 0.3 ng/mL to about 0.6 ng/mL, about 0.6 ng/mL to about 1 ng/mL, about 0.2 ng/mL, about 0.5 ng/mL, about 0.9 ng/mL, or any plasma concentration in a range bounded by, or between, any of these values.

[160] An oral dosage form comprising zoledronic acid having a dose of zoledronic acid and a configuration suitable for a particular species of mammal may be configured so that the elimination half-life of zoledronic acid in the particular species of mammal is about 30 hours to about 100 hours, about 40 hours to about 60 hours, about 40 hours to about 50 hours, about 50 hours to about 60 hours, about 42 hours, about 51 hours, about 59 hours, or any half-life in a range bounded by, or between, any of these values.

[161] As used herein, the “elimination half-life” refers to the apparent first-order terminal plasma elimination half-life, obtained by non-compartmental analysis using Win-Nonlin. A terminal plasma elimination half-life is the time required to reduce the plasma concentration to half after reaching pseudo-equilibrium, and not the time required to eliminate half the administered dose. For orally administered drugs, terminal plasma elimination half-life can be affected by absorption of the drug, as well as plasma clearance and extent of distribution.

[162] In some embodiments, the disodium salt form of zoledronic acid provides an enhancement to bioavailability, as compared to the diacid form of zoledronic acid, which adds to any enhancement to bioavailability provided by any bioavailability-enhancing agents in the dosage form. In some embodiments, the disodium salt form of zoledronic acid provides an enhancement to bioavailability, as compared to the diacid form of zoledronic acid, which is greater than any enhancement to bioavailability provided by any bioavailability-enhancing agents in the dosage form. In some embodiments, the disodium salt form of zoledronic acid

may be administered in a dosage form that is substantially free of bioavailability-enhancing agents.

[163] The C-terminal telopeptide (CTX) is one of the products from type I collagen degradation by osteoclasts during bone resorption. Thus, CTX serum levels may be used as a biomarker to indicate and monitor bone breakdown, resorption, and loss. In some embodiments, zoledronic acid and other bisphosphonates may be used to inhibit osteoclast activity and/or lower CTX serum levels, for example, by at least about 5%, at least about 10%, at least about 15%, at least about 20%, at least about 25%, at least about 30%, at least about 35%, at least about 40%, at least about 45%, at least about 50%, at least about 55%, at least about 60%, at least about 70%, at least about 75%, at least about 80%, at least about 85%, at least about 90%, at least about 95%, at least about 99%, at least about 100%, about 60%-70%, about 70%-80%, about 80%-90%, about 85-95%, about 80%-85%, about 85%-90%, about 90%-95%, or any other reduction in osteoclast activity or CTX serum levels in a range bounded by, or between, any of these values.

[164] In some embodiments, zoledronic acid in a disodium salt or an acid form and other bisphosphonates including salt or acid form may be used to treat Paget's disease of Bone or treat pain associated with Paget's disease of bone and/or lower serum alkaline phosphatase (ALP) levels. For example, the reduction of ALP levels by at least about 20%, at least about 40%, at least about 50%, at least about 60%, at least about 80%, about 50-60%, about 60-80%, about 80-90%, about 90-95%, or any other reduction in ALP levels in a range bounded by, or between, any of these values from baseline, within 12 months, 18 months, or up to at least 5 years from the time of the last oral administration of zoledronic acid or other bisphosphonates. In some embodiments, when zoledronic acid in a disodium salt or an acid form, or other bisphosphonate is administered to treat the Paget's disease of bone or pain associated with the Paget's disease of bone, the Paget's disease or the pain associated with the Paget's disease has recurrence rate of less than 20%, less than 10%, less than 5%, less than 1%, or does not return within 12 months, 18 months, or 5 years, or more, from the time of the last oral administration of zoledronic acid, or other bisphosphonates.

[165] In some embodiments, a dosage form comprising a disodium salt of zoledronic acid is a solid.

[166] In some embodiments, a dosage form comprising a disodium salt of zoledronic acid is used to treat an inflammatory condition.

[167] In some embodiments, a dosage form comprising a disodium salt of zoledronic acid is used to treat arthritis.

[168] In some embodiments, a dosage form comprising a disodium salt of zoledronic acid is used to treat complex regional pain syndrome.

[169] In some embodiments, zoledronic acid is in a form that has an aqueous solubility, meaning the solubility in water, greater than 1% (w/v), about 5% (w/v) to about 50% (w/v), about 5% (w/v) to about 20% (w/v), about 10% (w/v) to about 15% (w/v), or about 12% (w/v) to about 13% (w/v).

[170] The disodium salt form of zoledronic acid can be more compressible than the diacid form of zoledronic acid. This can make it easier for a dosage form to have a desired hardness. It can also make it easier to increase the drug load, so that a smaller tablet can be given for a given dosage strength. In some embodiments, a solid dosage form of zoledronic acid, such as the diacid form of zoledronic acid or the disodium salt form of zoledronic acid, can have a hardness of about 5 kPa to about 20 kPa or about 5 kPa to about 14 kPa.

[171] Zoledronic acid or another bisphosphonate may be combined with a pharmaceutical carrier selected on the basis of the chosen route of administration and standard pharmaceutical practice as described, for example, in Remington's Pharmaceutical Sciences, 2005, the disclosure of which is hereby incorporated herein by reference, in its entirety. The relative proportions of active ingredient and carrier may be determined, for example, by the solubility and chemical nature of the compounds, chosen route of administration and standard pharmaceutical practice.

[172] Zoledronic acid or another bisphosphonate may be administered by any means that may result in the contact of the active agent(s) with the desired site or site(s) of action in the body of a patient. The compounds may be administered by any conventional means available for use in conjunction with pharmaceuticals, either as individual therapeutic agents or in a combination of therapeutic agents. For example, they may be administered as the sole active agents in a pharmaceutical composition, or they can be used in combination with other therapeutically active ingredients.

[173] In some embodiments, an osteoclast inhibitor is co-administered with a steroid. Suitable steroids include, for example, hydrocortisone, hydrocortisone acetate, cortisone acetate, tixocortol pivalate, prednisolone, methylprednisolone, prednisone, triamcinolone acetonide, triamcinolone alcohol, mometasone, amcinonide, budesonide, desonide, fluocinonide, fluocinolone acetonide, halcinonide, betamethasone, betamethasone sodium phosphate, dexamethasone, dexamethasone sodium phosphate, fluocortolone, hydrocortisone-17-valerate, acleometasone dipropionate, betamethasone valerate, betamethasone dippropionate, prednicarbate, clobetasone-17-butyrate, clobetasol-17-

propionate, fluocortilone caproate, fluocortolone pivalate, and fluprednidene acetate, hydrocortisone-17-butyrate, 17-aceponate, 17-buteprate, and prednicarbate.

[174] Any effective dose of steroid can be administered to a person. In some embodiment, the dose of a steroid may be about 1-500 mg, 5-25 mg, about 1-3 mg, about 2-4 mg, about 3-5 mg, about 4-6 mg, about 5-7 mg, about 6-8 mg, about 7-9 mg, about 8-10 mg, about 10-15 mg, about 10-20 mg, about 20-50 mg, about 50-100 mg, about 100-200 mg, about 200-300 mg, about 300-400 mg, 400-500 mg 1-20 mg, about 10-30 mg, about 20-40 mg, about 30-50 mg, about 40-60 mg, about 50-70 mg, about 60-80 mg, about 70-90 mg, about 80-100 mg, about 90-110 mg, about 100-120 mg, about 110-130 mg, about 120-140 mg, about 130-150 mg, about 140-160 mg, about 150-170 mg, about 160-180 mg, about 170-190 mg, about 180-200 mg, about 190-210 mg, about 200-220 mg, about 210-230 mg, about 220-240 mg, about 230-250 mg, about 240-260 mg, about 250-270 mg, about 260-280 mg, about 270-290 mg, about 280-300 mg, about 290-310 mg, about 300-320 mg, about 310-330 mg, about 320-340 mg, about 330-350 mg, about 340-360 mg, about 350-370 mg, about 360-380 mg, about 370-390 mg, about 380-300 mg, about 390-410 mg, about 400-420 mg, about 410-430 mg, about 420-440 mg, about 430-450 mg, about 440-460 mg, about 450-470 mg, about 460-480 mg, about 470-490 mg, about 480-300 mg, about 490-510 mg of the steroid, or any amount in a range bounded by any of these values.

[175] The steroid can be given orally (for example, 7.5 mg of prednisone), by a separate infusion (for example, 7.5 mg of methyl prednisolone), mixed in with zoledronic acid in the same infusion, or be administered intramuscularly, subcutaneously, by rectal suppository, by inhalation, or injected directly into a joint.

[176] Zoledronic acid or another bisphosphonate may be administered to a human patient in a variety of forms adapted to the chosen route of administration, e.g., orally, rectally, or parenterally. Parenteral administration in this respect includes, but is not limited to, administration by the following routes: pulmonary, intrathecal, intravenous, intramuscular, subcutaneous, intraocular, intrasynovial, transepithelial including transdermal, sublingual and buccal; topically; nasal inhalation via insufflation; and rectal systemic.

[177] The effective amount of zoledronic acid or another bisphosphonate will vary depending on various factors known to the treating physicians, such as the severity of the condition to be treated, route of administration, formulation and dosage forms, physical characteristics of the bisphosphonate compound used, and age, weight and response of the individual patients.

[178] In some embodiments, the daily oral dose of pamidronate is about 10 mg to about 1,000 mg, about 50 mg to about 500 mg, about 100 mg to about 500 mg, or about

150 mg to about 300 mg. In some embodiments, the parenteral dose of pamidronate is about 5 mg to about 500 mg, about 5 mg to about 200 mg, or about 10 mg to about 150 mg.

[179] In some embodiments, the daily oral dose of neridronate is about 10 mg to about 1,000 mg, about 50 mg to about 500 mg, about 100 mg to about 500 mg, or about 150 mg to about 300 mg. In some embodiments, the parenteral dose of neridronate is about 5 mg to about 500 mg, about 5 mg to about 200 mg, or about 10 mg to about 150 mg.

[180] In some embodiments, the daily oral dose of alendronate is about 0.5 mg to about 200 mg, about 1 mg to about 100 mg, about 5 mg to about 100 mg, or about 2 mg to about 50 mg. In some embodiments, the parenteral dose of alendronate is about 1 mg to about 100 mg, about 1 mg to about 40 mg, or about 2 mg to about 30 mg.

[181] In some embodiments, the daily oral dose of olpadronate is about 0.5 mg to about 200 mg, about 1 mg to about 100 mg, about 5 mg to about 100 mg, or about 2 mg to about 50 mg. In some embodiments, the parenteral dose of olpadronate is about 1 mg to about 100 mg, about 1 mg to about 40 mg, or about 2 mg to about 30 mg.

[182] In some embodiments, the daily oral dose of ibandronate is about 0.25 mg to about 100 mg, about 0.5 mg to about 50 mg, about 2.5 mg to about 50 mg, or about 1 mg to about 25 mg. In some embodiments, the parenteral dose of ibandronate is about 0.5 mg to about 50 mg, about 0.5 mg to about 20 mg, or about 1 mg to about 15 mg.

[183] In some embodiments, the daily oral dose of risedronate is about 0.25 mg to about 100 mg, about 0.5 mg to about 50 mg, about 2.5 mg to about 50 mg, or about 1 mg to about 25 mg. In some embodiments, the parenteral dose of risedronate is about 0.25 mg to about 25 mg, about 0.25 mg to about 10 mg, or about 0.5 mg to about 7.5 mg.

[184] In some embodiments, the daily oral dose of zoledronate is about 0.005 mg to about 20 mg, about 0.1 mg to about 10 mg, about 0.5 mg to about 10 mg, or about 0.2 mg to about 5 mg. In some embodiments, the parenteral dose of zoledronate is about 0.25 mg to about 25 mg, about 0.25 mg to about 10 mg, or about 0.5 mg to about 7.5 mg.

[185] The dose of pamidronate, neridronate, olpadronate, alendronate, ibandronate, risedronate, zoledronate or another bisphosphonate compound may be administered in a single or divided dose.

[186] The amount of zoledronic acid or another bisphosphonate in a therapeutic composition may vary. For example, some liquid compositions may comprise about 0.0001% (w/v) to about 50% (w/v), about 0.01% (w/v) to about 20% (w/v), about 0.01% to about 10% (w/v), about 0.001% (w/v) to about 1% (w/v), about 0.1% (w/v) to about 0.5% (w/v), about 1% (w/v) to about 3% (w/v), about 3% (w/v) to about 5% (w/v), about 5% (w/v) to about 7% (w/v),

about 7% (w/v) to about 10% (w/v), about 10% (w/v) to about 15% (w/v), about 15% (w/v) to about 20% (w/v), about 20% (w/v) to about 30% (w/v), about 30% (w/v) to about 40% (w/v), or about 40% (w/v) to about 50% (w/v) of zoledronic acid.

[187] Some solid compositions may comprise at least about 5% (w/w), at least about 10% (w/w), at least about 20% (w/w), at least about 50% (w/w), at least about 70% (w/w), at least about 80%, about 10% (w/w) to about 30% (w/w), about 10% (w/w) to about 20% (w/w), about 20% (w/w) to about 30% (w/w), about 30% (w/w) to about 50% (w/w), about 30% (w/w) to about 40% (w/w), about 40% (w/w) to about 50% (w/w), about 50% (w/w) to about 80% (w/w), about 50% (w/w) to about 60% (w/w), about 70% (w/w) to about 75% (w/w), about 70% (w/w) to about 80% (w/w), or about 80% (w/w) to about 90% (w/w) of zoledronic acid.

[188] Any suitable amount of an osteoclast inhibitor, including a bisphosphonate, such as a nitrogen-containing bisphosphonate, e.g. zoledronic acid, minodronic acid, or ibandronic acid, may be used. Some solid or liquid oral dosage forms, or units of oral dosage forms (referred to collectively herein as "oral dosage form(s)") may contain about 0.005 mg to about 20 mg, about 0.1 mg to about 10 mg, about 0.5 mg to about 10 mg, about 0.2 mg to about 5 mg, about 1 mg to about 500 mg, about 1 mg to about 50 mg, about 10 mg to about 250 mg, about 100 mg to about 300 mg, about 20 mg to about 200 mg, about 20 mg to about 150 mg, about 30 mg to about 100 mg, about 50 mg to about 200 mg, about 1 mg to about 1,000 mg, about 10 mg to about 50 mg, about 40 mg to about 60 mg, about 50 mg to about 60 mg, about 55 mg, about 10 mg to about 300 mg, about 10 mg to about 150 mg, about 10 mg to about 100 mg, about 40 mg to about 150 mg, about 10 mg to about 600 mg, about 40 mg to about 600 mg, about 40 mg to about 2000 mg, about 40 mg to about 800 mg, about 25 mg to about 800 mg, about 30 mg to about 800 mg, about 10 mg to about 500 mg, about 50 mg to about 150 mg, about 50 mg, about 100 mg, about 50 mg to about 500 mg, about 150 mg to about 200 mg, about 100 mg to about 2000 mg, about 300 mg to about 1500 mg, about 200 mg to about 1000 mg, about 100 mg to about 500 mg, about 160 mg, or about 150 mg of zoledronic acid in an acid form or in a salt form such as disodium salt form, or any amount of osteoclast inhibitor in a range bounded by, or between, any of these values. In some embodiments, the oral osteoclast inhibitor is administered daily, weekly, biweekly, monthly, every two or three months, once a year, or twice a year.

[189] Some oral dosage forms may contain about 0.005 mg to about 20 mg, about 0.1 mg to about 10 mg, about 0.5 mg to about 10 mg, about 0.2 mg to about 5 mg, about 1 mg to about 500 mg, about 1 mg to about 50 mg, about 10 mg to about 250 mg, about 100 mg to about 300 mg, about 20 mg to about 200 mg, about 20 mg to about 150 mg, about 30 mg to about 100 mg, about 1 mg to about 1,000 mg, about 10 mg to about 50 mg, about 40

mg to about 60 mg, about 50 mg to about 60 mg, about 55 mg, about 10 mg to about 300 mg, about 10 mg to about 150 mg, about 10 mg to about 100 mg, about 40 mg to about 150 mg, about 10 mg to about 600 mg, about 40 mg to about 600 mg, about 40 mg to about 2000 mg, about 40 mg to about 800 mg, about 25 mg to about 800 mg, about 30 mg to about 800 mg, about 10 mg to about 500 mg, about 50 mg to about 150 mg, about 50 mg, about 100 mg, about 50 mg to about 200 mg, about 50 mg to about 500 mg, about 150 mg to about 200 mg, about 100 mg to about 2000 mg, about 300 mg to about 1500 mg, about 200 mg to about 1000 mg, about 100 mg to about 500 mg, about 160 mg, or about 150 mg of osteoclast inhibitor, or any amount of osteoclast inhibitor in a range bounded by, or between, any of these values. In some embodiments, the oral osteoclast inhibitor is administered daily, weekly, bi-weekly, monthly, every two or three months, once a year, or twice a year.

[190] Any suitable amount of an osteoclast inhibitor, including a bisphosphonate, such as a nitrogen-containing bisphosphonate, e.g. zoledronic acid, neridronate (neridronic acid), pamidronate, olpadronate, alendronate, risedronate, minodronic acid, or ibandronic acid, may be used. Some solid or liquid dosage forms, or units of dosage forms may contain about 0.005 mg to about 20 mg, about 0.1 mg to about 10 mg, about 0.5 mg to about 10 mg, about 0.2 mg to about 5 mg, about 1 mg to about 500 mg, about 1 mg to about 50 mg, about 10 mg to about 250 mg, about 100 mg to about 300 mg, about 20 mg to about 200 mg, about 20 mg to about 150 mg, about 30 mg to about 100 mg, about 50 mg to about 200 mg, about 1 mg to about 1,000 mg, about 10 mg to about 50 mg, about 40 mg to about 60 mg, about 50 mg to about 60 mg, about 55 mg, about 10 mg to about 300 mg, about 10 mg to about 150 mg, about 10 mg to about 100 mg, about 40 mg to about 150 mg, about 10 mg to about 600 mg, about 40 mg to about 600 mg, about 40 mg to about 2000 mg, about 40 mg to about 800 mg, about 25 mg to about 800 mg, about 30 mg to about 800 mg, about 10 mg to about 500 mg, about 50 mg to about 150 mg, about 50 mg, about 100 mg, about 50 mg to about 500 mg, about 150 mg to about 200 mg, about 100 mg to about 2000 mg, about 300 mg to about 1500 mg, about 200 mg to about 1000 mg, about 100 mg to about 500 mg, about 160 mg, or about 150 mg of a bisphosphonate in an acid form or in a salt form such as disodium salt form, or any amount of an osteoclast inhibitor, such as a bisphosphonate, in a range bounded by, or between, any of these values. In some embodiments, the oral or IV osteoclast inhibitor is administered daily, every other day, every third day, weekly, biweekly, monthly, every two or three months, every six months, once a year, or twice a year from day 1.

[191] Some dosage forms may contain about 0.005 mg to about 20 mg, about 0.1 mg to about 10 mg, about 0.5 mg to about 10 mg, about 0.2 mg to about 5 mg, about 1 mg to about 500 mg, about 1 mg to about 50 mg, about 10 mg to about 250 mg, about 100 mg to about 300 mg, about 20 mg to about 200 mg, about 20 mg to about 150 mg, about 30

mg to about 100 mg, about 1 mg to about 1,000 mg, about 10 mg to about 50 mg, about 40 mg to about 60 mg, about 50 mg to about 65 mg, about 65 mg to about 70 mg, about 50 mg to about 60 mg, about 55 mg, about 10 mg to about 300 mg, about 10 mg to about 150 mg, about 10 mg to about 100 mg, about 40 mg to about 150 mg, about 10 mg to about 600 mg, about 40 mg to about 600 mg, about 100 mg to about 600 mg, about 40 mg to about 2000 mg, about 40 mg to about 800 mg, about 25 mg to about 800 mg, about 30 mg to about 800 mg, about 10 mg to about 500 mg, about 50 mg to about 150 mg, about 50 mg, about 100 mg, about 50 mg to about 200 mg, about 50 mg to about 500 mg, about 150 mg to about 200 mg, about 100 mg to about 2000 mg, about 300 mg to about 1500 mg, about 200 mg to about 1000 mg, about 100 mg to about 500 mg, about 160 mg, or about 150 mg of osteoclast inhibitor, or any amount of osteoclast inhibitor in a range bounded by, or between, any of these values. In some embodiments, the oral or IV osteoclast inhibitor is administered daily, every other day, every third day, weekly, bi-weekly, monthly, every two or three months, every 6 months, once a year, or twice a year from day 1.

[192] In some embodiments, an oral dosage form may contain about 10 mg/m^2 to about 20 mg/m^2, about 15 mg/m^2 to about 20 mg/m^2, about 18 mg/m^2, about 80 mg/m^2 to about 150 mg/m^2, about 90 mg/m^2 to about 150 mg/m^2, about 100 mg/m^2 to about 150 mg/m^2 of zoledronic acid, or any amount of zoledronic in a range bounded by, or between, any of these values. All dosage ranges or amounts expressed in mg/m^2 are based upon the body surface area of the mammal.

[193] In some embodiments, the daily oral dose of an osteoclast inhibitor, including a bisphosphonate, such as a nitrogen-containing bisphosphonate, e.g. zoledronic acid, minodronic acid, or ibandronic acid, is about 0.005 mg to about 20 mg, about 0.1 mg to about 10 mg, about 0.5 mg to about 10 mg, about 0.2 mg to about 5 mg, or any amount in a range bounded by, or between, any of these values. In some embodiments, the daily oral dose of osteoclast inhibitor is less than about 35 mg/m^2, less than about 30 mg/m^2, less than about 25 mg/m^2, about 1 mg/m^2 to about 35 mg/m^2, about 1 mg/m^2 to about 30 mg/m^2, about 1.5 mg/m^2 to about 25 mg/m^2, about 1.8 mg/m^2 to about 20 mg/m^2, about 10 mg/m^2 to about 20 mg/m^2, about 10 mg/m^2 to about 30 mg/m^2, about 15 mg/m^2 to about 20 mg/m^2, about 18 mg/m^2, or any amount of zoledronic acid in a range bounded by, or between, any of these values.

[194] In some embodiments, the daily oral dose of an osteoclast inhibitor, including a bisphosphonate, such as a nitrogen-containing bisphosphonate, e.g. zoledronic acid, minodronic acid, or ibandronic acid, is about 0.005 mg to about 20 mg, about 0.1 mg to about 10 mg, about 0.5 mg to about 10 mg, about 0.2 mg to about 5 mg, or any amount of osteoclast inhibitor in a range bounded by, or between, any of these values. In some

embodiments, the daily oral dose of osteoclast inhibitor is less than about 35 mg/m^2, less than about 30 mg/m^2, less than about 25 mg/m^2, about 1 mg/m^2 to about 35 mg/m^2, about 1 mg/m^2 to about 30 mg/m^2, about 1.5 mg/m^2 to about 25 mg/m^2, about 1.8 mg/m^2 to about 20 mg/m^2, about 10 mg/m^2 to about 20 mg/m^2, about 10 mg/m^2 to about 30 mg/m^2, about 15 mg/m^2 to about 20 mg/m^2, about 18 mg/m^2, or any amount of osteoclast inhibitor in a range bounded by, or between, any of these values.

[195] In some embodiments the daily oral dose of zoledronic acid is about 0.005 mg to about 20 mg, about 0.1 mg to about 10 mg, about 0.5 mg to about 10 mg, about 0.2 mg to about 5 mg, or any amount of zoledronic acid in a range bounded by, or between, any of these values. In some embodiments, the daily oral dose of zoledronic acid is less than about 35 mg/m^2, less than about 30 mg/m^2, less than about 25 mg/m^2, about 1 mg/m^2 to about 35 mg/m^2, about 1 mg/m^2 to about 30 mg/m^2, about 1.5 mg/m^2 to about 25 mg/m^2, about 1.8 mg/m^2 to about 20 mg/m^2, about 10 mg/m^2 to about 20 mg/m^2, about 10 mg/m^2 to about 30 mg/m^2, about 15 mg/m^2 to about 20 mg/m^2, about 18 mg/m^2, or any amount of zoledronic acid in a range bounded by, or between, any of these values.

[196] In some embodiments, the weekly oral dose of the osteoclast inhibitor, including a bisphosphonate, such as a nitrogen-containing bisphosphonate, e.g. zoledronic acid, minodronic acid, ibandronic acid, is about 1 mg to about 1000 mg, about 1 mg to about 500 mg, about 10 mg to about 250 mg, about 100 mg to about 300 mg, about 10 mg to about 100 mg, about 10 mg to about 150 mg, about 10 mg to about 100 mg, about 10 mg to about 300 mg, about 20 mg to about 150 mg, about 20 mg to about 60 mg, about 30 mg to about 70 mg, about 40 mg to about 60 mg, about 50 mg to about 70 mg, about 50 mg, about 55 mg, about 100 mg to about 150 mg, or about 30 mg to about 100 mg. In some embodiments, the weekly oral dose of the osteoclast inhibitor is less than about 250 mg/m^2, less than about 200 mg/m^2, less than about 175 mg/m^2, about 6 mg/m^2 to about 250 mg/m^2, about 10 mg/m^2 to about 210 mg/m^2, about 10 mg/m^2 to about 170 mg/m^2, about 4 mg/m^2 to about 140 mg/m^2, about 100 mg/m^2 to about 140 mg/m^2, about 126 mg/m^2, or any amount in a range bounded by, or between, any of these values. The weekly oral dose may be given as a single dose, given once during the week, or may be given in 2, 3, 4, 5, 6, or 7 individual doses during the week.

[197] In some embodiments the weekly oral dose of zoledronic acid is about 1 mg to about 1000 mg, about 1 mg to about 500 mg, about 10 mg to about 250 mg, about 100 mg to about 300 mg, about 10 mg to about 100 mg, about 10 mg to about 150 mg, about 10 mg to about 100 mg, about 10 mg to about 300 mg, about 20 mg to about 150 mg, about 20 mg to about 60 mg, about 30 mg to about 70 mg, about 40 mg to about 60 mg, about 50 mg to about 70 mg, about 50 mg, about 55 mg, about 100 mg to about 150 mg, or

about 30 mg to about 100 mg. In some embodiments, the weekly oral dose of zoledronic acid is less than about 250 mg/m^2, less than about 200 mg/m^2, less than about 175 mg/m^2, about 6 mg/m^2 to about 250 mg/m^2, about 10 mg/m^2 to about 210 mg/m^2, about 10 mg/m^2 to about 170 mg/m^2, about 4 mg/m^2 to about 140 mg/m^2, about 100 mg/m^2 to about 140 mg/m^2, about 126 mg/m^2, or any amount of zoledronic acid in a range bounded by, or between, any of these values. The weekly oral dose may be given as a single dose, given once during the week, or may be given in 2, 3, 4, 5, 6, or 7 individual doses during the week.

[198] In some embodiments, the monthly dose of the osteoclast inhibitor, including a bisphosphonate, such as a nitrogen-containing bisphosphonate, e.g. zoledronic acid, minodronic acid, or ibandronic acid, or the amount of the osteoclast inhibitor that is administered over a period of a month, is about 5000 mg or less, about 4000 mg or less, about 3000 mg or less, about 2000 mg or less, about 1000 mg or less, about 700 mg or less, about 600 mg or less, about 1 mg to about 4,000 mg, about 1 mg to about 1,000 mg, about 10 mg to about 1000 mg, about 50 mg to about 1000 mg, about 10 mg to about 600 mg, about 40 mg to about 600 mg, about 50 mg to about 600 mg, about 40 mg to about 400 mg, about 50 mg to about 200 mg, about 200 mg to about 300 mg, about 250 mg to about 350 mg, or about 100 mg to about 600 mg, about 40 mg to about 2000 mg, about 40 mg to about 800 mg, about 50 mg to about 800 mg, or about 100 mg to about 800 mg, about 40 mg to about 1000 mg, about 50 mg to about 1000 mg, or about 100 mg to about 1000 mg, or any monthly dose in a range bounded by, or between, any of these values. In some embodiments, the monthly oral dose of the osteoclast inhibitor is less than about 1000 mg/m^2, less than about 800 mg/m^2, less than about 600 mg/m^2, about 10 mg/m^2 to about 1000 mg/m^2, about 50 mg/m^2 to about 800 mg/m^2, about 70 mg/m^2 to about 700 mg/m^2, about 100 mg/m^2 to about 700 mg/m^2, about 100 mg/m^2 to about 600 mg/m^2, about 50 mg/m^2 to about 200 mg/m^2, about 300 mg/m^2 to about 600 mg/m^2, about 450 mg/m^2 to about 600 mg/m^2, about 300 mg/m^2 to about 1000 mg/m^2, about 400 mg/m^2 to about 1000 mg/m^2, about 500 mg/m^2 to about 1000 mg/m^2, about 400 mg/m^2 to about 700 mg/m^2, about 500 mg/m^2 to about 600 mg/m^2, about 540 mg/m^2, or any amount in a range bounded by, or between, any of these values. A monthly dose may be given as a single dose, or as two or more individual doses administered during the month. In some embodiments, the monthly dose is administered in 2 or 3 weekly doses. In some embodiments, the monthly dose is administered in 4 or 5 weekly doses. In some embodiments, the monthly dose is administered in 28 to 31 daily doses. In some embodiments, the monthly dose is administered in 5 to 10 individual doses during the month. The monthly dose may be administered for only 1 month, or may be repeatedly administered for 2 or more months.

[199] In some embodiments, the monthly dose of zoledronic acid, or the amount of zoledronic acid that is administered over a period of a month, is about 5000 mg or less, about 4000 mg or less, about 3000 mg or less, about 2000 mg or less, about 1000 mg or less, about 700 mg or less, about 600 mg or less, about 1 mg to about 4,000 mg, about 1 mg to about 1,000 mg, about 10 mg to about 1000 mg, about 50 mg to about 1000 mg, about 10 mg to about 600 mg, about 40 mg to about 600 mg, about 50 mg to about 600 mg, about 40 mg to about 400 mg, about 50 mg to about 200 mg, about 200 mg to about 300 mg, about 250 mg to about 350 mg, or about 100 mg to about 600 mg, about 40 mg to about 2000 mg, about 40 mg to about 800 mg, about 50 mg to about 800 mg, or about 100 mg to about 800 mg, about 40 mg to about 1000 mg, about 50 mg to about 1000 mg, or about 100 mg to about 1000 mg, or any monthly dose in a range bounded by, or between, any of these values. In some embodiments, the monthly oral dose of zoledronic acid is less than about 1000 mg/m^2, less than about 800 mg/m^2, less than about 600 mg/m^2, about 10 mg/m^2 to about 1000 mg/m^2, about 50 mg/m^2 to about 800 mg/m^2, about 70 mg/m^2 to about 700 mg/m^2, about 100 mg/m^2 to about 700 mg/m^2, about 100 mg/m^2 to about 600 mg/m^2, about 50 mg/m^2 to about 200 mg/m^2, about 300 mg/m^2 to about 600 mg/m^2, about 450 mg/m^2 to about 600 mg/m^2, about 300 mg/m^2 to about 1000 mg/m^2, about 400 mg/m^2 to about 1000 mg/m^2, about 500 mg/m^2 to about 1000 mg/m^2, about 400 mg/m^2 to about 700 mg/m^2, about 500 mg/m^2 to about 600 mg/m^2, about 540 mg/m^2, or any amount of zoledronic acid in a range bounded by, or between, any of these values. A monthly dose may be given as a single dose, or as two or more individual doses administered during the month. In some embodiments, the monthly dose is administered in 2 or 3 weekly doses. In some embodiments, the monthly dose is administered in 4 or 5 weekly doses. In some embodiments, the monthly dose is administered in 28 to 31 daily doses. In some embodiments, the monthly dose is administered in 5 to 10 individual doses during the month. The monthly dose may be administered for only 1 month, or may be repeatedly administered for 2 or more months.

[200] In some embodiments, a six week dose of zoledronic acid may be about 200 mg to about 500 mg, about 300 mg to about 450 mg, or about 300 mg. In some embodiments, the six week dose of zoledronic acid may be administered only once. In some embodiments, the six week dose of zoledronic acid may be administered in six weekly doses, e.g about 35 mg to about 80 mg or about 50 mg to about 75 mg in each weekly dose.

[201] With respect to orally administering zoledronic acid to a mammal, such as a dog, a rat, a rabbit, a monkey, an ape, or a human being, doses of about 0.03 mg/kg to about 10 mg/kg, or any smaller range within this range, such as about 0.4 mg/kg to about 3 mg/kg, about 0.4 mg/kg to about 1.5 mg/kg, mg/kg, about 0.4 mg/kg to about 0.5 mg/kg, about 0.5 mg/kg to about 0.6 mg/kg, about 0.6 mg/kg to about 0.7 mg/kg, about 0.7 mg/kg to about 0.8 mg/kg, about 0.8 mg/kg to about 0.9 mg/kg, about 0.9 mg/kg to about 1 mg/kg, about 1

mg/kg to about 1.1 mg/kg, about 1.1 mg/kg to about 1.2 mg/kg, about 1.2 mg/kg to about 1.3 mg/kg, about 1.3 mg/kg to about 1.4 mg/kg, about 1.4 mg/kg to about 1.5 mg/kg, about 1.5 mg/kg to about 1.6 mg/kg, about 1.6 mg/kg to about 1.7 mg/kg, about 1.7 mg/kg to about 1.8 mg/kg, about 1.8 mg/kg to about 1.9 mg/kg, about 1.9 mg/kg to about 2 mg/kg, about 2 mg/kg to about 2.1 mg/kg, about 2.1 mg/kg to about 2.2 mg/kg, about 2.2 mg/kg to about 2.3 mg/kg, about 2.3 mg/kg to about 2.4 mg/kg, about 2.4 mg/kg to about 2.5 mg/kg, about 2.5 mg/kg to about 2.6 mg/kg, about 2.6 mg/kg to about 2.7 mg/kg, about 2.7 mg/kg to about 2.8 mg/kg, about 2.8 mg/kg to about 2.9 mg/kg, about 2.9 mg/kg to about 3 mg/kg, about 3 mg/kg to about 3.1 mg/kg, about 3.1 mg/kg to about 3.2 mg/kg, about 3.2 mg/kg to about 3.3 mg/kg, about 3.3 mg/kg to about 3.4 mg/kg, about 3.4 mg/kg to about 3.5 mg/kg, about 3.5 mg/kg to about 3.6 mg/kg, about 3.6 mg/kg to about 3.7 mg/kg, about 3.7 mg/kg to about 3.8 mg/kg, about 3.8 mg/kg to about 3.9 mg/kg, about 3.9 mg/kg to about 4 mg/kg, about 0.4 mg/kg to about 0.6 mg/kg, about 0.6 mg/kg to about 0.8 mg/kg, about 0.8 mg/kg to about 1 mg/kg, about 1 mg/kg to about 1.2 mg/kg, about 1.2 mg/kg to about 1.4 mg/kg, about 1.4 mg/kg to about 1.6 mg/kg, about 1.6 mg/kg to about 1.8 mg/kg, about 1.8 mg/kg to about 2 mg/kg, about 2 mg/kg to about 2.2 mg/kg, about 2.2 mg/kg to about 2.4 mg/kg, about 2.4 mg/kg to about 2.6 mg/kg, about 2.6 mg/kg to about 2.8 mg/kg, about 2.8 mg/kg to about 3 mg/kg, about 3 mg/kg to about 3.2 mg/kg, about 3.2 mg/kg to about 3.4 mg/kg, about 3.4 mg/kg to about 3.6 mg/kg, about 3.6 mg/kg to about 3.8 mg/kg, about 3.8 mg/kg to about 4 mg/kg, about 0.4 mg/kg to about 0.7 mg/kg, about 0.7 mg/kg to about 1 mg/kg, about 1 mg/kg to about 1.3 mg/kg, about 1.3 mg/kg to about 1.6 mg/kg, about 1.6 mg/kg to about 1.9 mg/kg, about 1.9 mg/kg to about 2.2 mg/kg, about 2.2 mg/kg to about 2.5 mg/kg, about 2.5 mg/kg to about 2.8 mg/kg, about 2.8 mg/kg to about 3 mg/kg, about 3.3 mg/kg to about 3.6 mg/kg, about 3.6 mg/kg to about 4 mg/kg, about 0.4 mg/kg to about 1 mg/kg, or about 0.5 mg/kg to about 1 mg/kg, may be a safe dose for repeated oral administration, such as once daily dosing to once yearly dosing, once daily dosing to twice yearly dosing, once daily dosing to thrice yearly dosing, once daily dosing to dosing every three months, once daily dosing to dosing every two months, once daily dosing to dosing every two months, once daily dosing to dosing every month, once daily dosing to dosing every 2-4 weeks, once daily dosing to once weekly dosing, etc.

[202] The doses referred to in the paragraph above for administration of zoledronic acid to a mammal may be safely administered 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15 times, or about 3 to about 10 times, once a day, or less frequently, such as once week, once every two weeks, once a month, etc.

[203] For once daily to once weekly oral administration of zoledronic acid to a mammal such as a mouse, rat, dog, primate, or a human being, in some embodiments, a safely repeated dose may be about 0.03 mg/kg to about 4 mg/kg, or any smaller range within this range, such as about 0.01 mg/kg to about 0.02 mg/kg, about 0.02 mg/kg to about 0.03

mg/kg, about 0.03 mg/kg to about 0.04 mg/kg, about 0.04 mg/kg to about 0.05 mg/kg, about 0.05 mg/kg to about 0.06 mg/kg, about 0.06 mg/kg to about 0.07 mg/kg, about 0.07 mg/kg to about 0.08 mg/kg, about 0.08 mg/kg to about 0.09 mg/kg, about 0.09 mg/kg to about 0.1 mg/kg, about 0.1 mg/kg to about 0.11 mg/kg, about 0.11 mg/kg to about 0.12 mg/kg, about 0.12 mg/kg to about 0.13 mg/kg, about 0.13 mg/kg to about 0.14 mg/kg, about 0.14 mg/kg to about 0.15 mg/kg, about 0.15 mg/kg to about 0.16 mg/kg, about 0.16 mg/kg to about 0.17 mg/kg, about 0.17 mg/kg to about 0.18 mg/kg, about 0.18 mg/kg to about 0.19 mg/kg, about 0.19 mg/kg to about 0.2 mg/kg, about 0.2 mg/kg to about 0.21 mg/kg, about 0.21 mg/kg to about 0.22 mg/kg, about 0.22 mg/kg to about 0.23 mg/kg, about 0.23 mg/kg to about 0.24 mg/kg, about 0.24 mg/kg to about 0.25 mg/kg, about 0.25 mg/kg to about 0.26 mg/kg, about 0.26 mg/kg to about 0.27 mg/kg, about 0.27 mg/kg to about 0.28 mg/kg, about 0.28 mg/kg to about 0.29 mg/kg, about 0.29 mg/kg to about 0.3 mg/kg, about 0.3 mg/kg to about 0.31 mg/kg, about 0.31 mg/kg to about 0.32 mg/kg, about 0.32 mg/kg to about 0.33 mg/kg, about 0.33 mg/kg to about 0.34 mg/kg, about 0.34 mg/kg to about 0.35 mg/kg, about 0.35 mg/kg to about 0.36 mg/kg, about 0.36 mg/kg to about 0.37 mg/kg, about 0.37 mg/kg to about 0.38 mg/kg, about 0.38 mg/kg to about 0.39 mg/kg, about 0.39 mg/kg to about 0.4 mg/kg, about 0.05 mg/kg to about 0.2 mg/kg, about 0.05 mg/kg to about 0.15 mg/kg, about 0.06 mg/kg to about 0.15 mg/kg, about 0.07 mg/kg to about 0.15 mg/kg, about 0.08 mg/kg to about 0.15 mg/kg, about 0.09 mg/kg to about 0.15 mg/kg, about 0.1 mg/kg to about 0.15 mg/kg, about 0.03 mg/kg to about 0.5 mg/kg, about 0.06 mg/kg to about 0.2 mg/kg, about 0.07 mg/kg to about 0.2 mg/kg, about 0.08 mg/kg to about 0.2 mg/kg, about 0.09 mg/kg to about 0.2 mg/kg, about 0.1 mg/kg to about 0.2 mg/kg, about 0.4 mg to about 4 mg, about 0.4 mg/kg to about 0.6 mg/kg, about 0.6 mg/kg to about 0.8 mg/kg, about 0.8 mg/kg to about 1 mg/kg, about 1 mg/kg to about 1.2 mg/kg, about 1.2 mg/kg to about 1.4 mg/kg, about 1.4 mg/kg to about 1.6 mg/kg, about 1.6 mg/kg to about 1.8 mg/kg, about 1.8 mg/kg to about 2 mg/kg, about 2 mg/kg to about 2.2 mg/kg, about 2.2 mg/kg to about 2.4 mg/kg, about 2.4 mg/kg to about 2.6 mg/kg, about 2.6 mg/kg to about 2.8 mg/kg, about 2.8 mg/kg to about 3 mg/kg, about 3 mg/kg to about 3.2 mg/kg, about 3.2 mg/kg to about 3.4 mg/kg, about 3.4 mg/kg to about 3.6 mg/kg, about 3.6 mg/kg to about 3.8 mg/kg, about 3.8 mg/kg to about 4 mg/kg, about 0.5 mg/kg to about 2 mg/kg, about 0.6 mg/kg to about 2 mg/kg, about 0.7 mg/kg to about 2 mg/kg, about 0.8 mg/kg to about 2 mg/kg, about 0.5 mg/kg to about 1.5 mg/kg, about 0.6 mg/kg to about 1.5 mg/kg, about 0.7 mg/kg to about 1.5 mg/kg, about 0.8 mg/kg to about 1.5 mg/kg, about 0.5 mg/kg to about 0.9 mg/kg, about 0.6 mg/kg to about 0.9 mg/kg, about 0.7 mg/kg to about 0.9 mg/kg, about 0.5 mg/kg to about 1 mg/kg, about 0.6 mg/kg to about 1 mg/kg, about 0.7 mg/kg to about 1 mg/kg, about 0.8 mg/kg to about 1 mg/kg, or about 0.8 mg/kg to about 0.9 mg/kg.

[204] For once weekly or less frequent oral administration of zoledronic acid to a mammal such as a mouse, rat, dog, primate, or a human being, in some embodiments, a safely repeated dose may be about 0.4 mg to about 10 mg, or any smaller range within this range, such as about 0.4 mg/kg to about 0.6 mg/kg, about 0.6 mg/kg to about 0.8 mg/kg, about 0.8 mg/kg to about 1 mg/kg, about 1 mg/kg to about 1.2 mg/kg, about 1.2 mg/kg to about 1.4 mg/kg, about 1.4 mg/kg to about 1.6 mg/kg, about 1.6 mg/kg to about 1.8 mg/kg, about 1.8 mg/kg to about 2 mg/kg, about 2 mg/kg to about 2.2 mg/kg, about 2.2 mg/kg to about 2.4 mg/kg, about 2.4 mg/kg to about 2.6 mg/kg, about 2.6 mg/kg to about 2.8 mg/kg, about 2.8 mg/kg to about 3 mg/kg, about 3 mg/kg to about 3.2 mg/kg, about 3.2 mg/kg to about 3.4 mg/kg, about 3.4 mg/kg to about 3.6 mg/kg, about 3.6 mg/kg to about 3.8 mg/kg, about 3.8 mg/kg to about 4 mg/kg, about 4 mg/kg to about 4.2 mg/kg, about 4.2 mg/kg to about 4.4 mg/kg, about 4.4 mg/kg to about 4.6 mg/kg, about 4.6 mg/kg to about 4.8 mg/kg, about 4.8 mg/kg to about 5 mg/kg, about 5 mg/kg to about 5.2 mg/kg, about 5.2 mg/kg to about 5.4 mg/kg, about 5.4 mg/kg to about 5.6 mg/kg, about 5.6 mg/kg to about 5.8 mg/kg, about 5.8 mg/kg to about 6 mg/kg, about 6 mg/kg to about 6.2 mg/kg, about 6.2 mg/kg to about 6.4 mg/kg, about 6.4 mg/kg to about 6.6 mg/kg, about 6.6 mg/kg to about 6.8 mg/kg, about 6.8 mg/kg to about 7 mg/kg, about 7 mg/kg to about 7.2 mg/kg, about 7.2 mg/kg to about 7.4 mg/kg, about 7.4 mg/kg to about 7.6 mg/kg, about 7.6 mg/kg to about 7.8 mg/kg, about 7.8 mg/kg to about 8 mg/kg, about 8 mg/kg to about 8.2 mg/kg, about 8.2 mg/kg to about 8.4 mg/kg, about 8.4 mg/kg to about 8.6 mg/kg, about 8.6 mg/kg to about 8.8 mg/kg, about 8.8 mg/kg to about 9 mg/kg, about 9 mg/kg to about 9.2 mg/kg, about 9.2 mg/kg to about 9.4 mg/kg, about 9.4 mg/kg to about 9.6 mg/kg, about 9.6 mg/kg to about 9.8 mg/kg, about 9.8 mg/kg to about 10 mg/kg, about 0.5 mg/kg to about 2 mg/kg, about 0.6 mg/kg to about 2 mg/kg, about 0.7 mg/kg to about 2 mg/kg, about 0.8 mg/kg to about 2 mg/kg, about 0.5 mg/kg to about 1.5 mg/kg, about 0.6 mg/kg to about 1.5 mg/kg, about 0.7 mg/kg to about 1.5 mg/kg, about 0.8 mg/kg to about 1.5 mg/kg, about 0.5 mg/kg to about 1 mg/kg, about 0.6 mg/kg to about 1 mg/kg, about 0.7 mg/kg to about 1 mg/kg, about 0.8 mg/kg to about 1 mg/kg, or about 0.8 mg/kg to about 0.9 mg/kg,

[205] In some embodiments, the osteoclast inhibitor comprises zoledronic acid, and the oral zoledronic acid, or disodium salt thereof, may be administered in combination with about 0.1 mg to about 10 mg of zoledronic acid, or a salt thereof, administered parenterally, such as intravenously. In some embodiments, about 50 mg, about 100 mg, or about 150 mg of the disodium salt of zoledronic acid is administered orally in combination with 1 mg parenteral, such as intravenous, zoledronic acid. In some embodiments the parenteral dose of zoledronic acid is about 0.25 mg to about 25 mg, about 0.25 mg to about 10 mg, or about 0.5 mg to about 7.5 mg.

[206] With respect to oral administration of an osteoclast inhibitor, such as zoledronic acid, minodronic acid, ibandronic acid, or another bisphosphonate, for the treatment of pain associated with inflammation, arthritis, CRPS, or any other condition recited herein, it may helpful if the mammal or human being to which the osteoclast inhibitor is administered does not eat food or drink beverage, (other than any water required to swallow the oral dosage form) for at least about 1 hour, at least about 2 hours, at least about 4 hours, at least about 6 hours, at least about 8 hours, at least about 10 hours, or at least about 12 hours before the osteoclast inhibitor is administered. It may also be helpful if the mammal or human being to which the osteoclast inhibitor is administered does not eat food or drink beverage for at least about 30 minutes, at least about 1 hour, at least about 2 hours, at least about 3 hours, or at least about 4 hours after the osteoclast inhibitor is administered. In some embodiments, a human being to which the zoledronic acid is administered avoids lying down, or remains upright or sits upright, for at least about 30 minutes or about 1 hour after receiving a dosage form containing the osteoclast inhibitor. Avoiding food or beverage before or after oral administration of the osteoclast inhibitor can improve the bioavailability of the osteoclast inhibitor.

[207] The oral bioavailability of osteoclast inhibitor in a dosage form can vary. Some dosage forms may have ingredients added to enhance the bioavailability. However, bioavailability enhancement is not necessary for an oral dosage form to be effective. In some embodiments, the dosage form is substantially free of bioavailability-enhancing agents, such as amino acids or large quantities (e.g. at least about 5%, 10%, 20%, 50%, 70%, or more) of carboxylic acid salts. In some embodiments, an oral dosage form may have an oral bioavailability of the osteoclast inhibitor—such as zoledronic acid, minodronic acid, ibandronic acid—of about 0.01% to about 10%, about 0.1% to about 7%, about 0.1% to about 5%, etc. Without ingredients or other methods to enhance bioavailability, bisphosphonates such as zoledronic acid typically have a low bioavailability in an oral dosage form. In some embodiments, the oral bioavailability of zoledronic acid is unenhanced or substantially unenhanced. For example, the oral bioavailability of zoledronic acid can be about 0.01% to about 5%, about 0.01% to about 4%, about 0.1% to about 3%, about 0.1% to about 2%, about 0.2% to about 2%, about 0.2% to about 1.5%, about 0.3% to about 1.5%, about 0.3% to about 1%, about 1% to about 3%, about 1.2% to about 3.5%, about 1.2% to about 3%, about 1% to about 4%, about 1.5% to about 4.5%, about 0.1% to about 0.5%, about 0.3% to about 0.5%, about 0.5% to about 1%, about 0.6% to about 0.7%, about 0.7% to about 0.8%, about 0.8% to about 0.9%, about 0.9%, about 1% to about 1.1%, about 1.1% to about 1.2%, about 1.2% to about 1.3%, about 1.3% to about 1.4%, about 1.4% to about 1.5%, about 1.5% to about 1.6%, about 1.6% to about 1.8%, about 1.8% to about 2%, about 2% to about 2.2%, about

2.2% to about 2.4%, about 2.4% to about 2.6%, about 2.6% to about 2.8%, about 2.8% to about 3.0%, about 3% to about 3.2%, about 3.2% to about 3.4%, about 3.4% to about 3.6%, about 3.6% to about 3.8%, about 3.8% to about 4%, about 2% to about 2.5%, or any bioavailability of zoledronic acid in a range bounded by, or between, any of these values.

[208] One embodiment is a pharmaceutical composition comprising an osteoclast inhibitor such as zoledronic acid, minodronic acid, or ibandronic acid wherein the oral bioavailability of zoledronic acid in the dosage form is from about 0.01% to about 10%.

[209] In some embodiments, the oral bioavailability of the osteoclast inhibitor in the dosage form is about 0.01% to about 5%, about 0.1% to about 7%, about 0.1% to about 5%, about 0.1% to about 3%, about 0.1% to about 2%, about 0.2% to about 2%, about 0.2% to about 1.5%, about 0.3% to about 1.5%, or about 0.3% to about 1.0%.

[210] In some embodiments, the oral bioavailability of zoledronic acid in the dosage form is about 0.01% to about 5%.

[211] In some embodiments, the oral bioavailability of zoledronic acid in the dosage form is about 0.1% to about 7%.

[212] In some embodiments, the oral bioavailability of zoledronic acid in the dosage form is about 0.1% to about 5%.

[213] In some embodiments, the oral bioavailability of zoledronic acid in the dosage form is about 0.1% to about 3%.

[214] In some embodiments, the oral bioavailability of zoledronic acid in the dosage form is about 0.1% to about 2%.

[215] In some embodiments, the oral bioavailability of zoledronic acid in the dosage form is about 0.2% to about 2%.

[216] In some embodiments, the oral bioavailability of zoledronic acid in the dosage form is about 0.2% to about 1.5%.

[217] In some embodiments, the oral bioavailability of zoledronic acid in the dosage form is about 0.3% to about 1.5%.

[218] In some embodiments, the oral bioavailability of zoledronic acid in the dosage form is about 0.3% to about 1.0%.

[219] In some embodiments, an oral dosage form comprises about 10 mg to about 300 mg of zoledronic acid, minodronic acid, or ibandronic acid and is administered daily for about 2 to about 15 consecutive days. This regimen may be repeated once monthly, once

every two months, once every three months, once every four months, once every five months, once every six months, once yearly, or once every two years.

[220] In some embodiments, an oral dosage form comprises about 10 mg to about 150 mg or about 10 mg to about 100 mg of zoledronic acid, minodronic acid, or ibandronic acid and is administered daily for about 2 to about 15 consecutive days. This regimen may be repeated once monthly, once every two months, once every three months, once every four months, once every five months, once every six months, once yearly, or once every two years.

[221] In some embodiments, an oral dosage form comprises about 10 mg to about 150 mg or about 10 mg to about 100 mg of zoledronic acid, minodronic acid, or ibandronic acid and is administered daily for about 5 to about 10 consecutive days. This regimen may be repeated once monthly, once every two months, once every three months, once every four months, once every five months, once every six months, once yearly, or once every two years.

[222] In some embodiments, an oral dosage form comprises about 40 mg to about 150 mg of zoledronic acid, minodronic acid, or ibandronic acid and is administered daily for about 5 to about 10 consecutive days. This regimen may be repeated once monthly, once every two months, once every three months, once every four months, once every five months, once every six months, once yearly, or once every two years.

[223] In some embodiments, the oral zoledronic acid, minodronic acid, or ibandronic acid may be administered as one dose of about 100 mg to about 2000 mg. In some embodiments, the oral zoledronic acid, minodronic acid, or ibandronic acid may be administered as one dose of about 300 mg to about 1500 mg. In some embodiments, the oral zoledronic acid, minodronic acid, or ibandronic acid may be administered as one dose of about 200 mg to about 1000 mg. The dose of zoledronic acid, minodronic acid, or ibandronic acid may be administered in a single or divided dose.

[224] An osteoclast inhibitor, such as zoledronic acid, minodronic acid, or ibandronic acid, may be formulated for oral administration, for example, with an inert diluent or with an edible carrier, or it may be enclosed in hard or soft shell gelatin capsules, compressed into tablets, or incorporated directly with the food of the diet. For oral therapeutic administration, the active compound may be incorporated with an excipient and used in the form of ingestible tablets, buccal tablets, coated tablets, troches, capsules, elixirs, dispersions, suspensions, solutions, syrups, wafers, patches, and the like.

[225] Tablets, troches, pills, capsules and the like may also contain one or more of the following: a binder such as gum tragacanth, acacia, corn starch or gelatin; an excipient,

such as dicalcium phosphate; a disintegrating agent such as corn starch, potato starch, alginic acid and the like; a lubricant such as magnesium stearate; a sweetening agent such as sucrose, lactose or saccharin; or a flavoring agent such as peppermint, oil of wintergreen or cherry flavoring. When the unit dosage form is a capsule, it may contain, in addition to materials of the above type, a liquid carrier. Various other materials may be present as coating, for instance, tablets, pills, or capsules may be coated with shellac, sugar or both. A syrup or elixir may contain the active compound, sucrose as a sweetening agent, methyl and propylparabens as preservatives, a dye and flavoring, such as cherry or orange flavor. It may be desirable for material in a dosage form or pharmaceutical composition to be pharmaceutically pure and substantially non toxic in the amounts employed.

[226] In some embodiments, an osteoclast inhibitor, including a bisphosphonate, such as zoledronic acid, neridronic acid, etc., is in a dosage form containing one of, or a combination of, the ingredients in the Table E below.

Table E:

Iron
Methyl Paraben
Propyl Paraben
Sorbitol
Carob Bean Gum
Mannitol
Gum Tragacanth
Guar Gum
Benzoic Acid
Sodium Benzoate
Garlic and Oil of Garlic
Oil of Rue
Propyl Gallate
Gum Ghatti
Gum Arabic
Sterculia Gum (karaya gum)
Indian Dill Seed
Pulps
Clove Bud Extract
Clove Bud Oil
Clove Bud Oleoresin
Clove Leaf Oil
Clove Stem Oil
Cholic acid
Desoxycholic acid
Glycocholic acid
Ox bile extract

Taurocholic acid
Sorbose
Sodium thiosulfate
Gelatin
Mustard or Oil of Mustard (Brown and Yellow)
Glycyrrhiza
Ammoniated Glycyrrhizin
Licorice
Caprylic Acid
Stannous Chloride
Ammonium bicarbonate
Ammonium carbonate
Ammonium chloride
Ammonium hydroxide
Ammonium phosphate, such as ammonium phosphate dibasic or Ammonium phosphate monobasic
Ammonium sulfate
Calcium iodate
Potassium iodate
Potassium iodide
Aconitic Acid
Calcium carbonate
Potassium bicarbonate
Sodium bicarbonate
Sodium carbonate
Sodium sesquicarbonate
Glycerin and Glycerides
Dextran
Dextrins
Corn dextrins
Calcium acetate
Calcium chloride
Calcium gluconate
Calcium phytate
Calcium hydroxide
Calcium oxide
Succinic acid
Butylated Hydroxytoluene (BHT)
Calcium hexametaphosphate
Calcium phosphate dibasic
Calcium phosphate monobasic
Calcium phosphate tribasic
Calcium pyrophosphate
Phosphoric acid
Potassium phosphate dibasic
Potassium phosphate monobasic
Potassium phosphate tribasic

Potassium polymetaphosphate
Potassium pyrophosphate
Potassium tripolyphosphate
Sodium acid pyrophosphate
Sodium hexametaphosphate
Sodium metaphosphate
Sodium phosphate dibasic
Sodium phosphate monobasic
Sodium phosphate tribasic
Sodium pyrophosphate, tetrabasic
Sodium tetrametaphosphate
Sodium tetraphosphate
Sodium trimetaphosphate
Sodium tripolyphosphate
Sulfuric Acid
alpha-Tocopherol acetate
Tocopherols
Choline Bitartrate
Choline Chloride
Aluminum ammonium sulfate
Aluminum hydroxide
Aluminum oleate
Aluminum palmitate
Aluminum potassium sulfate
Aluminum sodium sulfate
Aluminum sulfate
Sodium aluminate
Sodium aluminum phosphate, acidic
Sodium aluminum phosphate, basic
Sodium phosphoaluminate
Beeswax (yellow or white)
Japan wax
Carnauba wax
Corn Sugar (Dextrose)
Corn Syrup
Invert Sugar
Inositol
Calcium stearate
Hydrogenated tallow
Stearic acid
Tallow
Malic acid
L-Malic acid
Calcium sorbate
Potassium sorbate
Sodium sorbate

Sorbic acid
Sulfamic acid
Sodium hydrosulfite
Zinc hydrosulfite
Tall oil
Fish oil, hydrogenated
Sucrose
Agar-agar
Ammonium alginate
Calcium alginate
Potassium alginate
Propylene glycol alginate
Sodium alginate
Propylene Glycol
Propylene glycol monostearate
Brown algae
Red algae
Calcium glycerophosphate
Manganese glycerophosphate
Magnesium glycerophosphate
Potassium glycerophosphate
Potassium hydroxide
Sodium hydroxide
Potassium metabisulfite
Sodium bisulfite
Sodium metabisulfite
Sodium sulfite
Sulfur dioxide
Magnesium phosphate, dibasic
Magnesium carbonate
Magnesium chloride
Magnesium hydroxide
Magnesium oxide
Magnesium stearate
Magnesium sulfate
Magnesium phosphate, tribasic
Adipic acid
Hydrogenated soybean oil
Ethyl formate
Formic acid
Sodium formate
Carrageenan
Nutmeg and Mace
Zinc acetate
Zinc carbonate
Zinc chloride

Zinc oxide
Zinc sulfate
Caramel
Lard
Lard oil
Papain
Gum guaiac
Coconut oil
Linoleic acid
Oleic acid
Peanut oil
Calcium hypophosphite
Manganous hypophosphite
Potassium hypophosphite
Sodium hypophosphite
Pectin, amidated
Pectin, high ester
Pectin, low acid
Pectinates
Pectinic acid
Carboxymethyl cellulose
Cellulose acetate
Ethyl cellulose
Hydroxypropylmethyl cellulose
Methylcellulose
Sodium Carboxymethyl cellulose
Rennet
Tannic acid (hydrolyzable gallotannins)
Acetic acid
Sodium acetate
Sodium diacetate
Pyridoxine
Pyridoxine hydrochloride
Sodium oleate
Sodium palmitate
Ethyl acrylate, monomeric
Methyl acrylate, monomeric
Ethyl acrylate, polymeric
Methyl acrylate, polymeric
Bentonite
Clay (kaolin)
Corn silk
Ammonium citrate
Calcium citrate
Citric acid
Isopropyl citrate

Potassium citrate
Sodium citrate
Stearyl citrate
Triethyl citrate
Biotin
Enzymatically hydrolyzed casein
Acid hydrolyzed proteins
Enzymatically hydrolyzed protein
Soy sauces
Yeast autolyzates
Caffeine
L-Glutamic acid
L-Glutamic acid hydrochloride
Monoammonium L-glutamate
Monopotassium L-glutamate
Monosodium L-glutamate
Calcium Lactate
L(+)-calcium lactate
D(-)-Lactic acid
Lactic acid
L(+)-lactic acid
Butylated Hydroxyanisole (BHA)
D- or DL- Calcium pantothenate
D-Pantothenyl alcohol
D- or DL- Sodium pantothenate
Urea
Thiamine hydrochloride
Thiamine mononitrate
Magnesium gluconate
Potassium gluconate
Sodium gluconate
Zinc gluconate
Vitamin B12 (cyanocobalamin)
Vitamin D2 (ergocalciferol)
Vitamin D3 (cholecalciferol)
Potassium chloride
Sodium chloride
Soy protein isolate
Hydrochloric acid
Copper (cupric) gluconate
Copper (cupric) sulfate
Cuprous iodide
Calcium caseinate
Casein
Sodium caseinate
Aluminum calcium silicate

Calcium silicate
Diatomaceous earth (filter aid)
Magnesium silicate
Perlite (filter aid)
Potassium silicate
Silica aerogel
Silicon dioxides
Sodium aluminosilicate
Sodium calcium aluminosilicate
Sodium silicate
Talc (basic magnesium silicate)
Tricalcium silicate
L(+)-potassium acid tartrate
L(+)-sodium tartrate
L(+)-tartaric acid
Manganous chloride
Manganous citrate
Manganous gluconate
Manganous oxide
Manganous sulfate
Lecithin
Lecithin, hydrogen peroxide bleached
Riboflavin
Riboflavin-5'-phosphate
Calcium propionate
Dilauryl thiodipropionate
Propionic acid
Sodium propionate
Thiodipropionic acid
Hydrogen peroxide
Carbon dioxide
Nickel (elemental)
Niacin (nicotinic acid)
Niacinamide (nicotinamide)
Carotene (beta-carotene)
L-Ascorbic acid
Ascorbyl palmitate (palmitoyl L-ascorbic)
Calcium L-ascorbate
Erythorbic acid (D-isoascorbic acid)
Sodium erythorbate (sodium D-isoascorbate)
Sodium L-ascorbate
Acetylated Distarch Adipate
Acetylated Distarch Glycerol
Acetylated Distarch Phosphate
Acetylated Distarch Oxypropanol
Acid Modified Starch

Arrowroot Starch
Bleached Starch
Cornstarch
Distarch Glycerol
Distarch Oxypropanol
Distarch Phosphate
High Amylose Cornstarch
Hydroxypropyl Distarch Glycerol
Hydroxypropyl Distarch Phosphate
Hydroxypropyl Starch
Hydroxypropyl Starch, oxidized
Milo Starch
Monostarch Phosphate
Potato starch
Pregelatinized starch
Rice Starch
Sodium Hydroxide Gelatinized Starch
Starch Acetate
Starch Aluminum Octenyl Succinate
Starch Sodium Succinate
Starch Sodium Octenyl Succinate
Succinyl Distarch Glycerol
Tapioca Starch
Waxy Maize Starch
Wheat Starch
Phosphated Distarch Phosphate
Starch, Sodium Hypochlorite oxidized
Vitamin A
Vitamin A acetate
Vitamin A palmitate
Diacetyl
Starter distillate
Carbonyl Iron
Carbonyl Iron
Electrolytic Iron
Electrolytic Iron
Ferric ammonium citrate
Ferric chloride
Ferric citrate
Ferric oxide
Ferric phosphate
Ferric pyrophosphate
Ferric sodium pyrophosphate
Ferric sulfate
Ferrous ascorbate
Ferrous carbonate

Ferrous citrate
Ferrous fumarate
Ferrous gluconate
Ferrous lactate
Ferrous sulfate
Ferrous sulfate
Iron caprylate
Iron linoleate
Iron naphthenate
Iron oxides
Iron peptonate
Iron polyvinylpyrrolidone
Iron tallate
Sodium ferric EDTA
Sodium ferricitropyrophosphate
Dietary Iron
Ferric oxide
Potassium carbonate
Calcium glycerophosphate
Cellulose, such as microcrystalline cellulose
Titanium dioxide

[227] Some compositions or dosage forms may be a liquid, or may comprise a solid phase dispersed in a liquid.

[228] An osteoclast inhibitor, such as zoledronic acid, minodronic acid, or ibandronic acid may be formulated for parental or intraperitoneal administration. Solutions of the active compounds as free acids or pharmacologically acceptable salts can be prepared in water suitably mixed with a surfactant, such as hydroxypropylcellulose. A dispersion can also have an oil dispersed within, or dispersed in, glycerol, liquid polyethylene glycols, and mixtures thereof. Under ordinary conditions of storage and use, these preparations may contain a preservative to prevent the growth of microorganisms.

[229] In some embodiments, an oral dosage form may comprise a silicified microcrystalline cellulose such as PROSLOV®. For example, about 20% (wt/wt) to about 70% (wt/wt), about 10% (wt/wt) to about 20% (wt/wt), about 20% (wt/wt) to about 40% (wt/wt), about 25% (wt/wt) to about 30% (wt/wt), about 40% (wt/wt) to about 50% (wt/wt), or about 45% (wt/wt) to about 50% (wt/wt) silicified microcrystalline cellulose may be present in an oral dosage form or a unit of an oral dosage form.

[230] In some embodiments, an oral dosage form may comprise a crosslinked polyvinylpyrrolidone such as crospovidone. For example, about 1% (wt/wt) to about 10% (wt/wt), about 1% (wt/wt) to about 5% (wt/wt), or about 1% (wt/wt) to about 3% (wt/wt)

crosslinked polyvinylpyrrolidone may be present in an oral dosage form or a unit of an oral dosage form.

[231] In some embodiments, an oral dosage form may comprise a fumed silica such as AEROSIL®. For example, about 0.1% (wt/wt) to about 10% (wt/wt), about 0.1% (wt/wt) to about 1% (wt/wt), or about 0.4% (wt/wt) to about 0.6% (wt/wt) fumed silica may be present in an oral dosage form or a unit of an oral dosage form.

[232] In some embodiments, an oral dosage form may comprise magnesium stearate. For example, about 0.1% (wt/wt) to about 10% (wt/wt), about 0.1% (wt/wt) to about 1% (wt/wt), or about 0.4% (wt/wt) to about 0.6% (wt/wt) magnesium stearate may be present in an oral dosage form or a unit of an oral dosage form.

[233] An oral dosage form comprising zoledronic acid or another bisphosphonate or osteoclast inhibitor may be included in a pharmaceutical product comprising more than one unit of the oral dosage form.

[234] A pharmaceutical product containing oral dosage forms for daily use can contain 28, 29, 30, or 31 units of the oral dosage form for a monthly supply. An approximately 6 week daily supply can contain 40 to 45 units of the oral dosage form. An approximately 3 month daily supply can contain 85 to 95 units of the oral dosage form. An approximately six month daily supply can contain 170 to 200 units of the oral dosage form. An approximately one year daily supply can contain 350 to 380 units of the oral dosage form.

[235] A pharmaceutical product containing oral dosage forms for weekly use can contain 4 or 5 units of the oral dosage form for a monthly supply. An approximately two month weekly supply can contain 8 or 9 units of the oral dosage form. An approximately six week weekly supply can contain about 6 units of the oral dosage form. An approximately three month weekly supply can contain 12, 13 or 14 units of the oral dosage form. An approximately six month weekly supply can contain 22 to 30 units of the oral dosage form. An approximately one year weekly supply can contain 45 to 60 units of the oral dosage form.

[236] A pharmaceutical product may accommodate other dosing regimes. For example, a pharmaceutical product may comprise 5 to 10 units of the oral dosage form, wherein each unit of the oral dosage form contains about 40 mg to about 150 mg of zoledronic acid, minodronic acid, or ibandronic acid. Some pharmaceutical products may comprise 1 to 10 units of the oral dosage form, wherein the product contains about 200 mg to about 2000 mg of zoledronic acid, minodronic acid, or ibandronic acid. For such a product, each unit of the oral dosage form may be taken daily for 1 to 10 days or 5 to 10 days during a month, such as at the beginning of a month.

[237] Some oral dosage forms comprising an osteoclast inhibitor—such as suitable bisphosphonates like zoledronic acid, minodronic acid, or ibandronic acid or salts thereof—may have enteric coatings or film coatings. In some embodiments, an oral dosage form of an osteoclast inhibitor comprises a tablet having an enteric coating. In some embodiments, an oral dosage form of an osteoclast inhibitor comprises a capsule having an enteric coating. In some embodiments, an oral dosage form of an osteoclast inhibitor comprises a tablet having a film coating. In some embodiments, an oral dosage form of an osteoclast inhibitor comprises a capsule having a film coating.

[238] Useful doses for an antibody against RANK or RANKL, such as denosumab, may range from about 0.1 mg/kg to about 20 mg/kg, about 0.75 mg/kg to about 7.5 mg/kg, about 0.1 mg/kg to about 5 mg/kg, about 1 mg/kg to about 2 mg/kg, about 10 mg/kg to about 20 mg/kg, about 12 to about 17 mg/kg, about 15 mg/kg to about 20 mg/kg, about 1 mg/kg, about 1 mg/kg to about 10 mg/kg, or any value bounded by or in between these ranges based on the body weight of the mammal. The chosen dose may be administered repeatedly, particularly for chronic conditions, or the amount per dose may be increased or decreased as treatment progresses. The chosen dose may be administered one or more times per week, monthly, every two months, every three months, every six months, or every year.

[239] In some embodiments, 60 mg of denosumab is administered subcutaneously to patient in need of treatment. In some embodiments, the administration is repeated every six months.

[240] There are a number of ways that some part of Compound 1 and/or Compound 2 may be removed from a zoledronic acid product. For example, HPLC, preparative TLC, crystallization, sublimation, or zone purification may be employed. Solvents that may be useful in HPLC, TLC, or crystallization, may include, but are not limited to, water or organic solvents, such as hexanes, diethyl ether, ethyl acetate, methyl acetate, acetone, acetic acid, acetonitrile, tetrahydrofuran, ethanol, methanol, isopropyl alcohol, chloroform, diethyl ether, toluene, dimethylformamide, benzene, etc. Gradients, or two solvent systems may be employed as well. For example, an HPLC separation may begin by elution with water, after some time eluting with water, an organic solvent, such as acetonitrile, methanol, ethanol, ethyl acetate, acetone, acetic acid, methyl acetate, or another solvent could gradually be added to the water, or may replace the water entirely. Similarly, crystallization or recrystallization may employ a single solvent, or a combination of solvents. For example, zoledronic acid or a salt thereof, such as a disodium salt, might be recrystallized from water, ethanol, methanol, diethyl ether, methyl acetate, acetic acid, etc., or a combination of these solvents or others. In some embodiments, zoledronic acid or a salt thereof, such as a disodium salt, may be dissolved in one solvent, such as water or acetic acid, and crystallized by a

second solvent or solvent system, such as hexane, diethyl ether, chloroform, dichloromethane, ethyl acetate, methyl acetate, acetic acid, ethanol, methanol, or a combination thereof. In some embodiments, a disodium salt of zoledronic acid is dissolved in water, and then crystallized by adding hexane. In some embodiments, a disodium salt of zoledronic acid is dissolved in water, and then crystallized by adding diethyl ether. In some embodiments, a disodium salt of zoledronic acid is dissolved in water, and then crystallized by adding chloroform. In some embodiments, a disodium salt of zoledronic acid is dissolved in water, and then crystallized by adding dichloromethane. In some embodiments, a disodium salt of zoledronic acid is dissolved in water, and then crystallized by adding ethyl acetate. In some embodiments, a disodium salt of zoledronic acid is dissolved in water, and then crystallized by adding methyl acetate. In some embodiments, a disodium salt of zoledronic acid is dissolved in water, and then crystallized by adding acetic acid. In some embodiments, a disodium salt of zoledronic acid is dissolved in water, and then crystallized by adding ethanol. In some embodiments, a disodium salt of zoledronic acid is dissolved in water, and then crystallized by adding methanol. For embodiments employing water and a second solvent, the ratio of water to the second solvent (water:second solvent) may be about 1:100 to about 100:1, about 1:10 to about 1:5, about 1:5 to about 1:4, about 1:4 to about 1:3, about 1:3 to about 1:2, about 1:2 to about 1:1, about 1:1 to about 2:1, about 2:1 to about 3:1, about 3:1 to about 4:1, about 4:1 to about 5:1, or about 1:1 to about 10:1.

[241] In some embodiments, a combination of two methods recited in the paragraph above may be employed, such as HPLC or TLC and crystallization. In some embodiments, a method may be repeated, such as HPLC, preparative TLC, crystallization, sublimation, or zone purification. In some embodiments, a purification method recited in the paragraph above may be performed twice. In some embodiments, a purification method recited in the paragraph above may be performed three or four times.

[242] Some oral dosage forms comprising zoledronic acid or a salt thereof may have enteric coatings or film coatings.

[243] In the examples below, zoledronic acid was administered in the disodium salt form as disodium zoledronate tetrahydrate. No bioavailability enhancing agents were used in the test compositions.

Example 1

Effect of Orally Administered Zoledronic Acid in Rat Model of Inflammatory Pain

Method:

[244] The effect of orally administered zoledronic acid on inflammatory pain was examined using the rat complete Freund's adjuvant (CFA) model. Inflammatory pain was induced by injection of 100% CFA in a 75 µL volume into the left hind paws of Sprague-Dawley® rats on day 0, followed by assessments on days 1-3. Animals were orally administered vehicle (control), zoledronic acid 18 mg/m^2 (or 3 mg/kg), zoledronic acid 120 mg/m^2 (or 20 mg/kg), or zoledronic acid 900 mg/m^2 (or 150 mg/kg) daily on days 1-3. Drug was dissolved in distilled water and prepared fresh daily. Animals were fasted prior to dosing. Under current FDA guidelines for extrapolating starting dosages from animals to humans, dosages expressed in mg/m^2 are considered equivalent between mammalian species. Thus, for example, 18 mg/m^2 in a rat is considered equivalent to 18 mg/m^2 in a human being, while 3 mg/kg in a rat may not be equivalent to 3 mg/kg in a human being.

[245] Values for inflammatory pain (mechanical hyperalgesia) in the vehicle and drug-treated animals were obtained on day 0 prior to CFA injection, and at baseline and post-treatment on days 1-3. Pain was assessed using a digital Randall-Selitto device (dRS; IITC Life Sciences, Woodland Hills, CA). Animals were placed in a restraint sling that suspended the animal, leaving the hind limbs available for testing. Paw compression threshold was measured by applying increasing pressure to the plantar surface of the hind paw with a dome-shaped tip placed between the 3rd and 4th metatarsus. Pressure was applied gradually over approximately 10 seconds. Measurements were taken from the first observed nocifensive behavior of vocalization, struggle or withdrawal. A cut-off value of 300 g was used to prevent injury to the animal.

[246] Reversal of inflammatory pain was calculated according to the formula:

% reversal = (Post-treatment – Post-CFA baseline)/(Pre-CFA baseline – Post-CFA baseline) x 100.

[247] The experiment was carried out using 9-10 animals per group.

Results:

[248] Oral administration of zoledronic acid significantly improved inflammatory pain thresholds compared to vehicle. Pain threshold measurements taken at various times are shown in FIG. 1. Paw compression thresholds in the 18 mg/m^2 group were higher than for vehicle during the entire measurement period after 30 minutes from the start of treatment. On day three, paw compression thresholds for both the 18 mg/m^2 and 900 mg/m^2 groups were greater than for vehicle. An improvement in pain threshold of 49% and 83% from baseline was observed for the 18 mg/m^2 and the 900 mg/m^2 groups respectively.

[249] Orally administered zoledronic acid produced a 29% reversal of inflammatory pain at the 18 mg/m^2, and a 48% reversal at the 900 mg/m^2 dose. This magnitude of effect is comparable to that obtained with clinical doses of commercially available NSAIDs when tested in a similar model of inflammatory pain. Under current FDA guidelines, the reference body surface area of a human adult is 1.62 m^2. Thus, a daily dose of 18 mg/m^2 corresponds to a monthly dose of about 500-560 mg/m^2 or a human dose of about 800-900 mg.

[250] Surprisingly, the two higher doses resulted in thresholds that were lower than vehicle on the first two days of dosing. The 120 mg/m^2 group was approximately equal or inferior to vehicle at all time points during the assessment period. While the 900 mg/m^2 group showed effectiveness on day 3, this result was accompanied by significant toxicity necessitating euthanization of all the animals in this group two days after cessation of dosing.

Example 2

Effect of Orally Administered Zoledronic Acid in Rat Model of Arthritis Pain

Method:

[251] The effect of orally administered zoledronic acid on arthritis pain was examined in the rat complete Freund's adjuvant (CFA) model of arthritis pain. In this model, injection of 100% complete Freund's adjuvant (CFA) in a 75 µL volume into the left hind paws is followed by a 10-14 day period to allow for the development of arthritis pain. Animals were orally administered vehicle (control), zoledronic acid 54 mg/m^2 (or 9 mg/kg), or zoledronic acid 360 mg/m^2 (or 60 mg/kg), divided in three equal daily doses on the first three days post CFA injection. Drug was dissolved in distilled water and prepared fresh daily. Animals were fasted prior to dosing.

[252] Arthritis pain (mechanical hyperalgesia) in the vehicle and drug-treated animals was evaluated on day 14 post CFA injection using a digital Randall-Selitto device (dRS; IITC Life Sciences, Woodland Hills, CA). Animals were placed in a restraint sling that suspended the animal, leaving the hind limbs available for testing. Paw compression threshold was measured by applying increasing pressure to the plantar surface of the hind paw with a dome-shaped tip placed between the 3rd and 4th metatarsus. Pressure was applied gradually over approximately 10 seconds. Measurements were taken from the first observed nocifensive behavior of vocalization, struggle or withdrawal. A cut-off value of 300 g was used to prevent injury to the animal.

[253] Reversal of arthritis pain in the ipsilateral (CFA-injected) paw was calculated according to the formula:

% reversal = (ipsilateral drug threshold – ipsilateral vehicle threshold)/(contralateral vehicle threshold – ipsilateral vehicle threshold) x 100.

[254] The experiment was carried out using 7-10 animals per group.

Results:

[255] Oral administration of zoledronic acid significantly improved arthritis pain thresholds compared to vehicle. As shown in FIGS. 2A and 2B, orally administered zoledronic acid produced a dose-dependent reversal of arthritis pain. A reversal of 33% was observed in the 54 mg/m^2 group, and reversal of 54% was observed in the 360 mg/m^2 group. Under current FDA guidelines, the reference body surface area of a human adult is 1.62 m^2. Thus, 54 mg/m^2 in a rat is equivalent to an implied human dose of about 87 mg, and 360 mg/m^2 in a rat is equivalent to an implied human dose of about 583 mg.

Example 3. Treatment of Complex Regional Pain Syndrome with Orally Administered Zoledronic Acid.

[256] The effect of orally administered zoledronic acid was examined in the rat tibia fracture model of complex regional pain syndrome (CRPS). CRPS was induced in the rats by fracturing the right distal tibias of the animals and casting the fractured hindpaws for 4 weeks, as described in Guo TZ et al. (*Pain*. 2004; 108: 95–107). This animal model has been shown to replicate the inciting trauma (such as a fracture, a surgery, a crushing injury, a cutting injury, a scratch, or a puncture injury), natural history, signs, symptoms, and pathologic changes observed in human CRPS patients (Kingery WS et al., *Pain*. 2003;104:75–84).

[257] Animals were orally administered either vehicle (control) or zoledronic acid, in a dosage of 18 mg/m^2/day (3 mg/kg/day) for 28 days, starting on the day of fracture and casting. Drug was dissolved in distilled water and administered by gavage. Animals were fasted for 4 hours before and 2 hours after dosing. At the end of the 28-day period, casts were removed, and on the following day, the rats were tested for hindpaw pain, edema, and warmth.

Pain assessments

[258] Pain was assessed by measuring hyperalgesia, and weight bearing.

[259] To measure hyperalgesia, an up-down von Frey testing paradigm was used. Rats were placed in a clear plastic cylinder (20 cm in diameter) with a wire mesh bottom and allowed to acclimate for 15 minutes. The paw was tested with one of a series of eight von Frey hairs ranging in stiffness from 0.41 g to 15.14 g. The von Frey hair was applied against the hindpaw plantar skin at approximately midsole, taking care to avoid the tori pads. The fiber was pushed until it slightly bowed and then it was jiggled in that position for 6 seconds. Stimuli were presented at an interval of several seconds. Hindpaw withdrawal from the fiber was

considered a positive response. The initial fiber presentation was 2.1 g and the fibers were presented according to the up-down method of Dixon to generate six responses in the immediate vicinity of the 50% threshold. Stimuli were presented at an interval of several seconds.

[260] An incapacitance device (IITC Inc. Life Science, Woodland, CA, USA) was used to measure hindpaw weight bearing, a postural effect of pain. The rats were manually held in a vertical position over the apparatus with the hindpaws resting on separate metal scale plates and the entire weight of the rat was supported on the hindpaws. The duration of each measurement was 6 seconds and 10 consecutive measurements were taken at 60-second intervals. Eight readings (excluding the highest and lowest ones) were averaged to calculate the bilateral hindpaw weight-bearing values. Weight bearing data were analyzed as the ratio between right (fracture) and left hindpaw weight bearing values ((2R/(R+L)) ×100%).

Edema assessment

[261] A laser sensor technique was used to determine the dorsal-ventral thickness of the hindpaw. Before baseline testing the bilateral hindpaws were tattooed with a 2 to 3 mm spot on the dorsal skin over the midpoint of the third metatarsal. For laser measurements each rat was briefly anesthetized with isoflurane and then held vertically so the hindpaw rested on a table top below the laser. The paw was gently held flat on the table with a small metal rod applied to the top of the ankle joint. Using optical triangulation, a laser with a distance measuring sensor was used to determine the distance to the table top and to the top of the hindpaw at the tattoo site and the difference was used to calculate the dorsal-ventral paw thickness. The measurement sensor device used in these experiments (4381 Precicura, Limab, Goteborg, Sweden) has a measurement range of 200 mm with a 0.01 mm resolution.

Hindpaw temperature measurement

[262] The temperature of the hindpaw was measured using a fine wire thermocouple (Omega, Stanford, CT, USA) applied to the paw skin. Six sites were tested per hindpaw. The six measurements for each hindpaw were averaged for the mean temperature.

Results

[263] As illustrated in FIG. 3, treatment with orally administered zoledronic acid reversed pain, restored weight bearing, and prevented edema as compared to vehicle treated animals.

[264] As illustrated in FIG. 4, von Frey pain thresholds for the right (fracture) hindpaw were reduced by 72% versus the contralateral (normal) hindpaw in vehicle treated

animals. Zoledronate treatment reversed fracture induced pain by 77% as compared to vehicle treatment.

[265] As illustrated in FIG. 5, reduction in weight bearing, a postural effect of pain, was significantly higher in the vehicle treated group as compared to the zoledronic acid treated group. Weight bearing on the fracture hindlimb was reduced to 55% of normal in the vehicle treated group. Zoledronate treatment significantly restored hindlimb weight bearing as compared to vehicle treatment (86% of normal).

[266] As illustrated in FIG. 6, the expected increase in hindpaw thickness was greater in the vehicle treated group as compared to the zoledronic acid treated group, reflecting the development of edema. Zoledronate treatment reduced hindpaw edema by 60% versus vehicle treatment.

[267] Zoledronic acid reduced hindpaw warmth by 5% versus vehicle treatment.

[268] The daily dose in the above experiment was 18 mg/m^2/day. Under current FDA guidelines, the reference body surface area of a human adult is 1.62 m^2. Thus, a daily dose of 18 mg/m^2 corresponds to a monthly dose of about 500-560 mg/m^2 or a human dose of about 800-900 mg.

Example 4. Solubility of Disodium Salt of Zoledronic Acid

[269] The aqueous solubility of zoledronic acid and disodium zoledronate tetrahydrate was determined. One gram of the test compound was measured in to a beaker. Demineralized water (pH 5.5) was then added in small increments to the test compound, and sonication was applied to the mixture. The procedure was continued until complete dissolution was achieved. Full dissolution was determined to have been reached when a clear solution was present with no visible material. The volume of water required to reach full dissolution was used to calculate a solubility value expressed in grams per 100 mL. The procedure was performed for each compound.

Results

[270] As shown in FIG. 7, the aqueous solubility of disodium zoledronate tetrahydrate is approximately 50 times that of zoledronic acid. Disodium zoledronate tetrahydrate has a solubility of 12.5 g/100 mL compared to only 0.25 g/100 mL for zoledronic acid.

Example 5. Bioavailability of Orally Administered Zoledronic Acid and Disodium Zoledronate

[271] Tablets were manufactured containing either pure zoledronic acid or the disodium salt of zoledronic acid (disodium zoledronate tetrahydrate). Both types of tablets contained 50 mg of zoledronic acid equivalent per tablet. Identical excipients were used in both types of tablets, with amounts adjusted to account for the difference in molecular weights between the acid and the disodium salt.

[272] Beagle dogs were orally administered tablets containing 150 mg zoledronic acid equivalent either in the form of disodium zoledronate (Group 1) or pure zoledronic acid (Group 2). Each animal was given three 50 mg equivalent tablets (150 mg total), which were administered together. The animal's oral cavity was wetted with water before placing the tablets on the back of the animal's tongue. Animals were fasted before and after dosing. Animals were 6 to 9 months of age and weighed 6 to 10 kg on the day of dosing. There were three dogs per group.

[273] Serial blood samples were collected from each animal by venipuncture of the jugular vein at various points after dosing for measurement of plasma concentrations of zoledronic acid. Blood samples were collected into chilled tubes containing K_2EDTA as the anticoagulant. Samples were then centrifuged at approximately 3000 rpm at +4°C for 10 minutes for plasma derivation. Plasma concentrations of zoledronic acid were measured using an LC/MS/MS method.

Results

[274] The average plasma concentrations of zoledronic acid for each group of dogs is summarized in Table 1 and illustrated in FIG. 8. Detectable plasma levels of zoledronic acid were observed for the entire 48 hours that they were measured.

Table 1
Zoledronic Acid plasma concentrations in beagle dogs

		Time (hour)	Plasma concentration (ng/mL)
Group 1 (N=3)	Disodium Zoledronate Tablets (150 mg acid equivalent)	0	0.00
		0.25	1193.97
		0.5	1852.12
		0.75	1776.51
		1	1626.56
		2	640.57
		4	136.93
		6	53.11
		8	26.97
		12	13.74

Table 1
Zoledronic Acid plasma concentrations in beagle dogs

		Time (hour)	Plasma concentration (ng/mL)
		24	6.78
		48	5.39
Group 2 (N=3)	Zoledronic Acid Tablets (150 mg acid equivalent)	0	0.00
		0.25	390.92
		0.5	846.19
		0.75	819.15
		1	831.77
		2	477.76
		4	90.11
		6	28.22
		8	15.10
		12	6.13
		24	3.18
		48	1.84

[275] Disodium zoledronate produced significantly higher plasma levels of zoledronic acid than pure zoledronic acid, indicating improved oral absorption with the salt form. Measured using peak plasma concentrations (C_{max}), the disodium salt resulted in a 119% actual and 74% weight-adjusted increase in bioavailability as compared to pure zoledronic acid. Measured using area under the plasma concentration curve ($AUC_{0-\infty}$), bioavailability was 84% and 46% greater with the disodium salt than with pure zoledronic acid, on an actual and weight-adjusted basis respectively. The average $AUC_{0-\infty}$ for the disodium salt was 4073 ng•h/mL and the average $AUC_{0-\infty}$ for the diacid was 2217 ng•h/mL. The $AUC_{0-\infty}$ was found to be dose proportional. Thus, for beagle dogs similar to those tested, about 3 mg to about 4 mg of the disodium salt would be expected to result in an $AUC_{0-\infty}$ of about 100 ng•h/mL, and about 7 mg to about 8 mg of the disodium salt would be expected to result in an $AUC_{0-\infty}$ of about 200 ng•h/mL.

Example 6. Hardness of Tablets Comprising Zoledronic Acid in the Free Acid and Disodium Salt Forms

[276] Tablets were prepared by blending zoledronic acid, either in the form of the free acid or the disodium salt, with identical excipients. For dosage forms with a greater amount of active, the amount of the excipients was reduced proportionally to keep the weight

of the tablet at about 100 mg. After blending, the ingredients were compressed at varying pressures, followed by a film coating. The resulting tablets were then tested for hardness using a Dr. Schleuniger Pharmatron 8M Tablet Hardness Tester. The results are shown in Table 2 and FIG. 9.

Table 2

Compression Force	Hardness (kPa)		
(psi)	Diacid 50 mg	Disodium Salt 50 mg	Disodium Salt 71 mg
800	4.0	8.7	4.8
1100	6.1	11.2	6.8
1500	7.7	13.7	7.4
2000	8.7	16.3	10.7
2400	8.7		11.3
3000	11.4		14.1
4400	12.5		14.9
5500	12.8		18.2
6100	13.0		

Example 7. Effects of Zoledronic Acid on Patients with Osteoarthritis and BML

[277] Some embodiments related to joint pain, bone marrow lesions, and osteoarthritis were conceived as a result of analyzing data from a clinical study. Some of the results of this study were reported by Laslett et al. in *Ann Rheum Dis* 2012; 71:1322-1328. Some of the description and data reported below was not published prior to filing the present application. Fifty-two (52) patients with clinical knee osteoarthritis and knee bone marrow lesions (BML) were randomized to receive either intravenous zoledronic acid (5 mg) or placebo in a double blind fashion. All patients had to have at least one bone marrow lesion (BML) in the affected knee on magnetic resonance imaging (MRI). All patients had x-ray of the knee for determination of joint space narrowing (JSN), which was graded according to the Osteoarthritis Research Society International (OARSI) atlas. Patients had either no joint space narrowing (OARSI Grade 0), or greater degrees of joint space narrowing (OARSI Grade 1 and Grade 2). Twenty six patients were treated with zoledronic acid (8, 6, and 12 with OARSI Grades 0, 1, and 2, respectively). Twenty six patients received placebo (8, 8, and 10 with OARSI Grades 0, 1 and 2, respectively).

[278] Pain intensity was assessed, at baseline and at three months, using a 100 mm visual analog scale (VAS), with zero representing no pain and 100 representing extreme pain. The change in pain intensity from baseline to 3 months was calculated.

[279] With zoledronic acid treatment, pain was reduced significantly as compared to placebo in patients with no joint space narrowing (OARSI Grade 0), but not in patients with joint space narrowing (OARSI Grades 1-2). As shown in Table 3 and FIG. 10, average VAS scores were reduced by 15 mm as compared to placebo in the OARSI Grade 0 group, but only by 0.28 as compared to placebo in patients with OARSI Grades 1-2.

[280] In the zoledronic acid group, average VAS scores at 3 months decreased from baseline by approximately 25 mm and 21 mm in patients with OARSI Grades 0 and 1, respectively, but only by 9 mm in the OARSI Grade 2 patients (FIG. 11).

Table 3. Change in VAS Pain Scores at Three Months by OARSI Grade (mm)

	OARSI Grade 0	OARSI Grades 1-2
Zoledronic Acid	-24.6	-13.2
Placebo	-9.6	-12.9
Difference from Placebo	-15.0	-0.28

[281] With zoledronic acid treatment, pain was reduced significantly as compared to placebo in patients with baseline VAS pain intensity scores of 50 mm or greater, but not in patients with baseline VAS scores less than 50 mm. As shown in Table 4, average VAS scores were reduced by 9 mm as compared to placebo in the patients with baseline VAS ≥ 50 mm, but only by 0.6 as compared to placebo in patients with baseline VAS < 50 mm.

Table 4. Change in VAS Pain Scores at Three Months by Baseline VAS (mm)

	Baseline VAS ≥ 50 mm	Baseline VAS < 50 mm
Zoledronic Acid	-26.2	-7.3
Placebo	-17.2	-6.7
Difference from Placebo	-9.0	-0.6

[282] As summarized in Table 5 and illustrated in FIG. 12, pain reduction was greater in patients with baseline VAS ⩾ 50 mm, greater still in patients with OARSI Grade 0 joint space narrowing, and greatest in patients with both baseline VAS ⩾ 50 mm and OARSI Grade 0 joint space narrowing.

Table 5. Pain Reduction Compared to Placebo at Three Months (mm)

	VAS Change
All patients	-4.8
Baseline VAS ≥ 50 mm	-9.0

	VAS Change
OARSI Grade 0	-15.0
Baseline VAS ≥ 50 mm + OARSI Grade 0	-19.4

[283] BMLs were evaluated using proton density-weighted fat saturation MR images. BMLs were scored using Osiris software (University of Geneva, Geneva, Switzerland). The maximum size was measured in mm^2 using software cursors applied to the greatest area of each lesion. The lesion with the highest score was used if more than one was present at the same site. Each patient was given a BML score (mm^2) at each of the four sites (medial tibial, medial femoral, lateral tibial, and lateral femoral sites) and these were summed to create a total BML score (mm^2). The change in the total area of BMLs from baseline to 6 months was calculated.

[284] The size of BMLs was reduced with zoledronic acid treatment. As shown in FIG. 13 and Table 6, average BML area decreased by approximately 190 mm^2 as compared to placebo in the OARSI Grade 0 group, but only by approximately 33 mm^2 as compared to placebo in patients with OARSI Grades 1-2.

Table 6. Change in BML Size (mm^2)

	OARSI Grade 0	OARSI Grades 1-2
Zoledronic Acid	-244	-117
Placebo	-55	-84
Difference from Placebo	-190	-33

Example 8

Methods

[285] A study was performed to evaluate the efficacy of a single intravenous infusion of 5 mg ZA in comparison with intravenous placebo infusion among patients with chronic low back pain (LBP) and Modic changes on MRI. This study was a double-blinded, randomized, placebo-controlled clinical trial in patients with low back pain (LBP). Patients were included in the study if they had low back symptoms for at least three months, a LBP of at least six (6) on a 10-cm Visual Analog Scale (VAS) or an Oswestry Disability Index (ODI) of at least 30%, and an M1, mixed M1/2 or M2 type change on MRI performed within six months at most prior to enrolment.

[286] Patients were excluded from the study if they had renal impairment with reduced creatinine clearance defined as an estimated glomerular filtration rate (eGFR) below

40 ml/min, hypocalcemia, known hypersensitivity to zoledronic acid or other bisphosphonates or ingredients of the infusion product, the presence of red flags, nerve root entrapment or willingness for early retirement. Premenopausal women of childbearing potential were also excluded. Blood samples were taken prior to the infusion to assess the serum concentration of calcium and creatinine. The clinical examination included medical history and clinical assessment of lumbar flexibility, tendon signs, and motor and sensory testing.

[287] After confirmation of eligibility patients were randomized to receive a single intravenous infusion of 5 mg zoledronic acid (n = 20) or 100 ml saline as placebo (n = 20) over a 15-minute period. Information on use of the concomitant medication and hospital admissions were recorded. Blood samples were taken for the assessment of safety, inflammatory mediators and markers of bone turnover at baseline, one month and one year.

[288] Clinical assessments were performed 14 days before enrolment (screening visit), and follow-up visits at one month and one year after the infusion. The primary outcome was the change in the intensity of LBP on VAS. Secondary outcomes included leg pain intensity, ODI, health-related quality of life assessed with RAND-36, patient-reported sick leaves and lumbar flexibility. These outcome measures were assessed at baseline and at each follow-up. Lumbar flexibility was evaluated using the fingers-to-floor and trunk side bending measures (in cm). The percentage of patients undergoing a 20% relative improvement, the proportion of patients reaching a VAS score of 40 or less in the primary outcome, and patient acceptable symptom state (PASS) were also assessed. Pain medication use was inquired about during the follow-up visits.

Results

[289] Zoledronic acid treatment resulted in a greater improvement in LBP intensity at one month as compared to placebo treatment. Furthermore, the patients receiving zoledronic acid reported NSAID use at one year significantly less often than those in the placebo group. Overall, the improvements in most of the evaluated parameters were greater in the zoledronic acid group throughout the follow-up period.

[290] The clinical characteristics of study participants at baseline are displayed in Table 6. The mean LBP duration was 293 days, initial LBP intensity on VAS 6.7, leg pain on VAS 2.9 and the ODI score was 32%. Altogether 19 patients in the ZA group and 18 in the placebo group had a M1/2 lesion. Modic changes were most commonly (70%) situated at L4/5 or L5/S1. The zoledronic acid and placebo groups were similar as regards the demographic and background characteristics of all patients at baseline (Table 6).

[291] The mean difference (MD) between the treatment groups in the primary outcome, intensity of LBP, significantly favored zoledronic acid at one month (MD 1.4; 95% CI

0.01 to 2.9) while at one year no significant difference was observed (MD 0.7; 95% CI –1.0 to 2.4; Table 7). The proportion of patients with at least 20% improvement in intensity of LBP and PASS both favored the zoledronic acid treatment at one month: zoledronic acid 55% vs. placebo 25% (p = 0.105) and zoledronic acid 50% vs. placebo 20% (p = 0.096), respectively.

[292] For the patients who were treated with zoledronic acid, the reduction in pain intensity was greater in those with greater baseline pain intensity as shown in Table 9. The mean reduction in pain from baseline was 3.4 for patients with baseline pain intensity $\geqslant 7$, as compared to a reduction of only 0.1 for patients with a baseline pain intensity < 6.

[293] Of the secondary outcomes, the improvement in ODI, favored zoledronic acid at 1 month, the adjusted between-group difference being 6.0% (95% CI –0.6 to 13), but not at one year (Table 7). Similarly, side bending (to right and left) favored the zoledronic acid treatment at one month but not at one year (Table 7). Changes in total RAND-36, and in the physical and mental components of RAND-36 are shown in Table 8.

[294] At baseline, there were no differences in self-reported use of non-steroidal anti-inflammatory drugs (NSAIDs) between the treatment groups, whereas at one year, only 20% of patients in the ZA group used NSAIDs versus 60% in the placebo group.

Table 6: Baseline characteristics of study population according to treatment group

Characteristics	**Zoledronic Acid n = 20**	**Pacebo n = 20**
Sex, n (%) men	15 (75)	11 (55)
Age, mean (SD) years	49 (9.3)	51 (7.3)
Smoking, n (%) regular smokers*	5 (25)	6 (30)
BMI, mean (SD) kg/m	26 (3.3)	27 (3.2)
Workload, n (%)		
-Sedentary work with limited walking	4 (20)	4 (22)
-Fairly light work with considerable walking but no lifting or carrying heavy objects	4 (20)	3 (17)
-Fairly strenuous work with walking and lifting heaving objects or climbing stairs or uphill	8 (40)	6 (33)
-Very strenuous work with lifting or carrying heaving objects such as shoveling, digging, or hammering	4 (20)	5 (28)
Type of worst MC-lesion**, n		
- Type I	1	1
- Type I/II	19	18
- Type II	0	1
MC at two or more levels, n (%)	7 (3.5)	4 (20)
Levels of MC, n		
- L2/3	4	0
- L3/4	3	5
- L4/5	6	5
- L5/S1	7	10

Characteristics	Zoledronic Acid n = 20	Pacebo n = 20
Duration of LBP, median (IQ range) days	330 (200, 365)	315 (270, 365)
Intensity of LBP, mean (SD)***	6.6 (1.4)	6.8 (1.6)
Duration of leg pain, median (IQ range) days	50 (0, 100)	36 (0, 160)
Intensity of leg pain, mean (SD)***	3.0 (3.1)	2.9 (2.3)
Oswestry Disability Index, %, Mean (SD)	30 (11)	35 (10)
Duration of sick leave during the past year, median (IQ range) days	14 (0, 48)	18 (1, 181)
RAND-36, mean (SD)	50 (8)	50 (7)
RAND-36 physical component, mean (SD)	51 (8)	49 (8)
RAND-36 mental component, mean (SD)	51 (8)	49 (9)

BMI = Body Mass Index, MC = Modic Change, LBP = low back pain, SD = standard deviation, IQ = inter-quartile.
*Smoking at least one cigarette per day.
**If different types of MC at two or more levels, classification is based on the assumed severity of the type, i.e., Type I > mixed Type I/II > Type II.
***Assessed using a 10 cm Visual Analogue Scale (VAS).

Table 7. Low back symptoms and lumbar flexibility at baseline, one month and 12 months according to treatment group and between group comparisons of difference from baseline to one month and 12 months

	Mean (SD) original values		Mean (SD) change		Unadjusted analyses		Adjusted analyses	
	ZA n=20	Placebo n=20	ZA	Placebo	Difference (95% CI)	P	Difference (95% CI)	P*
Intensity of LBP								
- Baseline	6.6 (1.4)	6.8 (1.6)						
- 1 mo.	4.3 (2.3)	5.8 (2.2)	–2.2 (2.7)	–0.9 (2.1)	1.3 (–0.2 to 2.8)	0.097	1.4 (0.01 to 2.9)	0.049
- 12 mos.	3.8 (2.5)	4.6 (2.9)	–2.8 (2.9)	–2.2 (2.5)	0.6 (–1.1 to 2.4)	0.474	0.7 (–1.0 to 2.4)	0.387
Intensity of leg pain[a]								
- Baseline	3.0 (3.1)	2.9 (2.3)						
- 1 mo.	2.0 (2.3)	3.0 (2.4)	–0.6 (2.4)	0.1 (2.6)	0.8 (–0.9 to 2.4)	0.367	0.8 (–0.6 to 2.2)	0.237
- 12 mos.	2.1 (2.8)	2.7 (2.6)	–0.9 (3.4)	–0.3 (3.0)	0.6 (–1.5 to 2.7)	0.573	0.5 (–1.3 to 2.2)	0.573
Oswestry disability index, %								
- Baseline	30 (11)	35 (10)						
- 1 mo.	24 (10)	33 (13)	–5.9 (11)	–1.7 (9.7)	4.3	0.212	6.0	0.071

	Mean (SD) original values		Mean (SD) change		Unadjusted analyses		Adjusted analyses	
	ZA n=20	Placebo n=20	ZA	Placebo	Difference (95% CI)	P	Difference (95% CI)	P*
					(–2.5 to 11)		(–0.6 to 13)	
- 12 mos.	25 (13)	33 (15)	–5.0 (15)	–1.9 (12)	3.1 (–5.6 to 12)	0.475	5.1 (–3.4 to 14)	0.231
Fingers-to-floor, cm								
- Baseline	23 (19)	19 (18)						
- 1 mo.	17 (17)	19 (17)	–5.1 (20)	–0.1 (8.3)	5.0 (–4.8 to 15)	0.306	3.6 (–5.0 to 12)	0.403
- 12 mos.	16 (16)	20 (19)	–6.3 (23)	0.9 (11)	7.1 (–4.3 to 18)	0.215	5.3 (–4.5 to 15)	0.277
Sidebending to right, cm								
- Baseline	14.1 (4.9)	13.8 (7.2)						
- 1 mo.	15.7 (5.9)	13.3 (6.9)	1.5 (4.7)	–0.5 (2.2)	–2.0 (–4.3 to 0.4)	0.101	–2.0 (–4.4 to 0.3)	0.087
- 12 mos.	15.7 (5.6)	13.8 (6.5)	1.6 (4.8)	–0.1 (3.5)	–1.6 (–4.3 to 1.1)	0.227	–1.7 (–4.2 to 0.8)	0.180
Sidebending to left, cm								
- Baseline	15.0 (5.4)	13.3 (5.5)						
- 1 mo.	16.1 (5.3)	12.8 (5.9)	1.1 (3.0)	–0.5 (2.2)	–1.5 (–3.2 to 0.1)	0.072	–1.7 (–3.4 to 0.0)	0.051
- 12 mos.	16.2 (6.7)	13.7 (5.7)	1.2 (5.3)	0.5 (3.2)	–0.7 (–3.5 to 2.1)	0.601	–1.0 (–3.8 to 1.8)	0.458

SD = standard deviation, CI = confidence interval, ZA = zoledronic acid, LBP = low back pain.
*ANCOVA: Difference between follow-up and baseline, treatment effect adjusted for baseline value.
[a]One subject missing at baseline in placebo group and in ZA group, and one subject at 1 month in ZA group.

Table 8: Health-related quality of life assessed using RAND-36 at baseline, one month, and 12 months according to treatment group and between group comparisons of difference from baseline to one month and 12 months

	Mean (SD) original values		Mean (SD) change		Unadjusted analyses		Adjusted analyses	
	ZA n = 20	Placebo n = 20	ZA	Placebo	Difference (95% CI)	P	Difference (95% CI)	P*
Total RAND-36								
- Baseline	50 (8)	50 (7)						
- 1 mo.	51 (8)	49 (8)	0.6 (6.4)	-0.6 (5.0)	1.2 (-3 to 5)	0.530	1.3 (-3 to 5)	0.477
- 12 mos.	51 (8)	49 (9)	1.0 (8.7)	-1.0 (5.9)	2.1 (-3 to 7)	0.378	2.2 (-2 to 7)	0.314
Physical component								
- Baseline	52 (8)	48 (8)						
- 1 mo.	52 (9)	48 (8)	0.1 (8.6)	-0.1 (5.5)	0.3 (-4 to 5)	0.897	1.3 (-3 to 6)	0.554
- 12 mos.	52 (8)	48 (2)	0.3 (10)	-0.3 (6.5)	0.7 (-5 to 6)	0.808	2.1 (-3 to 7)	0.405
Mental component								
- Baseline	49 (9)	51 (8)						
- 1 mo.	50 (9)	50 (9)	1,0 (6.1)	-1.0 (5.6)	2.0 (-2 to 6)	0.286	1.6 (-2 to 5)	0.396
- 12 mos.	51 (9)	49 (9)	1,8 (9.0)	-1.8 (6.7)	3.5 (-2 to 9)	0.167	2.7 (-2 to 7)	0.261

SD = standard deviation, CI = confidence interval, ZA = zoledronic acid.
*ANCOVA: Difference between follow-up and baseline, treatment effect adjusted for baseline value.

Table 9. Pain Reduction in Patients Treated Zoledronic Acid (cm)

	VAS Change from Baseline
Baseline VAS < 6	-0.1
Baseline VAS ≥ 6 and <7	-2.3
Baseline VAS ≥ 7	-3.4

Example 9

Methods:

[295] A study was performed to evaluate the efficacy of bisphosphonates such as oral zoledronic acid in inhibiting immune responses and pain behavior in a rat fracture model of CRPS.

[296] The effect of orally administered zoledronic acid was examined in the rat tibia fracture model of complex regional pain syndrome (CRPS). CRPS was induced in the

rats by fracturing the right distal tibias of the animals and casting the fractured hindpaws for 4 weeks, as described in Guo TZ et al. (Pain. 2004; 108: 95-107). This animal model has been shown to replicate the inciting trauma (such as a fracture, a surgery, a crushing injury, a cutting injury, a scratch, or a puncture injury), natural history, signs, symptoms, and pathologic changes observed in human CRPS patients (Kingery WS et al., Pain. 2003;104:75-84).

[297] Starting four weeks after fracture and casting, animals were orally administered either vehicle (control) or zoledronic acid, a dose of 21 mg/kg on the first day and 3 mg/kg/day daily thereafter, or distilled water for 3 weeks (weeks 4-7 post-fracture). Drug was dissolved in distilled water and administered by gavage. Animals were fasted for 4 hours before and 2 hours after dosing. At the end of the 21-day period, casts were removed, and on the following day, the rats were tested for hindpaw pain, edema, and warmth.

Results

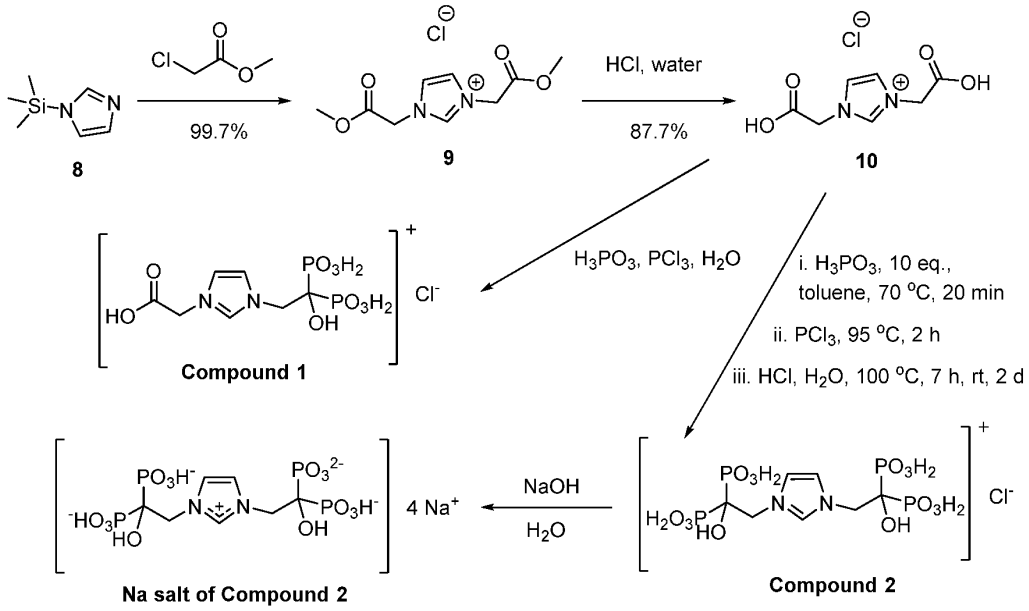
[298] As illustrated in FIGs. 14-15, treatment with orally administered zoledronic acid reversed pain and restored weight bearing as compared to the vehicle treated animals.

[299] As illustrated in FIG. 14, von Frey pain thresholds for the right (fracture) hindpaw were reduced by over 100% as compared to baseline when oral zoledronic acid was administered.

[300] As illustrated in FIG. 15, reduction in weight bearing, a postural effect of pain, was significantly higher in the vehicle treated group as compared to the zoledronic acid treated group. Weight bearing on the fracture hindlimb was reduced to about 80% of normal in the vehicle treated group. Zoledronate treatment significantly restored hindlimb weight bearing as compared to vehicle treatment (over 90% of normal).

[301] As can be seen in FIG. 16, orally administering zoledronic acid four weeks after the fracture resulted in significantly greater improvement of pain relief as compared to administration at the time of injury.

Example 10



[302] **1,3-Bis(2-methoxy-2-oxoethyl)-1*H*-imidazol-3-ium chloride (9)**. Methyl chloroacetate (29.8 mL, 338.6 mmol, 2.0 eq) was added drop-wise to 1-(trimethylsilyl)-1*H*-imidazole (**8**; 25.0 mL, 169.3 mmol). The mixture was heated at 60 °C for 24 hours. The mixture was cooled to room temperature, washed with Et_2O (3 x 500 mL) and dried in *vacuo* yielding **9** (41.97 g, 168.8 mmol, 99.7%) as a white solid.

[303] **1,3-Bis(carboxymethyl)1*H*-imidazol-3-ium chloride (10)**. To 1,3-bis(2-methoxy-2-oxoethyl)-1*H*-imidazol-3-ium chloride (**9**; 41.00 g, 164.88 mmol, 1 eq.) was added 37% aq. HCl (30.03 mL, 362.74 mmol, 2.2 eq.). The mixture was stirred under reflux for 0.5 hour. The mixture was concentrated and the remaining solid was washed with acetone (2 x 200 mL) and Et_2O (3 x 200 mL). Drying in *vacuo* gave **10** (31.89 g, 144.55 mmol, 87.7%) as a white solid.

[304] **Compound 1**: Compound 10 is reacted with an equimolar amount of phosphorous acid, followed by an equimolar amount of phosphorous trichloride, and an excess of water to form **Compound 1**, which is precipitated from ethanol.

[305] **Compound 2**: 1,3-Bis(carboxymethyl)-1H-imidazol-3-ium chloride (**10**, 2.00 g, 9 mmol, 1.0 eq) and H_3PO_3 (7.37 g, 90 mmol, 10 eq) were dissolved in toluene (10 mL) and heated to 70 °C. The reaction mixture was stirred at this temperature for 20 min before PCl_3 (16 mL, 180 mmol, 20 eq) was added within 30 min. The reaction mixture was then heated to 95 °C and stirred at this temperature for 2 h. Then, aq. HCl (30 mL, 37% HCl and 5 mL H_2O) was added. The reaction mixture was heated to 100 °C and stirred at this

temperature for 7 h, then stirred at room temperature for 2 days and filtered. The filtrate was cooled in an ice bath and added within 45 min to absolute EtOH (90 mL). The resulting turbid solution was stirred for 1 h at room temperature before the solid was filtered off. The filter cake (**Compound 2**) was isolated and analyzed by 2D-NMR spectroscopy and mass spectrometry (m/z= 477). The filtrate was concentrated *in vacuo* to give a residue. This residue (500 mg) was treated with aq. NaOH (150 mg in 3.5 mL of H_2O) and EtOH (7 mL). After standing overnight the liquid was decanted and the resulting solid (**Na salt of Compound 2**) was obtained and analyzed by NMR and mass spectrometry (m/z= 477).

[306] The following embodiments are specifically contemplated:

Embodiment 1. A method of relieving inflammatory pain comprising administering an oral dosage form containing zoledronic acid to a mammal in need thereof, wherein the mammal receives a total monthly dose of zoledronic acid that is about 800 mg/m^2 or less based upon the body surface area of the mammal.

Embodiment 2. The method of embodiment 1, wherein the mammal is a human being that receives a total monthly dose of zoledronic acid that is about 30 mg/m^2 to about 700 mg/m^2.

Embodiment 3. The method of embodiment 2, wherein the total monthly dose is administered in 4 or 5 weekly doses.

Embodiment 4. The method of embodiment 2, wherein the total monthly dose is administered in 28 to 31 daily doses.

Embodiment 5. The method of embodiment 2, wherein the total monthly dose is administered in 5 to 10 individual doses during the month.

Embodiment 6. The method of embodiment 1, wherein the mammal is a human being that receives a total weekly dose of zoledronic acid that is about 10 mg to about 300 mg.

Embodiment 7. The method of embodiment 6, wherein the total weekly dose is a single dose, administered once a week.

Embodiment 8. The method of embodiment 6, wherein the total weekly dose is administered in 2 to 7 individual doses during the week.

Embodiment 9. The method of embodiment 1, wherein the mammal is a human being that receives a total weekly dose of zoledronic acid that is about 10 mg to about 150 mg.

Embodiment 10. The method of any preceding embodiment, wherein the mammal experiences significant pain relief more than 3 hours after administration of the dosage form.

Embodiment 11. The method of embodiment 10, wherein the mammal experiences significant pain relief during at least a part of a time from about 3 hours to about 24 hours after administration of the dosage form.

Embodiment 12. The method of embodiment 10, wherein the mammal experiences significant pain relief during at least a part of a time from about 3 hours to about 3 weeks after administration of the dosage form.

Embodiment 13. A method of relieving inflammatory pain comprising administering an oral dosage form containing zoledronic acid to a mammal in need thereof, wherein the oral dosage form contains about 10 mg/m^2 to about 20 mg/m^2 of zoledronic acid based upon the body surface area of the mammal.

Embodiment 14. The method of embodiment 13, wherein the oral dosage form contains about 15 mg/m^2 to about 20 mg/m^2 of zoledronic acid based upon the body surface area of the mammal.

Embodiment 15. A method of relieving inflammatory pain comprising orally administering to a mammal in need thereof, about 300 mg/m^2 to about 600 mg/m^2 of zoledronic acid per month to the mammal, based upon the body surface area of the mammal.

Embodiment 16. The method of embodiment 15, comprising orally administering about 450 mg/m^2 to about 600 mg/m^2 of zoledronic acid per month to the mammal, based upon the body surface area of the mammal.

Embodiment 17. The method of any preceding embodiment, wherein the mammal is not suffering from bone metastasis.

Embodiment 18. The method of any preceding embodiment, wherein the mammal is not suffering from cancer.

Embodiment 19. The method of any preceding embodiment, wherein the zoledronic acid is administered as a salt of a dianion of zoledronic acid.

Embodiment 20. A method of relieving pain associated with an arthritis comprising administering an oral dosage form containing zoledronic acid to a human being in need thereof.

Embodiment 21. The method of embodiment 20, wherein the human being receives a total monthly dose of zoledronic acid that is about 40 mg to about 2000 mg.

Embodiment 22. The method of embodiment 21, wherein the total monthly dose is administered in 4 or 5 weekly doses.

Embodiment 23. The method of embodiment 21, wherein the total monthly dose is administered in 28 to 31 daily doses.

Embodiment 24. The method of embodiment 21, wherein the total monthly dose is administered in 5 to 10 individual doses during the month.

Embodiment 25. The method of embodiment 20, wherein the human being receives a total weekly dose of zoledronic acid that is about 100 mg to about 300 mg.

Embodiment 26. The method of embodiment 25, wherein the total weekly dose is a single dose, administered once a week.

Embodiment 27. The method of embodiment 25, wherein the total weekly dose is administered in 2 to 7 individual doses during the week.

Embodiment 28. The method of embodiment 20, wherein the human being receives a total weekly dose of zoledronic acid that is about 10 mg to about 100 mg.

Embodiment 29. The method of any of embodiments 20-28, wherein the human being experiences significant pain relief more than 3 hours after administration of the dosage form.

Embodiment 30. The method of embodiment 29, wherein the human being experiences significant pain relief during at least a part of a time from about 3 hours to about 24 hours after administration of the dosage form.

Embodiment 31. The method of embodiment 29, wherein the human being experiences significant pain relief during at least a part of a time from about 3 hours to about 3 weeks after administration of the dosage form.

Embodiment 32. The method of any of embodiments 20-31, wherein the dosage form contains about 10 mg/m^2 to about 20 mg/m^2 of zoledronic acid based upon the body surface area of the human being.

Embodiment 33. The method of embodiment 32, wherein the dosage form contains about 15 mg/m^2 to about 20 mg/m^2 of zoledronic acid based upon the body surface area of the human being.

Embodiment 34. The method of any of embodiments 20-33, wherein about 50 mg/m^2 to about 200 mg/m^2 of zoledronic acid is orally administered per month, based upon the body surface area of the human being.

Embodiment 35. The method of any of embodiments 20-31, wherein the dosage form contains about 80 mg/m^2 to about 150 mg/m^2 of zoledronic acid based upon the body surface area of the human being.

Embodiment 36. The method of embodiment 35, wherein about 300 mg/m^2 to about 1000 mg/m^2 of zoledronic acid is orally administered per month, based upon the body surface area of the human being.

Embodiment 37. The method of any of embodiments 20-36, wherein the human being is not suffering from bone metastasis.

Embodiment 38. The method of any of embodiments 20-37, wherein the human being is not suffering from cancer.

Embodiment 39. The method of any preceding embodiment, wherein the zoledronic acid is in the disodium salt form.

Embodiment 40. An oral dosage form comprising zoledronic acid, wherein the oral bioavailability of zoledronic acid in the dosage form is about 0.01% to about 4%.

Embodiment 41. The oral dosage form of embodiment 40, wherein the oral dosage form contains about 10 mg to about 300 mg of zoledronic acid.

Embodiment 42. The oral dosage form of embodiment 40, wherein the oral dosage form contains about 10 mg to about 50 mg of zoledronic acid.

Embodiment 43. The oral dosage form of any of embodiments 40-42, wherein the oral bioavailability of zoledronic acid in the dosage form is about 0.1% to about 2%.

Embodiment 44. A pharmaceutical product comprising more than one unit of an oral dosage form of embodiment 40.

Embodiment 45. The pharmaceutical product of embodiment 44, wherein each unit of the oral dosage form contains about 1 mg to about 50 mg of zoledronic acid.

Embodiment 46. The pharmaceutical product of embodiment 45, comprising 28, 29, 30, or 31 units of the oral dosage form, for a total of about 28 mg to about 1600 mg of zoledronic acid to be administered in about 1 month.

Embodiment 47. The pharmaceutical product of embodiment 45, comprising 85 to 95 units of the oral dosage form, for a total of about 85 mg to about 4800 mg of zoledronic acid to be administered in about 3 months.

Embodiment 48. The pharmaceutical product of embodiment 45, comprising 170 to 200 units of the oral dosage form, for a total of about 170 mg to about 10,000 mg of zoledronic acid to be administered in about 6 months.

Embodiment 49. The pharmaceutical product of embodiment 45, comprising 350 to 380 units of the oral dosage form, for a total of about 350 mg to about 19,000 mg of zoledronic acid to be administered in about 1 year.

Embodiment 50. The pharmaceutical product of embodiment 44, wherein each unit of the oral dosage form contains about 10 mg to about 300 mg.

Embodiment 51. The pharmaceutical product of embodiment 50, comprising 4 or 5 units of the oral dosage form, for a total of about 40 mg to about 1500 mg of zoledronic acid to be administered within a period of about 1 month.

Embodiment 52. The pharmaceutical product of embodiment 50, comprising 8 or 9 units of the oral dosage form, for a total of about 80 mg to about 2700 mg of zoledronic acid to be administered in about 2 months.

Embodiment 53. The pharmaceutical product of embodiment 50, comprising 12, 13 or 14 units of the oral dosage form, for a total of about 120 mg to about 4200 mg of zoledronic acid to be administered in about 3 months.

Embodiment 54. The pharmaceutical product of embodiment 50, comprising 22 to 30 units of the oral dosage form, for a total of about 220 mg to about 9000 mg of zoledronic acid to be administered in about 6 months.

Embodiment 55. The pharmaceutical product of embodiment 50, comprising 45 to 60 units of the oral dosage form, for a total of about 450 mg to about 18000 mg of zoledronic acid to be administered in about 1 year.

Embodiment 56. The pharmaceutical product of embodiment 44, comprising 1 to 10 units of the oral dosage form, wherein the product contains about 200 mg to about 2000 mg of zoledronic acid.

Embodiment 57. The oral dosage form of any preceding embodiment, wherein the zoledronic acid is in the form of a sodium salt.

Embodiment 58. The oral dosage form of any preceding embodiment, wherein the zoledronic acid is in a form that has an aqueous solubility greater than 1% (w/v).

Embodiment 59. The oral dosage form of any preceding embodiment, wherein the zoledronic acid is in a form that has an aqueous solubility of about 5% (w/v) to about 50% (w/v).

Embodiment 60. An oral dosage form comprising zoledronic acid and an excipient, wherein the zoledronic acid is in a form that has an aqueous solubility greater than 1% (w/v).

Embodiment 61. The oral dosage form of embodiment 60, wherein the zoledronic acid is in a form that has an aqueous solubility of about 5% (w/v) to about 50% (w/v).

Embodiment 62. A method of treating complex regional pain syndrome comprising administering an oral dosage form containing zoledronic acid to a mammal in need thereof.

Embodiment 63. The method of embodiment 62, wherein the mammal is a human being that receives an amount of zoledronic acid that is about 30 mg/m^2 to about 700 mg/m^2 in a period of one month or less.

Embodiment 64. The method of embodiment 63, wherein 4 or 5 weekly doses are administered in a period of one month or less.

Embodiment 65. The method of embodiment 63, wherein 28 to 31 daily doses are administered in a period of one month or less.

Embodiment 66. The method of embodiment 63, wherein 5 to 10 individual doses are administered during a period of one month or less.

Embodiment 67. The method of embodiment 63, wherein about 30 mg/m^2 to about 700 mg/m^2 of zoledronic acid is administered during only one month.

Embodiment 68. The method of embodiment 63, wherein about 30 mg/m^2 to about 700 mg/m^2 of zoledronic acid is administered in a period of one month or less for 2 or more consecutive months.

Embodiment 69. The method of embodiment 62, wherein the mammal receives about 10 mg/m^2 to about 30 mg/m^2 of zoledronic acid daily.

Embodiment 70. The method of embodiment 62, wherein the mammal is a human being that receives a total weekly dose of zoledronic acid that is about 10 mg to about 300 mg.

Embodiment 71. The method of embodiment 70, wherein the total weekly dose is a single dose, administered once a week.

Embodiment 72. The method of embodiment 70, wherein the total weekly dose is administered in 2 to 7 individual doses during the week.

Embodiment 73. The method of any of embodiments 62-72, wherein the complex regional pain syndrome is complex regional pain syndrome type I.

Embodiment 74. The method of any of embodiments 62-72, wherein the complex regional pain syndrome is complex regional pain syndrome type II.

Embodiment 75. The method of any preceding embodiment, wherein the zoledronic acid is in a salt form.

Embodiment 76. The method of any of embodiments 62-75, wherein the dosage form contains about 10 mg/m^2 to about 20 mg/m^2 of zoledronic acid based upon the body surface area of the mammal.

Embodiment 77. The method of embodiment 76, wherein the dosage form contains about 15 mg/m^2 to about 20 mg/m^2 of zoledronic acid based upon the body surface area of the mammal.

Embodiment 78. A method of treating complex regional pain syndrome, comprising administering pamidronic acid to a human being in need thereof.

Embodiment 79. A method of treating complex regional pain syndrome, comprising administering neridronic acid to a human being in need thereof.

Embodiment 80. A method of treating complex regional pain syndrome, comprising administering olpadronic acid to a human being in need thereof.

Embodiment 81. A method of treating complex regional pain syndrome, comprising administering alendronic acid to a human being in need thereof.

Embodiment 82. A method of treating complex regional pain syndrome, comprising administering incadronic acid to a human being in need thereof.

Embodiment 83. A method of treating complex regional pain syndrome, comprising administering ibandronic acid to a human being in need thereof.

Embodiment 84. A method of treating complex regional pain syndrome, comprising administering risedronic acid to a human being in need thereof.

Embodiment 85. A method of treating pain, comprising administering pamidronic acid to a human being in need thereof.

Embodiment 86. A method of treating pain, comprising administering neridronic acid to a human being in need thereof.

Embodiment 87. A method of treating pain, comprising administering olpadronic acid to a human being in need thereof.

Embodiment 88. A method of treating pain, comprising administering alendronic acid to a human being in need thereof.

Embodiment 89. A method of treating pain, comprising administering incadronic acid to a human being in need thereof.

Embodiment 90. A method of treating pain, comprising administering ibandronic acid to a human being in need thereof.

Embodiment 91. A method of treating pain, comprising administering risedronic acid to a human being in need thereof.

Embodiment 92. A method of treating arthritis pain, comprising administering pamidronic acid to a human being in need thereof.

Embodiment 93. A method of treating arthritis pain, comprising administering neridronic acid to a human being in need thereof.

Embodiment 94. A method of treating arthritis pain, comprising administering olpadronic acid to a human being in need thereof.

Embodiment 95. A method of treating arthritis pain, comprising administering alendronic acid to a human being in need thereof.

Embodiment 96. A method of treating arthritis pain, comprising administering incadronic acid to a human being in need thereof.

Embodiment 97. A method of treating arthritis pain, comprising administering ibandronic acid to a human being in need thereof.

Embodiment 98. A method of treating arthritis pain, comprising administering risedronic acid to a human being in need thereof.

Embodiment 99. A method of treating inflammatory pain, comprising administering pamidronic acid to a human being in need thereof.

Embodiment 100. A method of treating inflammatory pain, comprising administering neridronic acid to a human being in need thereof.

Embodiment 101. A method of treating inflammatory pain, comprising administering olpadronic acid to a human being in need thereof.

Embodiment 102. A method of treating inflammatory pain, comprising administering alendronic acid to a human being in need thereof.

Embodiment 103. A method of treating inflammatory pain, comprising administering incadronic acid to a human being in need thereof.

Embodiment 104. A method of treating inflammatory pain, comprising administering ibandronic acid to a human being in need thereof.

Embodiment 105. A method of treating inflammatory pain, comprising administering risedronic acid to a human being in need thereof.

Embodiment 106. A method of treating complex regional pain syndrome, comprising administering etidronic acid to a human being in need thereof.

Embodiment 107. A method of treating pain, comprising administering etidronic acid to a human being in need thereof.

Embodiment 108. A method of treating arthritis pain, comprising administering etidronic acid to a human being in need thereof.

Embodiment 109. A method of treating inflammatory pain, comprising administering etidronic acid to a human being in need thereof.

Embodiment 110. A method of treating complex regional pain syndrome, comprising administering clodronic acid to a human being in need thereof.

Embodiment 111. A method of treating pain, comprising administering clodronic acid to a human being in need thereof.

Embodiment 112. A method of treating arthritis pain, comprising administering clodronic acid to a human being in need thereof.

Embodiment 113. A method of treating inflammatory pain, comprising administering clodronic acid to a human being in need thereof.

Embodiment 114. A method of treating complex regional pain syndrome, comprising administering tiludronic acid to a human being in need thereof.

Embodiment 115. A method of treating pain, comprising administering tiludronic acid to a human being in need thereof.

Embodiment 116. A method of treating arthritis pain, comprising administering tiludronic acid to a human being in need thereof.

Embodiment 117. A method of treating inflammatory pain, comprising administering tiludronic acid to a human being in need thereof.

Embodiment 118. The method of any of embodiments 78-117, wherein the active compound is orally administered.

Embodiment 119. The method of any of embodiments 78-117, wherein the active compound is parenterally administered.

Embodiment 120. A method of enhancing the oral bioavailability of zoledronic acid comprising orally administering a dosage form containing zoledronic acid in the disodium salt form.

Embodiment 121. The method of embodiment 120, wherein the zoledronic acid in the disodium salt form provides an enhancement to bioavailability, as compared to zoledronic acid in the diacid form, which adds to any enhancement to bioavailability provided by any bioavailability-enhancing agents in the dosage form.

Embodiment 122. The method of embodiment 120, wherein the dosage form is substantially free of bioavailability-enhancing agents.

Embodiment 123. The method of embodiment 120, wherein the zoledronic acid in the disodium salt form is administered to a mammal in an amount that provides an area under the plasma concentration curve of zoledronic acid of about 4 ng•h/mL to about 2000 ng•h/mL to the mammal each time the zoledronic acid in the disodium salt is administered.

Embodiment 124. The method of embodiment 123, wherein the zoledronic acid in the disodium salt form is administered at an interval of about 3 to about 4 weeks in an amount that provides an area under the plasma concentration curve of zoledronic acid of about 100 ng•h/mL to about 2000 ng•h/mL to the mammal each time the zoledronic acid in the disodium salt form is administered.

Embodiment 125. The method of embodiment 123, wherein the zoledronic acid in the disodium salt form is administered weekly, or 3 to 5 times in a month, in an amount that provides an area under the plasma concentration curve of zoledronic acid of about 20 ng•h/mL to about 700 ng•h/mL to the mammal each time the zoledronic acid in the disodium salt form is administered.

Embodiment 126. The method of embodiment 123, wherein the zoledronic acid in the disodium salt form is administered daily in an amount that provides an area under the plasma concentration curve of zoledronic acid of about 4 ng•h/mL to about 100 ng•h/mL to the mammal each time the zoledronic acid in the disodium salt form is administered.

Embodiment 127. The method of embodiment 120, wherein the dosage form is a solid.

Embodiment 128. The method of embodiment 120, 121, 122, 123, 124, 125, 126, or 127, wherein the bioavailability of zoledronic acid is improved by at least about 20% as compared to administration of zoledronic acid in the diacid form.

Embodiment 129. The method of embodiment 120, 121, 122, 123, 124, 125, 126, 127, or 128, further comprising administering, on a molar basis, less of the zoledronic acid in the disodium salt form than would be administered of zoledronic acid in the diacid form in order to achieve the same plasma levels of zoledronic acid.

Embodiment 130. The method of embodiment 129, wherein at least about 10 mole% less of the disodium salt form is administered as compared the amount of zoledronic acid in the diacid form that would be administered in order to achieve the same plasma levels of zoledronic acid.

Embodiment 131. The method of embodiment 129, wherein the disodium salt form is administered in an amount, on a molar basis, that has a value of about $0.8n_d$ to about $1.2n_d$, wherein:

$$n_d = (b_a/b_d)(n_a)$$

wherein b_a is the bioavailability of the diacid form, b_d is the bioavailability of the disodium salt form, and n_a is the number of moles of zoledronic acid in the diacid form that would be administered in order to achieve the same plasma levels of zoledronic acid.

Embodiment 132. The method of embodiment 131, wherein the disodium salt is administered in an amount that has a value of about n_d.

Embodiment 133. The method of any of embodiments 120-132, wherein the zoledronic acid is used to treat an inflammatory condition.

Embodiment 134. The method of embodiment 133, wherein the zoledronic acid is used to treat arthritis.

Embodiment 135. The method of embodiment 133, wherein the zoledronic acid is used to treat complex regional pain syndrome.

Embodiment 136. The method of any of embodiments 1-39, 62-77, and 120-135, wherein:

a first oral dosage form is administered; and

a second oral dosage form is administered;

wherein, with respect to the first oral dosage form, the second oral dosage form is administered at 10 x T_{max} or greater, wherein T_{max} is the time of maximum plasma concentration for the first oral dosage form.

Embodiment 137. A dosage form comprising zoledronic acid in the disodium salt form, wherein the bioavailability, in a mammal, of zoledronic acid in the disodium salt form is greater than the bioavailability of zoledronic acid in the diacid form would be in the same dosage form.

Embodiment 138. A dosage form comprising zoledronic acid in the disodium salt form, wherein the dosage form contains an amount of zoledronic acid in the disodium salt form that provides an area under the plasma concentration curve of zoledronic acid of about 4 ng•h/mL to about 2000 ng•h/mL to a human being to which the dosage form is administered.

Embodiment 139. The dosage form of embodiment 138, wherein the dosage form contains an amount of zoledronic acid in the disodium salt form that provides an area under the plasma concentration curve of zoledronic acid of about 100 ng•h/mL to about 2000 ng•h/mL to a human being to which the dosage form is administered.

Embodiment 140. The dosage form of embodiment 138, wherein the dosage form contains an amount of zoledronic acid in the disodium salt form that provides an area under the plasma concentration curve of zoledronic acid of about 20 ng•h/mL to about 700 ng•h/mL to a human being to which the dosage form is administered.

Embodiment 141. The dosage form of embodiment 138, wherein the dosage form contains an amount of zoledronic acid in the disodium salt form that provides an area under the plasma concentration curve of zoledronic acid of about 4 ng•h/mL to about 100 ng•h/mL to a human being to which the dosage form is administered.

Embodiment 142. A dosage form comprising zoledronic acid in the disodium salt form,

wherein the disodium salt form is present in a lower molar amount than would be present if the zoledronic acid were in the diacid form; and

wherein the zoledronic acid in the disodium salt form has an improved bioavailability as compared to the zoledronic acid in the diacid form to the extent that the lower molar amount

of the disodium salt in the dosage form does not reduce the amount of zoledronic acid delivered to the plasma of a mammal.

Embodiment 143. The dosage form of embodiment 137, 138, 139, 140, 141, or 142, wherein the dosage form is a solid.

Embodiment 144. The dosage form of embodiment 142 or 143, wherein the bioavailability of zoledronic acid in the disodium salt form is improved by at least about 10% as compared to an otherwise identical dosage form containing zoledronic acid in the diacid form.

Embodiment 145. The dosage form of embodiment 142, 143, or 144, containing at least about 20 mole% less of the disodium salt form as compared to the amount of the zoledronic acid in the diacid form that would be present if the zoledronic acid were in the diacid form.

Embodiment 146. The dosage form of embodiment 142, wherein the disodium salt form is present in an amount, on a molar basis, that has a value of about 0.9nd to about 1.1nd, wherein:

$$n_d = (b_a/b_d)(n_a)$$

wherein b_a is the bioavailability of the diacid form, b_d is the bioavailability of the disodium salt form, and n_a is the number of moles of the diacid form that would be present if the zoledronic acid were in the diacid form.

Embodiment 147. The dosage form of embodiment 146, wherein the disodium salt is administered in an amount that has a value of about n_d.

Embodiment 148. The method of any of embodiments 1-39, 62-77, and 120-136, wherein:

only a single oral dosage form is administered; or

a first oral dosage form is administered, and a second oral dosage form is administered after the first oral dosage form, wherein the second oral dosage form is administered before the maximum pain relieving effect of the first oral dosage form is achieved, or the second oral dosage form is administered before an observable pain relieving effect is achieved.

Embodiment 149. The method of embodiment 148, wherein the second oral dosage form is administered before an observable pain relieving effect is achieved.

Embodiment 150. The method of any of embodiments 1-39, 62-77, and 120-132, wherein a first dosage form is administered, followed by administration of a second dosage form, wherein the second dosage form is administered after the maximum pain relieving effect

of the first oral dosage form is achieved, and the second oral dosage form is administered while a pain relieving effect from the first oral dosage form is observable.

Embodiment 151. The method of embodiment 148, 149, or 150, wherein the second oral dosage form is administered about 24 hours to about 28 days after the first oral dosage form is administered.

Embodiment 152. The method of any of embodiments 20-39, wherein the human being is about 30 years old to about 75 years old.

Embodiment 153. The method of any of embodiments 20-39, wherein the human being is about 1 year old to about 16 years old.

Embodiment 154. The method of any of embodiments 20-39, wherein the human being is about 80 years old to about 95 years old.

Embodiment 155. The method of any of embodiments 20-39, wherein the human being has suffered from the arthritis for at least 2 months.

Embodiment 156. The method of any of embodiments 20-39, wherein the arthritis affects, a knee, an elbow, a wrist, a shoulder, or a hip.

Embodiment 157. The method of any of embodiments 1-44, 62-133, and 144-156, wherein the mammal or human being to which the zoledronic acid is administered does not eat food or drink beverage for at least 1 hour before the zoledronic acid is administered.

Embodiment 158. The method of embodiment 157, wherein the mammal or human being to which the zoledronic acid is administered does not eat food or drink beverage for at least 2 hours before the zoledronic acid is administered.

Embodiment 159. The method of embodiment 158, wherein the mammal or human being to which the zoledronic acid is administered does not eat food or drink beverage for at least 4 hours before the zoledronic acid is administered.

Embodiment 160. The method of embodiment 159, wherein the mammal or human being to which the zoledronic acid is administered does not eat food or drink beverage for at least 6 hours before the zoledronic acid is administered.

Embodiment 161. The method of any of embodiments 157-160, wherein the mammal or human being to which the zoledronic acid is administered does not eat food or drink beverage for at least 30 minutes after the zoledronic acid is administered.

Embodiment 162. The method of embodiment 161, wherein the mammal or human being to which the zoledronic acid is administered does not eat food or drink beverage for at least 1 hour after the zoledronic acid is administered.

Embodiment 163. The method of embodiment 161, where in the mammal or human being to which the zoledronic acid is administered does not eat food or drink beverage for at least 2 hours after the zoledronic acid is administered.

Embodiment 164. The method, dosage form, or product, of any preceding embodiment, wherein the zoledronic acid in the oral dosage form has a 24 hour sustained plasma level factor of about 1 or higher.

Embodiment 165. The method, dosage form, or product, of any preceding embodiment, wherein the zoledronic acid in the oral dosage form has a 24 hour sustained plasma level factor that is higher than that of intravenously administered zoledronic acid.

Embodiment 166. The method, dosage form, or product, of any preceding embodiment, wherein the oral dosage form is a solid that has a hardness of about 5 kPa to about 20 kPa.

Embodiment 167. A method of treating bone marrow lesions comprising: selecting a patient having a bone marrow lesion and OARSI grade 0 of joint space narrowing, and administering an inhibitor of osteoclast activity to the patient for the treatment of the bone marrow lesion.

Embodiment 168. The method of embodiment 167, wherein the inhibitor of osteoclast activity is administered at least twice.

Embodiment 169. The method of embodiment 167, wherein the inhibitor of osteoclast activity is administered about every three months, or more frequently.

Embodiment 170. The method of embodiment 167, wherein the inhibitor of osteoclast activity comprises a nitrogen-containing bisphosphonate.

Embodiment 171. The method of any one of embodiments 167-170, wherein the inhibitor of osteoclast activity is or comprises zoledronic acid.

Embodiment 172. The method of any one of embodiments 167-170, wherein the inhibitor of osteoclast activity is or comprises pamidronic acid.

Embodiment 173. The method of any one of embodiments 167-170, wherein the inhibitor of osteoclast activity is or comprises neridronic acid.

Embodiment 174. The method of any one of embodiments 167-170, wherein the inhibitor of osteoclast activity is or comprises olpadronic acid.

Embodiment 175. The method of any one of embodiments 167-170, wherein the inhibitor of osteoclast activity is or comprises alendronic acid.

Embodiment 176. The method of any one of embodiments 167-170, wherein the inhibitor of osteoclast activity is or comprises incadronic acid.

Embodiment 177. The method of any one of embodiments 167-170, wherein the inhibitor of osteoclast activity is or comprises ibandronic acid.

Embodiment 178. The method of any one of embodiments 167-170, wherein the inhibitor of osteoclast activity is or comprises risedronic acid.

Embodiment 179. The method of any one of embodiments 167-178, wherein the inhibitor of osteoclast activity is administered orally.

Embodiment 180. The method of any one of embodiments 167-178, wherein the inhibitor of osteoclast activity is administered intravenously.

Embodiment 181. The method of any one of embodiments 167-180, wherein the patient experiences a reduction in bone marrow lesion size that is at least about 100% greater than a reduction in bone marrow lesion size achieved with a placebo.

Embodiment 182. The method of any one of embodiments 167-180, wherein the patient experiences a reduction in bone marrow lesion size that is at least about 150% greater than a reduction in bone marrow lesion size achieved with a placebo.

Embodiment 183. The method of any one of embodiments 167-182, wherein the inhibitor of osteoclast activity is administered at least twice over a period of at least four weeks.

Embodiment 184. The method of any one of embodiments 167-183, wherein the inhibitor of osteoclast activity is administered once weekly for a period of six weeks.

Embodiment 185. The method of any one of embodiments 167-184, wherein the inhibitor of osteoclast activity comprises zoledronic acid, and the weekly dose is between about 25 mg and about 75 mg.

Embodiment 186. A method of treating knee pain comprising: selecting a patient having knee pain and OARSI grade 0 of joint space narrowing, and administering an inhibitor of osteoclast activity to the patient for the treatment of the knee pain.

Embodiment 187. The method of embodiment 186, wherein the inhibitor of osteoclast activity is administered at least twice.

Embodiment 188. The method of any one of embodiments 186-187, wherein the inhibitor of osteoclast activity is administered about every three months, or more frequently.

Embodiment 189. The method of any one of embodiments 186-188, wherein the inhibitor of osteoclast activity comprises a nitrogen-containing bisphosphonate.

Embodiment 190. The method of any one of embodiments 186-189, wherein the patient experiences pain relief three months after administration of the inhibitor of osteoclast activity.

Embodiment 191. The method of any one of embodiments 186-190, wherein the inhibitor of osteoclast activity is or comprises zoledronic acid.

Embodiment 192. The method of any one of embodiments 186-190, wherein the inhibitor of osteoclast activity is or comprises pamidronic acid.

Embodiment 193. The method of any one of embodiments 186-190, wherein the inhibitor of osteoclast activity is or comprises neridronic acid.

Embodiment 194. The method of any one of embodiments 186-190, wherein the inhibitor of osteoclast activity is or comprises olpadronic acid.

Embodiment 195. The method of any one of embodiments 186-190, wherein the inhibitor of osteoclast activity is or comprises alendronic acid.

Embodiment 196. The method of any one of embodiments 186-190, wherein the inhibitor of osteoclast activity is or comprises incadronic acid.

Embodiment 197. The method of any one of embodiments 186-190, wherein the inhibitor of osteoclast activity is or comprises ibandronic acid.

Embodiment 198. The method of any one of embodiments 186-190, wherein the inhibitor of osteoclast activity is or comprises risedronic acid.

Embodiment 199. The method of any one of embodiments 186-198, wherein the patient experiences a reduction in pain intensity—when using a 100 mm visual analog scale—of at least about 20.

Embodiment 200. A method of treating a bone marrow lesion of the knee comprising: selecting a patient having a bone marrow lesion of the knee and OARSI Grade 0 or Kellgren and Lawrence Grade 0 or Grade 1 of joint space narrowing, and administering an inhibitor of osteoclast activity to the patient for the treatment of the bone marrow lesion.

Embodiment 201. The method of embodiment 200, wherein the inhibitor of osteoclast activity is administered at least twice.

Embodiment 202. The method of embodiment 201, wherein the inhibitor of osteoclast activity is administered about every three months, or more frequently.

Embodiment 203. The method of embodiment 200, wherein the inhibitor of osteoclast activity comprises a nitrogen-containing bisphosphonate.

Embodiment 204. The method of embodiment 203, wherein the inhibitor of osteoclast activity is zoledronic acid.

Embodiment 205. The method of embodiment 203, wherein the inhibitor of osteoclast activity is pamidronic acid.

Embodiment 206. The method of embodiment 203, wherein the inhibitor of osteoclast activity is neridronic acid.

Embodiment 207. The method of embodiment 203, wherein the inhibitor of osteoclast activity is olpadronic acid.

Embodiment 208. The method of embodiment 203, wherein the inhibitor of osteoclast activity is minodronic acid.

Embodiment 209. The method of embodiment 203, wherein the inhibitor of osteoclast activity is incadronic acid.

Embodiment 210. The method of embodiment 203, wherein the inhibitor of osteoclast activity is ibandronic acid.

Embodiment 211. The method of embodiment 203, wherein the inhibitor of osteoclast activity is risedronic acid.

Embodiment 212. The method of embodiment 203, wherein the inhibitor of osteoclast activity is alendronic acid.

Embodiment 213. The method of embodiment 200, wherein the inhibitor of osteoclast activity is administered orally.

Embodiment 214. The method of embodiment 200, wherein the inhibitor of osteoclast activity is administered intravenously.

Embodiment 215. The method of embodiment 200, wherein the patient experiences a reduction in bone marrow lesion size that is at least about 15% within about 6 months after the inhibitor of osteoclast activity is administered to the patient.

Embodiment 216. The method of embodiment 200, wherein the patient experiences a reduction in bone marrow lesion size that is at least about 25% within about 6 months after the inhibitor of osteoclast activity is administered to the patient.

Embodiment 217. The method of embodiment 201, wherein the inhibitor of osteoclast activity is administered at least twice over a period of at least four weeks.

Embodiment 218. The method of embodiment 201, wherein the inhibitor of osteoclast activity is administered once weekly for a period of six weeks.

Embodiment 219. The method of embodiment 218, wherein the inhibitor of osteoclast activity comprises zoledronic acid, and the weekly dose is between about 25 mg and about 75 mg.

Embodiment 220. A method of treating knee pain comprising:

a. selecting a patient having knee pain, and:
   i. OARSI Grade 0 or Kellgren and Lawrence Grade 0 or Grade 1 of joint space narrowing, or
   ii. pain intensity of 5 or greater measured using the 0-10 NRS or 5 cm or greater using the 10 cm VAS; and
b. administering an inhibitor of osteoclast activity to the patient.

Embodiment 221. The method of embodiment 220, comprising selecting a patient having OARSI Grade 0 or Kellgren and Lawrence Grade 0 or Grade 1 of joint space narrowing.

Embodiment 222. The method of embodiment 220 or 221, comprising selecting a patient having pain intensity of 5 or greater measured using the 0-10 NRS or 5 cm or greater using the 10 cm VAS.

Embodiment 223. The method of embodiment 220, wherein the inhibitor of osteoclast activity is administered at least twice.

Embodiment 224. The method of embodiment 223, wherein the inhibitor of osteoclast activity is administered about every three months, or more frequently.

Embodiment 225. The method of embodiment 220, wherein the inhibitor of osteoclast activity comprises a nitrogen-containing bisphosphonate.

Embodiment 226. The method of embodiment 220, wherein the patient experiences pain relief within about three months after the inhibitor of osteoclast activity is administered to the patient.

Embodiment 227. The method of embodiment 226, wherein the patient experiences pain relief at least 24 hours after the inhibitor of osteoclast activity is administered to the patient.

Embodiment 228. The method of embodiment 220, wherein the inhibitor of osteoclast activity is zoledronic acid.

Embodiment 229. The method of embodiment 220, wherein the inhibitor of osteoclast activity is minodronic acid.

Embodiment 230. The method of embodiment 220, wherein the inhibitor of osteoclast activity is neridronic acid.

Embodiment 231. The method of embodiment 220, wherein the inhibitor of osteoclast activity is olpadronic acid.

Embodiment 232. The method of embodiment 220, wherein the inhibitor of osteoclast activity is alendronic acid.

Embodiment 233. The method of embodiment 220, wherein the inhibitor of osteoclast activity is incadronic acid.

Embodiment 234. The method of embodiment 220, wherein the inhibitor of osteoclast activity is ibandronic acid.

Embodiment 235. The method of embodiment 220, wherein the inhibitor of osteoclast activity is risedronic acid.

Embodiment 236. The method of embodiment 220, wherein the patient experiences a reduction in pain intensity—when using a 100 mm visual analog scale—of at least about 5.

Embodiment 237. The method of embodiment 220, wherein the inhibitor of osteoclast activity is administered at least twice over a period of at least four weeks.

Embodiment 238. The method of embodiment 220, wherein the inhibitor of osteoclast activity is administered once weekly for a period of six weeks.

Embodiment 239. The method of embodiment 238, wherein the inhibitor of osteoclast activity comprises zoledronic acid, and the weekly dose is between about 25 mg and about 75 mg.

Embodiment 240. A method of treating moderate to severe knee pain comprising administering an inhibitor of osteoclast activity to a person suffering from moderate to severe knee pain.

Embodiment 241. The method of embodiment 240, wherein the person suffering from moderate to severe knee pain has a normal joint space in the knee.

Embodiment 242. The method of embodiment 240, wherein the inhibitor of osteoclast activity is administered at least twice.

Embodiment 243. The method of embodiment 240, wherein the inhibitor of osteoclast activity is administered about every three months, or more frequently.

Embodiment 244. The method of embodiment 240, wherein the inhibitor of osteoclast activity comprises a nitrogen-containing bisphosphonate.

Embodiment 245. The method of embodiment 240, wherein the patient experiences pain relief within about three months after the inhibitor of osteoclast activity is administered to the patient.

Embodiment 246. The method of embodiment 245, wherein the patient experiences pain relief at least 24 hours after the inhibitor of osteoclast activity is administered to the patient.

Embodiment 247. The method of embodiment 240, wherein the inhibitor of osteoclast activity is zoledronic acid.

Embodiment 248. The method of embodiment 240, wherein the inhibitor of osteoclast activity is minodronic acid.

Embodiment 249. The method of embodiment 240, wherein the inhibitor of osteoclast activity is neridronic acid.

Embodiment 250. The method of embodiment 240, wherein the inhibitor of osteoclast activity is olpadronic acid.

Embodiment 251. The method of embodiment 240, wherein the inhibitor of osteoclast activity is alendronic acid.

Embodiment 252. The method of embodiment 240, wherein the inhibitor of osteoclast activity is incadronic acid.

Embodiment 253. The method of embodiment 240, wherein the inhibitor of osteoclast activity is ibandronic acid.

Embodiment 254. The method of embodiment 240, wherein the inhibitor of osteoclast activity is risedronic acid.

Embodiment 255. The method of embodiment 240, wherein the patient experiences a reduction in pain intensity—when using a 100 mm visual analog scale—of at least about 5.

Embodiment 256. The method of embodiment 240, wherein the inhibitor of osteoclast activity is administered at least twice over a period of at least four weeks.

Embodiment 257. The method of embodiment 240, wherein the inhibitor of osteoclast activity is administered once weekly for a period of six weeks.

Embodiment 258. The method of embodiment 257, wherein the inhibitor of osteoclast activity comprises zoledronic acid, and the weekly dose is between about 25 mg and about 75 mg.

Embodiment 259. A method of safely delivering zoledronic acid to the blood of a mammal through repeated oral administration comprising:

orally administering about 0.4 mg/kg to about 4 mg/kg of zoledronic acid to the mammal no more frequently than once a day and more frequently than once a week; or

orally administering about 0.4 mg/kg to about 10 mg/kg to the mammal once a week, or less frequently.

Embodiment 260. The method of any preceding embodiment, such as embodiment 259, wherein about 0.5 mg/kg to about 2 mg/kg is orally administered to the mammal daily.

Embodiment 261. The method of any preceding embodiment, such as embodiment 260, wherein about 0.6 mg/kg to about 0.9 mg/kg is orally administered to the mammal daily.

Embodiment 262. The method of any preceding embodiment, such as embodiment 259, wherein about 0.5 mg/kg to about 2 mg/kg is orally administered to the mammal weekly.

Embodiment 263. The method of any preceding embodiment, such as embodiment 263, wherein about 0.6 mg/kg to about 0.9 mg/kg is orally administered to the mammal weekly.

Embodiment 264. The method of any preceding embodiment, such as embodiment 259, 260, 261, 262, or 263, wherein zoledronic acid is orally administered about 3 to about 10 times.

Embodiment 265. The method of any preceding embodiment, such as embodiment 259, 260, 261, 262, 263, or 264, wherein zoledronic acid is orally administered in a dosage form comprising more than about 10% zoledronic acid by weight.

Embodiment 266. The method of any preceding embodiment, such as embodiment 259, 260, 261, 262, 263, 264, or 265, wherein zoledronic acid is administered in a manner and amount that results in the mammal having an AUC_{0-24} of zoledronic acid that is about 50 ng•h/mL to about 500 ng•h/mL with each administration of zoledronic acid.

Embodiment 267. The method of any preceding embodiment, such as embodiment 266, wherein zoledronic acid is administered in a manner and amount that results in the mammal having an AUC_{0-24} of zoledronic acid that is about 100 ng•h/mL to about 500 ng•h/mL with each administration of zoledronic acid.

Embodiment 268. A method of preparing an oral dosage form that is safe for repeated administration to a mammal comprising combining zoledronic acid with an excipient that is pharmaceutically acceptable to the mammal, wherein the amount of zoledronic acid that is combined with the excipient is such that zoledronic acid is present in the oral dosage form in an amount that is 0.4 mg/kg to about 10 mg/kg based upon the weight of the mammal.

Embodiment 269. The method of any preceding embodiment, such as embodiment 268, wherein the amount of zoledronic acid that is combined with the excipient is such that the oral dosage form comprises more than about 10% zoledronic acid by weight.

Embodiment 270. The method of any preceding embodiment, such as embodiment 268 or 269, wherein the amount of zoledronic acid that is combined with the excipient is such that zoledronic acid is present in the oral dosage form in an amount that is 0.4 mg/kg to about 3 mg/kg based upon the weight of the mammal.

Embodiment 271. The method of any preceding embodiment, such as embodiment 270, wherein the amount of zoledronic acid that is combined with the excipient is such that zoledronic acid is present in the oral dosage form in an amount that is 0.4 mg/kg to about 1.5 mg/kg based upon the weight of the mammal.

Embodiment 272. The method of any preceding embodiment, such as embodiment 270, wherein the amount of zoledronic acid that is combined with the excipient is such that zoledronic acid is present in the oral dosage form in an amount that is 0.6 mg/kg to about 0.9 mg/kg based upon the weight of the mammal.

Embodiment 273. The method of any preceding embodiment, such as embodiment 268, 269, 270, 271, or 272, wherein the oral dosage form is safe for once daily administration of the oral dosage form for about 3 to about 10 days.

Embodiment 274. The method of any preceding embodiment, such as embodiment 268, 269, 270, 271, or 272, wherein the oral dosage form is safe for once weekly administration of the oral dosage form for about 3 to about 10 weeks.

Embodiment 275. A method of safely delivering zoledronic acid to the blood of a mammal through repeated oral administration comprising:

orally administering about 0.05 mg/kg to about 4 mg/kg of zoledronic acid to the mammal no more frequently than once a day and more frequently than once a week; or

orally administering about 0.1 mg/kg to about 10 mg/kg to the mammal once a week, or less frequently

wherein zoledronic acid is orally administered at least 5 times.

Embodiment 276. The method of any preceding embodiment, such as embodiment 275, wherein zoledronic acid is orally administered about 5 to about 10 times.

Embodiment 277. The method of any preceding embodiment, such as embodiment 275 or 276, wherein zoledronic acid is orally administered in a dosage form comprising more than about 10% zoledronic acid by weight.

Embodiment 278. The method of any preceding embodiment, such as embodiment 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, or 277, wherein the mammal is a human being.

Embodiment 279. The method of any preceding embodiment, such as embodiment 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, or 278, wherein about 50 mg to about 350 mg of oral zoledronic acid is administered to the mammal per month.

Embodiment 280. An oral dosage form prepared by the method of any preceding embodiment, such as embodiment 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, or 279.

Embodiment 281. An oral dosage form prepared by the method of any preceding embodiment, wherein an osteoclast inhibitor, including a bisphosphonate, such as zoledronic acid, neridronic acid, etc., is in a dosage form containing one of, or a combination of, the ingredients in the Table E.

Embodiment 282. A molecular complex comprising zoledronic acid or neridronic acid in an acid or a salt form.

Embodiment 283. The molecular complex of Embodiment 282, further comprising a basic or a salt form of a) an amine, b) an amide, or c) ammonium.

Embodiment 284. The molecular complex of Embodiment 283, wherein the molecular complex comprises ammonia in a salt form.

Embodiment 285. The molecular complex of Embodiment 283, wherein the amine is an amino acid.

Embodiment 286. The molecular complex of Embodiment 285, wherein the amino acid is a lysine.

Embodiment 287. The molecular complex of Embodiment 285, wherein the amino acid is L-lysine.

Embodiment 288. The molecular complex of Embodiment 285, wherein the amino acid is D-lysine.

Embodiment 289. The molecular complex of Embodiment 285, wherein the amino acid is DL-lysine.

Embodiment 290. The molecular complex of Embodiment 285, wherein the amino acid is a glycine.

Embodiment 291. The molecular complex of Embodiment 285, wherein the amino acid is L-glycine.

Embodiment 292. The molecular complex of Embodiment 285, wherein the amino acid is D-glycine.

Embodiment 293. The molecular complex of Embodiment 285, wherein the amino acid is DL-glycine.

Embodiment 294. The molecular complex of Embodiment 283, wherein the amide is nicotinamide.

Embodiment 295. The molecular complex of Embodiment 283, wherein the amine is adenine.

Embodiment 296. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is alanine.

Embodiment 297. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is arginine.

Embodiment 298. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is asparagine.

Embodiment 299. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is aspartic acid.

Embodiment 300. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is cysteine.

Embodiment 301. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is glutamic acid.

Embodiment 302. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is glutamine.

Embodiment 303. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is histidine.

Embodiment 304. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is isoleucine.

Embodiment 305. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is leucine.

Embodiment 306. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is methionine.

Embodiment 307. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is phenylalanine.

Embodiment 308. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is proline.

Embodiment 309. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is serine.

Embodiment 310. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is threonine.

Embodiment 311. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is tryptophan.

Embodiment 312. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is tyrosine.

Embodiment 313. The molecular complex of Embodiment 285, wherein the amino acid (including the DL-mixture, a D-enantiomer, or an L-enantiomer) is valine.

Embodiment 314. A dosage form comprising the molecular complex of Embodiment 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, or 313.

Embodiment 315. The dosage form of Embodiment 314, which is an oral dosage form.

Embodiment 316. A method of treating pain, a musculoskeletal condition, or a condition related to bone or joint comprising administering a dosage form of Embodiment 314 or 315 to a mammal in need thereof.

Embodiment 317. The method of Embodiment 316, wherein the mammal is a human being.

Embodiment 318. The method of Embodiment 316 or 317, comprising treating acute pain, central pain, radio-therapy or chemo-therapy associated neuropathy, ankylosing spondylitis, arthritis, axial spondyloarthritis, blood cancers, bone fracture, bone metastases from solid tumors, bone metastasis, breast cancer, cancer, central multiple sclerosis pain, Charcot's foot, chronic pain, complex regional pain syndrome, diabetic peripheral neuropathy, erosive osteoarthritis, excessive bone resorption, fibrous dysplasia, giant cell tumor of bone, HIV-associated neuropathy, hypercalcemia of malignancy, inflammatory pain, juvenile rheumatoid arthritis, leukemias, low back pain, lumbar nerve root compression, lumbosacral pain, lung cancer, metastatic bone cancer, monoradiculopathies, multiple myeloma, musculoskeletal pain, neuropathic arthropaties, neuropathic pain, non-articular rheumatism, osteoarthritis, osteogenesis imperfecta, osteoporosis, Paget's disease, Paget's disease of bone, peri-articular disorders, phantom limb pain, post-herpetic neuralgia, postoperative pain, post-stroke pain, prostate cancer, rheumatoid arthritis, SAPHO syndrome, sero-negative (non-rheumatoid) arthropathies, solid tumors or cancers, spinal cord injury, systemic lupus erythematosus, transient osteoarthritis of the hip, transient osteoporosis, transient osteoporosis of the hip, trigeminal neuralgia, tumor induced hypocalcemia, or vertebral crush fracture.

Embodiment 319. The method of Embodiment 316 or 317, comprising treating arthritis.

Embodiment 320. The method of Embodiment 319, comprising relieving pain associated with arthritis.

Embodiment 321. The method of Embodiment 320, wherein the arthritis affects a knee, an elbow, a wrist, a shoulder, or a hip.

Embodiment 322. The method of Embodiment 321, wherein the arthritis affects a knee.

Embodiment 323. The method of Embodiment 316 or 317, comprising treating musculoskeletal pain.

Embodiment 324. The method of Embodiment 316 or 317, comprising treating a bone marrow lesion.

Embodiment 325. The method of Embodiment 324, wherein the mammal is a human being that experiences a reduction in bone marrow lesion size that is at least about 15% within about 6 months after the inhibitor of osteoclast activity is administered to the human being.

Embodiment 326. The method of Embodiment 324, wherein the mammal is a human being that experiences a reduction in bone marrow lesion size that is at least about 25% within about 6 months after the inhibitor of osteoclast activity is administered to the human being.

Embodiment 327. The method of Embodiment 324, 325, or 326, wherein the bone marrow lesion affects a knee.

Embodiment 328. The method of Embodiment 324, 325, 326, or 327, comprising treating a bone marrow lesion of the knee by selecting a patient having a bone marrow lesion of the knee and OARSI Grade 0 or Kellgren and Lawrence Grade 0 or Grade 1 of joint space narrowing, and administering the dosage form to the patient for the treatment of the bone marrow lesion.

Embodiment 329. The method of Embodiment 316 or 317, comprising treating osteoarthritis.

Embodiment 330. The method of Embodiment 329, wherein the osteoarthritis affects a knee.

Embodiment 331. The method of Embodiment 329 or 330, comprising treating an osteolytic lesion associated with osteoarthritis.

Embodiment 332. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, or 331, comprising treating knee pain.

Embodiment 333. The method of Embodiment 332, comprising treating moderate to severe knee pain.

Embodiment 334. The method of Embodiment 332 or 333, wherein the mammal is a human being that has a normal joint space in the knee.

Embodiment 335. The method of Embodiment 332, comprising treating knee pain by:

1) selecting a patient having knee pain, and:
   a. OARSI Grade 0 or Kellgren and Lawrence Grade 0 or Grade 1 of joint space narrowing, or
   b. pain intensity of 5 or greater measured using the 0-10 NRS, or 5 cm or greater using the 10 cm VAS; and
2) administering the dosage form to the patient.

Embodiment 336. The method of Embodiment 335, comprising selecting a patient having OARSI Grade 0 or Kellgren and Lawrence Grade 0 or Grade 1 of joint space narrowing.

Embodiment 337. The method of Embodiment 335, comprising selecting a patient having pain intensity of 5 or greater measured using the 0-10 NRS, or 5 cm or greater using the 10 cm VAS.

Embodiment 338. The method of Embodiment 335, 336, or 337, wherein the patient experiences a reduction in pain intensity—when using a 100 mm visual analog scale—of at least about 5 mm.

Embodiment 339. The method of Embodiment 316 or 317, comprising treating musculoskeletal pain.

Embodiment 340. The method of Embodiment 316 or 317, comprising treating inflammatory pain.

Embodiment 341. The method of Embodiment 316 or 317, comprising treating back pain.

Embodiment 342. The method of Embodiment 341, wherein the back pain comprises low back pain.

Embodiment 343. The method of Embodiment342, wherein the low back pain is related to a vertebral change.

Embodiment 344. The method of Embodiment 316 or 317, comprising treating type 1 Modic changes, or type 1 and type 2 Modic changes.

Embodiment 345. The method of Embodiment 344, wherein the Modic change is located at C1/2, C2/3, C3/4, C4/5, C5/6, or C6/7.

Embodiment 346. The method of Embodiment 344, wherein the Modic change is located at C7/T1, T1/2, T2/3, T3/4, T4/5, T5/6, T6/7, T7/8, T8/9, T9/10, T10/11, or T11/12.

Embodiment 347. The method of Embodiment 344, wherein the Modic change is located at T12/L1, L1/2, L2/3, L3/4, L4/5, or L5/S1.

Embodiment 348. The method of Embodiment 316 or 317, comprising treating pain in an extremity.

Embodiment 349. The method of Embodiment 316 or 317, comprising treating joint pain.

Embodiment 350. The method of Embodiment 316 or 317, comprising treating muscle pain.

Embodiment 351. The method of Embodiment 316 or 317, comprising treating neuropathic pain.

Embodiment 352. The method of Embodiment 316 or 317, comprising treating complex regional pain syndrome.

Embodiment 353. The method of Embodiment 352, wherein the complex regional pain syndrome is complex regional pain syndrome type I.

Embodiment 354. The method of Embodiment 352, wherein the complex regional pain syndrome is complex regional pain syndrome type II.

Embodiment 355. The method of Embodiment 316 or 317, comprising treating Paget's disease of bone.

Embodiment 356. The method of Embodiment 316 or 317, comprising treating multiple myeloma.

Embodiment 357. The method of Embodiment 316 or 317, comprising treating ankylosing spondylitis.

Embodiment 358. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, or 357, wherein the dosage form is administered about every three months, or more frequently.

Embodiment 359. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, or 358, wherein the mammal experiences pain relief at least 24 hours after the dosage form is administered to the mammal.

Embodiment 360. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, or 359, wherein the mammal experiences pain relief three months after the dosage form is administered.

Embodiment 361. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, or 360, wherein the human being experiences pain relief that lasts for a duration of at least 48 hours after administration of the dosage form.

Embodiment 362. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, or 361, wherein the human being receives the dosage form no more often than once daily.

Embodiment 363. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, or 361, wherein there is a period of about 24 hours to about 7 days between administration of dosage forms.

Embodiment 364. The method of Embodiment 363, wherein the dosage form is administered weekly.

Embodiment 365. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, or 361, wherein there is a period of about 14 days to about 28 days between administration of dosage forms.

Embodiment 366. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, or 361, wherein there is a period of at least one month between administration of dosage forms.

Embodiment 367. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, or 361, wherein there is a period of about 7 days to about 14 days between administration of dosage forms.

Embodiment 368. The method of Embodiment 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, or 367, wherein the compound is administered more than once.

Embodiment 369. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity and/or CTX serum levels.

Embodiment 370. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 5%.

Embodiment 371. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 10%.

Embodiment 372. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 15%.

Embodiment 373. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 20%.

Embodiment 374. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 25%.

Embodiment 375. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 30%.

Embodiment 376. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 35%.

Embodiment 377. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 40%.

Embodiment 378. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 45%.

Embodiment 379. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 50%.

Embodiment 380. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 55%.

Embodiment 381. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 60%.

Embodiment 382. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at about 60%-70%.

Embodiment 383. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by about 70%-80%.

Embodiment 384. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 70%.

Embodiment 385. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at about 75%.

Embodiment 386. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by about 80%-90%.

Embodiment 387. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 80%.

Embodiment 388. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 85%.

Embodiment 389. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by about 80%-85%.

Embodiment 390. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 90%.

Embodiment 391. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by about 85%-90%.

Embodiment 392. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by about 85%-95%.

Embodiment 393. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by about 90%-95%.

Embodiment 394. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 95%.

Embodiment 395. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 99%.

Embodiment 396. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases osteoclast activity by at least about 100%.

Embodiment 397. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 5%.

Embodiment 398. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 10%.

Embodiment 399. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 15%.

Embodiment 400. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 20%.

Embodiment 401. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 25%.

Embodiment 402. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 30%.

Embodiment 403. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 35%.

Embodiment 404. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 40%.

Embodiment 405. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 45%.

Embodiment 406. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 50%.

Embodiment 407. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 55%.

Embodiment 408. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 60%.

Embodiment 409. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by about 60%-70%.

Embodiment 410. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by about 70%-80%.

Embodiment 411. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by least about 70%.

Embodiment 412. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 75%.

Embodiment 413. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 80%.

Embodiment 414. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 85%.

Embodiment 415. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by about 80%-85%.

Embodiment 416. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 90%.

Embodiment 417. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by about 80%-90%.

Embodiment 418. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by about 85%-90%.

Embodiment 419. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by about 85%-95%.

Embodiment 420. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by about 90%-95%.

Embodiment 421. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 95%.

Embodiment 422. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 99%.

Embodiment 423. The method, composition, molecular complex, dosage form, or product, of any preceding embodiment, wherein zoledronic acid or neridronic acid decreases CTX serum levels by at least about 100%.

Embodiment 424. The method, dosage form, or product, of any preceding embodiment, wherein the zoledronic acid is orally administered in a manner that results in a 24 hour sustained plasma level factor that is at least 1.5 times that of 4 mg of zoledronic acid administered intravenously.

[307] Unless otherwise indicated, all numbers expressing quantities of ingredients, properties such as molecular weight, reaction conditions, and so forth used in the specification and claims are to be understood in all instances as indicating both the exact values as shown and as being modified by the term “about.” Accordingly, unless indicated to the contrary, the numerical parameters set forth in the specification and attached claims are approximations that may vary depending upon the desired properties sought to be obtained. At the very least, and not as an attempt to limit the application of the doctrine of equivalents to the scope of the claims, each numerical parameter should at least be construed in light of the number of reported significant digits and by applying ordinary rounding techniques.

[308] The terms “a,” “an,” “the” and similar referents used in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any

and all examples, or exemplary language (e.g., "such as") provided herein is intended merely to better illuminate the invention and does not pose a limitation on the scope of any claim. No language in the specification should be construed as indicating any non-claimed element essential to the practice of the invention.

[309] Groupings of alternative elements or embodiments disclosed herein are not to be construed as limitations. Each group member may be referred to and claimed individually or in any combination with other members of the group or other elements found herein. It is anticipated that one or more members of a group may be included in, or deleted from, a group for reasons of convenience and/or patentability. When any such inclusion or deletion occurs, the specification is deemed to contain the group as modified thus fulfilling the written description of all Markush groups used in the appended claims.

[310] Certain embodiments are described herein, including the best mode known to the inventors for carrying out the invention. Of course, variations on these described embodiments will become apparent to those of ordinary skill in the art upon reading the foregoing description. The inventor expects skilled artisans to employ such variations as appropriate, and the inventors intend for the invention to be practiced otherwise than specifically described herein. Accordingly, the claims include all modifications and equivalents of the subject matter recited in the claims as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is contemplated unless otherwise indicated herein or otherwise clearly contradicted by context.

[311] In closing, it is to be understood that the embodiments disclosed herein are illustrative of the principles of the claims. Other modifications that may be employed are within the scope of the claims. Thus, by way of example, but not of limitation, alternative embodiments may be utilized in accordance with the teachings herein. Accordingly, the claims are not limited to embodiments precisely as shown and described.

WHAT IS CLAIMED IS:

1. A method of treating allodynia associated with complex regional pain syndrome, comprising parenterally administering neridronic acid in a salt or an acid form to a human being suffering from allodynia associated with complex regional pain syndrome.

2. The method of claim 1, wherein a total of about 200 mg to about 500 mg of the neridronic acid is administered parenterally to the human being.

3. The method of claim 1, wherein a total of about 400 mg of the neridronic acid is administered parenterally to the human being.

4. The method of claim 1, wherein a total of about 100 mg to about 200 mg of the neridronic acid is administered parenterally to the human being within a period of about 1 month.

5. The method of claim 1, wherein a total of about 250 mg of the neridronic acid is administered parenterally to the human being within a period of about 1 month.

6. The method of claim 2, wherein the neridronic acid is administered in divided parenteral doses.

7. The method of claim 6, wherein each division of the divided parenteral doses contains about 10 mg to about 150 mg of the neridronic acid.

8. The method of claim 6, wherein each division of the divided parenteral doses contains about 62 mg to about 63 mg of the neridronic acid.

9. The method of claim 1, wherein the complex regional pain syndrome is associated with an inciting traumatic event.

10. The method of claim 1, wherein the human being has suffered from complex regional pain syndrome for at least 6 months.

11. The method of claim 1, wherein the human being has suffered from complex regional pain syndrome for about 6 months to about 12 months.

12. The method of claim 1, wherein the human being has suffered from complex regional pain syndrome for about 1 year to about 2 years.

13. The method of claim 1, wherein the human being has an age of about 30 years to about 40 years.

14. The method of claim 1, wherein the human being has a pain intensity of at least 7 cm on the 10 cm VAS or at least 7 on the 0-10 NRS.

15. The method of claim 1, wherein the human being has a pain intensity of at least 8 cm on the 10 cm VAS or at least 8 on the 0-10 NRS.

16. The method of claim 1, wherein the human being has a pain intensity of at least 9 cm on the 10 cm VAS or at least 9 on the 0-10 NRS.

17. A method of treating autonomic motor change associated with complex regional pain syndrome (CRPS), comprising administering neridronic acid in a salt form or an acid form to a human being suffering from autonomic motor change associated with CRPS.

18. The method of claim 17, wherein a total of about 200 mg to about 500 mg of the neridronic acid is administered parenterally to the human being.

19. The method of claim 17, wherein a total of about 400 mg of the neridronic acid is administered parenterally to the human being.

20. The method of claim 17, wherein a total of about 100 mg to about 200 mg of the neridronic acid is administered parenterally to the human being within a period of about 1 month.

21. The method of claim 17, wherein a total of about 250 mg of the neridronic acid is administered parenterally to the human being within a period of about 1 month.

22. The method of claim 18, wherein the neridronic acid is administered in divided parenteral doses.

23. The method of claim 22, wherein each divided parenteral dose contains about 10 mg to about 150 mg of the neridronic acid.

24. The method of claim 22, wherein each divided parenteral dose contains about 62 mg to about 63 mg of the neridronic acid.

25. The method of claim 17, wherein the complex regional pain syndrome is associated with an inciting traumatic event.

26. The method of claim 17, wherein the human being has suffered from complex regional pain syndrome for at least 6 months.

27. The method of claim 17, wherein the human being has suffered from complex regional pain syndrome for about 6 months to about 12 months.

28. The method of claim 17, wherein the human being has suffered from complex regional pain syndrome for about 1 year to about 2 years.

29. The method of claim 17, wherein the human being has an age of about 30 years to about 40 years.

30. The method of claim 17, wherein the human being has a pain intensity of at least 8 cm on the 10 cm VAS or at least 8 on the 0-10 NRS.

Neridronic Acid for Treating Complex Regional Pain Syndrome

ABSTRACT

Oral dosage forms of osteoclast inhibitors, such as neridronic acid, in an acid form or a salt form can be used to treat or alleviate pain or related conditions, such as allodynia associated with complex regional pain syndrome.

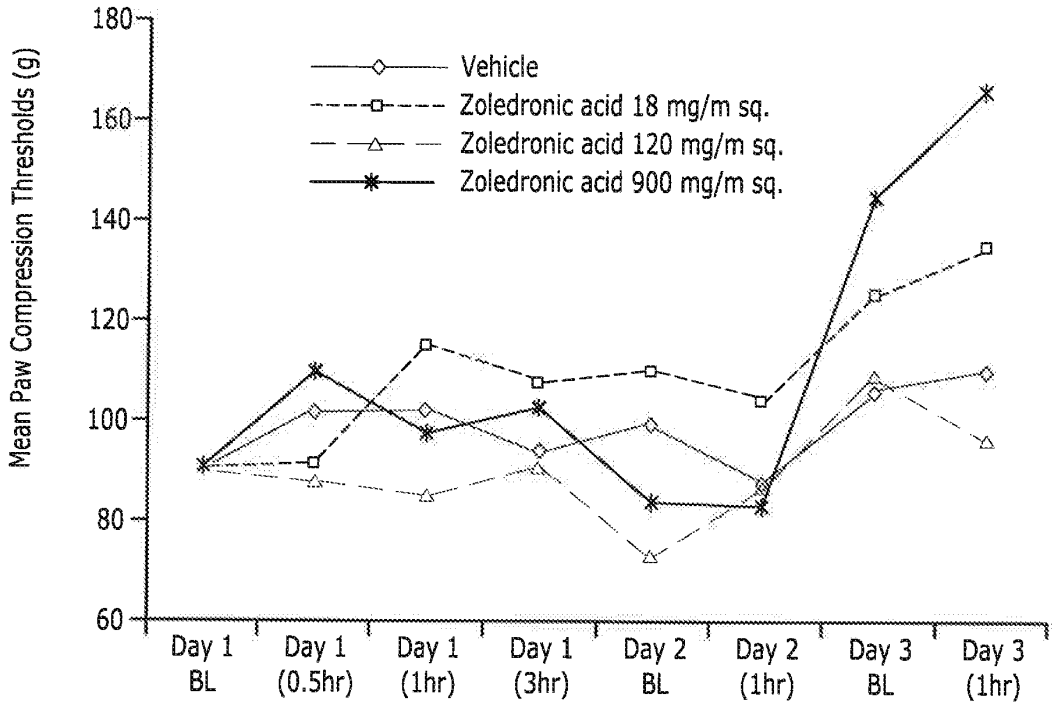

Mean Paw Compression Thresholds (g)
180
160
140
120
100
80
60
Vehicle
Zoledronic acid 18 mg/m sq.
Zoledronic acid 120 mg/m sq.
Zoledronic acid 900 mg/m sq.
Day 1 BL
Day 1 (0.5hr)
Day 1 (1hr)
Day 1 (3hr)
Day 2 BL
Day 2 (1hr)
Day 3 BL
Day 3 (1hr)

FIG. 1

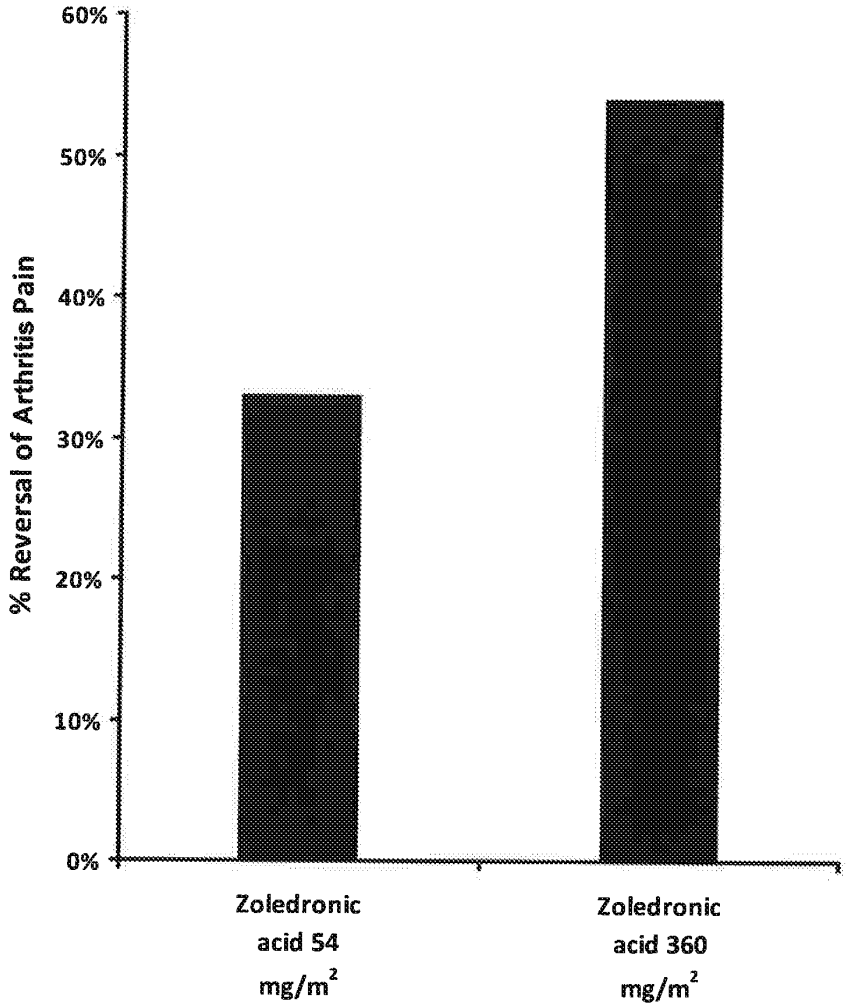

60%
50%
40%
30%
20%
10%
0%
% Reversal of Arthritis Pain
Zoledronic acid 54 mg/m2
Zoledronic acid 360 mg/m2

FIG. 2A

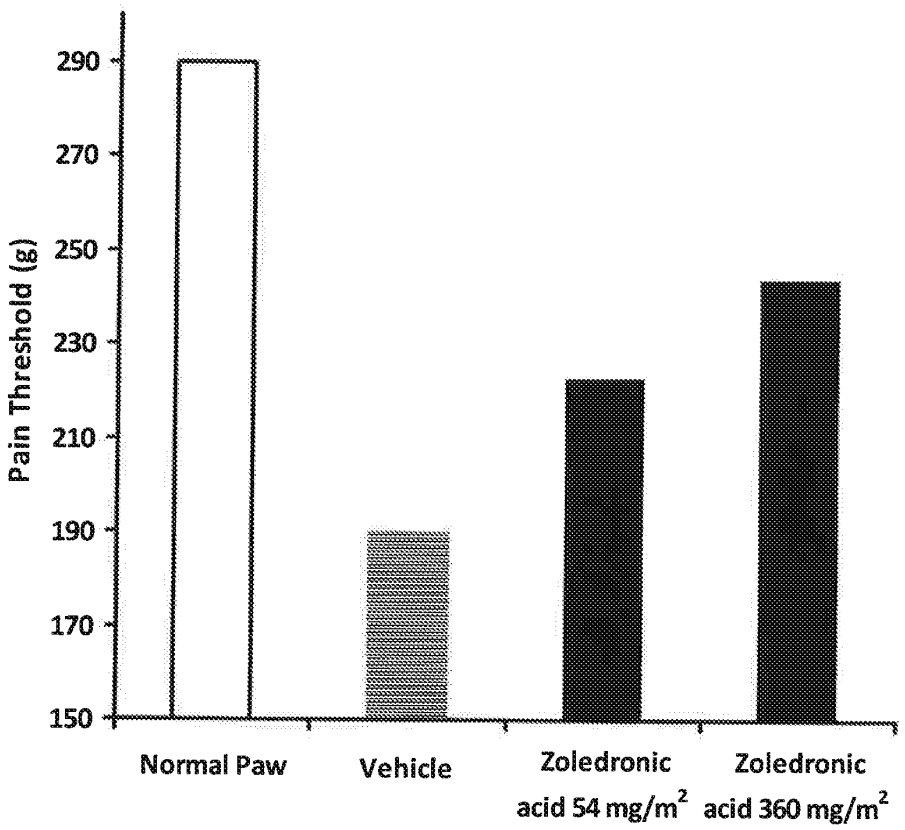

290
270
250
230
210
190
170
150
Pain Threshold (g)
Normal Paw
Vehicle
Zoledronic acid 54 mg/m2
Zoledronic acid 360 mg/m2

FIG. 2B

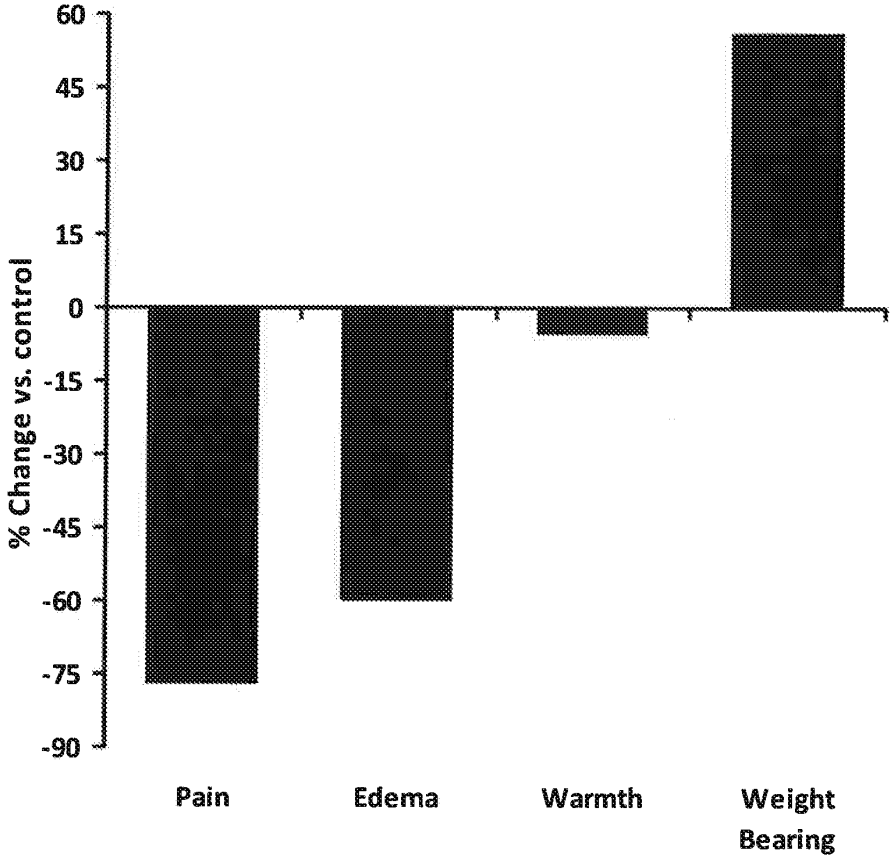

60
45
30
15
0
-15
-30
-45
-60
-75
-90
% Change vs. control
Pain
Edema
Warmth
Weight Bearing

FIG. 3

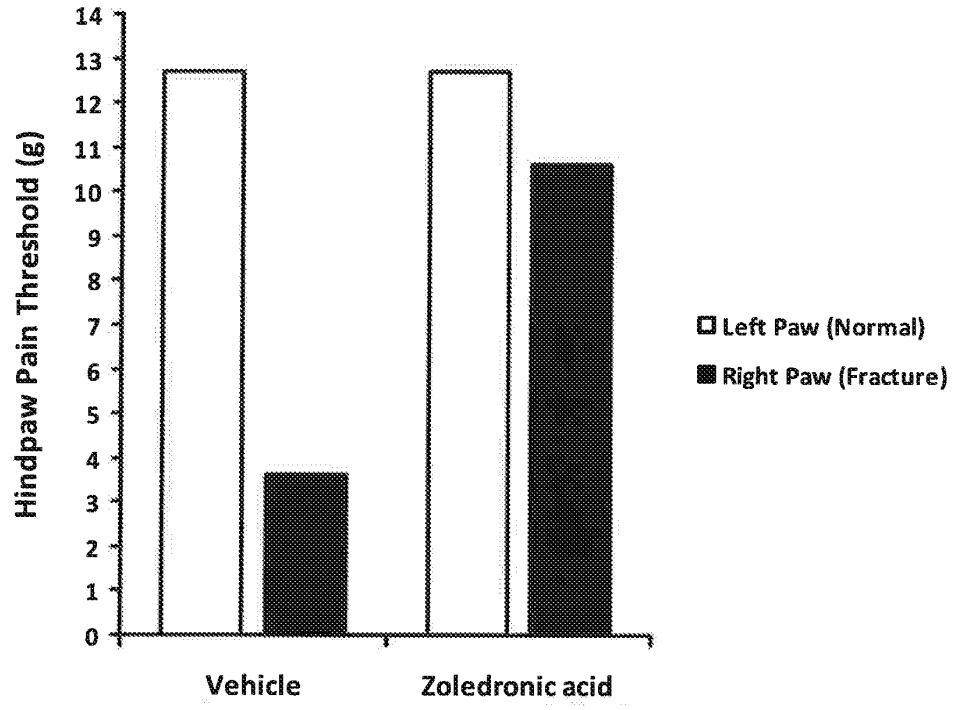

Hindpaw Pain Threshold (g)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Vehicle
Zoledronic acid
Left Paw (Normal)
Right Paw (Fracture)

FIG. 4

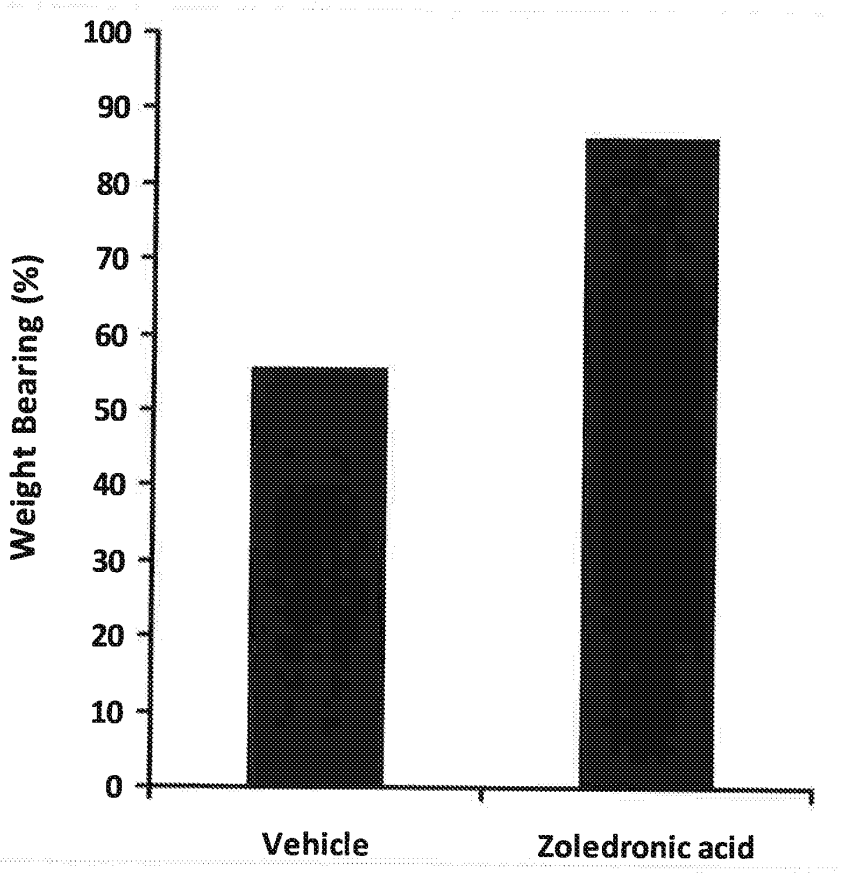

100
90
80
70
60
50
40
30
20
10
0
Weight Bearing (%)
Vehicle
Zoledronic acid

FIG. 5

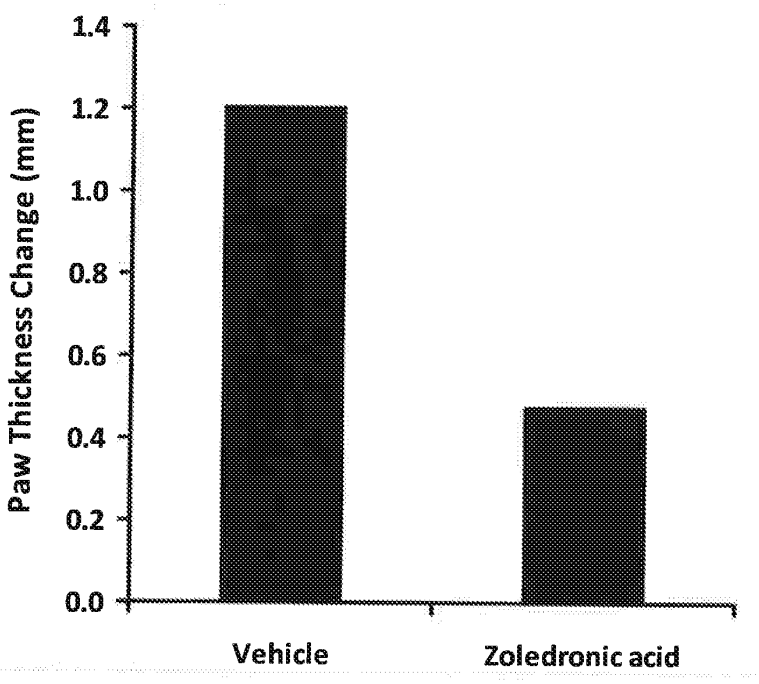

Paw Thickness Change (mm)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Vehicle
Zoledronic acid

FIG. 6

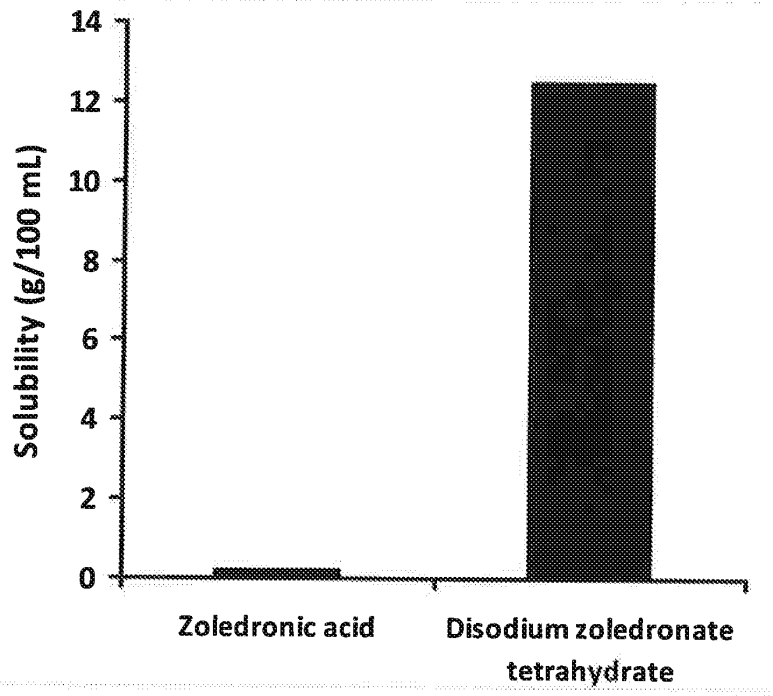

14
12
10
8
6
4
2
0
Solubility (g/100 mL)
Zoledronic acid
Disodium zoledronate tetrahydrate

FIG. 7

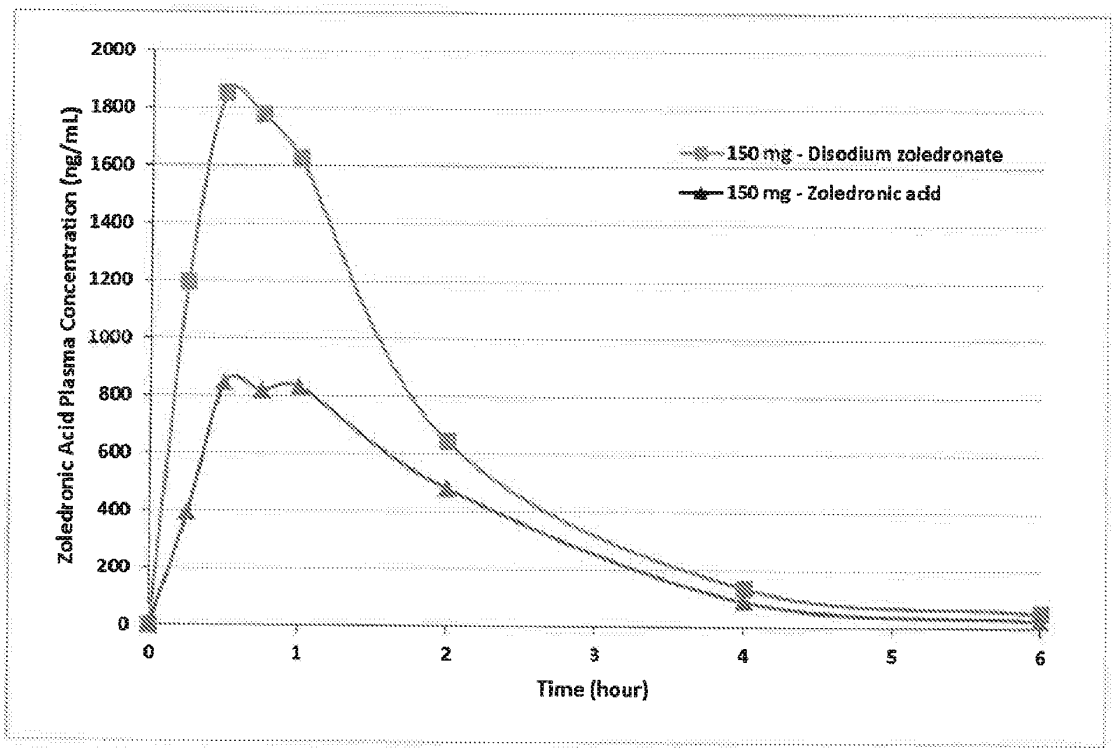

2000
1800
1600
1400
1200
1000
800
600
400
200
0
Zoledronic Acid Plasma Concentration (ng/mL)
0
1
2
3
4
5
6
Time (hour)
150 mg - Disodium zoledronate
150 mg - Zoledronic acid

FIG. 8

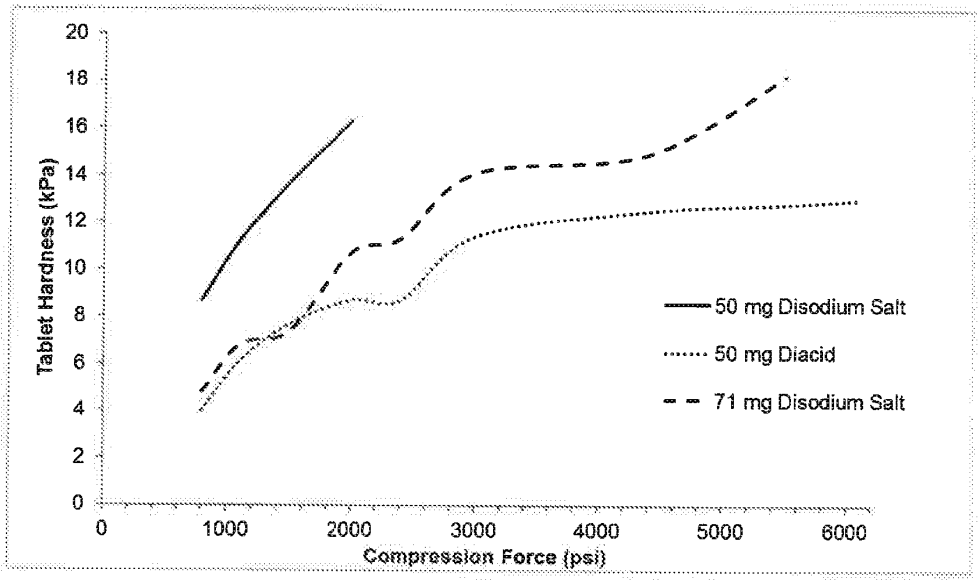

Tablet Hardness (kPa)
20
18
16
14
12
10
8
6
4
2
0
0
1000
2000
3000
4000
5000
6000
Compression Force (psi)
50 mg Disodium Salt
50 mg Diacid
71 mg Disodium Salt

FIG. 9

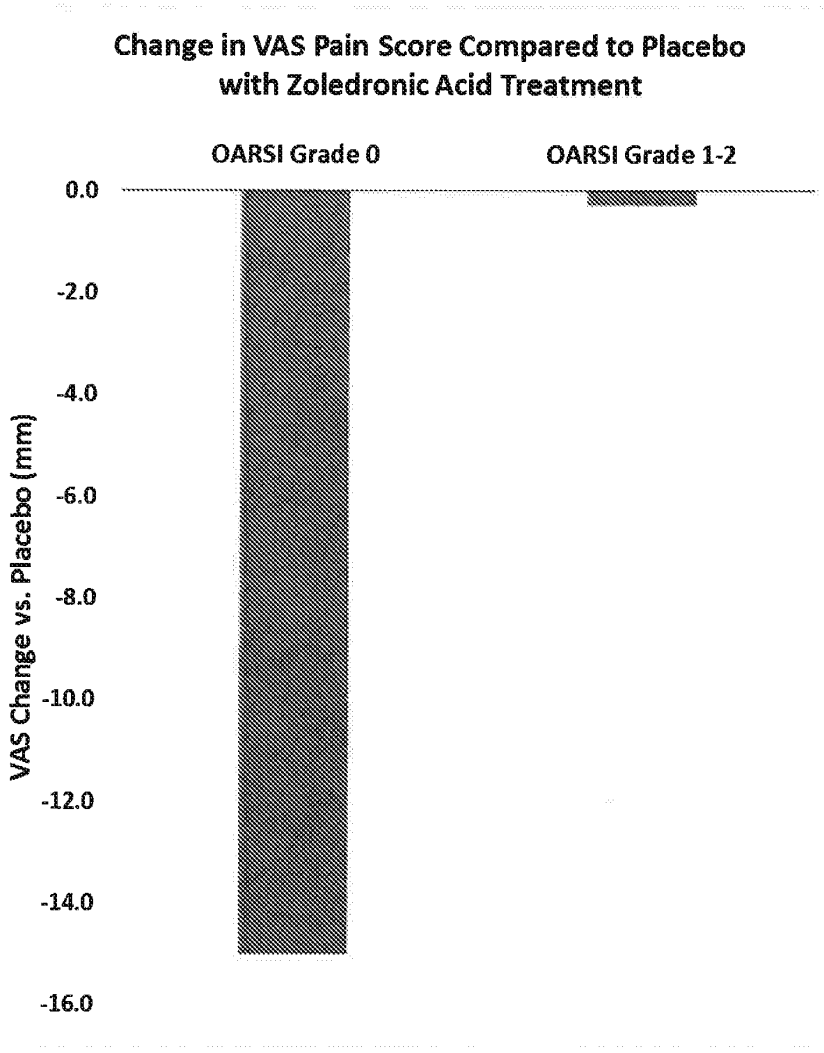

Change in VAS Pain Score Compared to Placebo with Zoledronic Acid Treatment
OARSI Grade 0
OARSI Grade 1-2
VAS Change vs. Placebo (mm)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0

FIG. 10

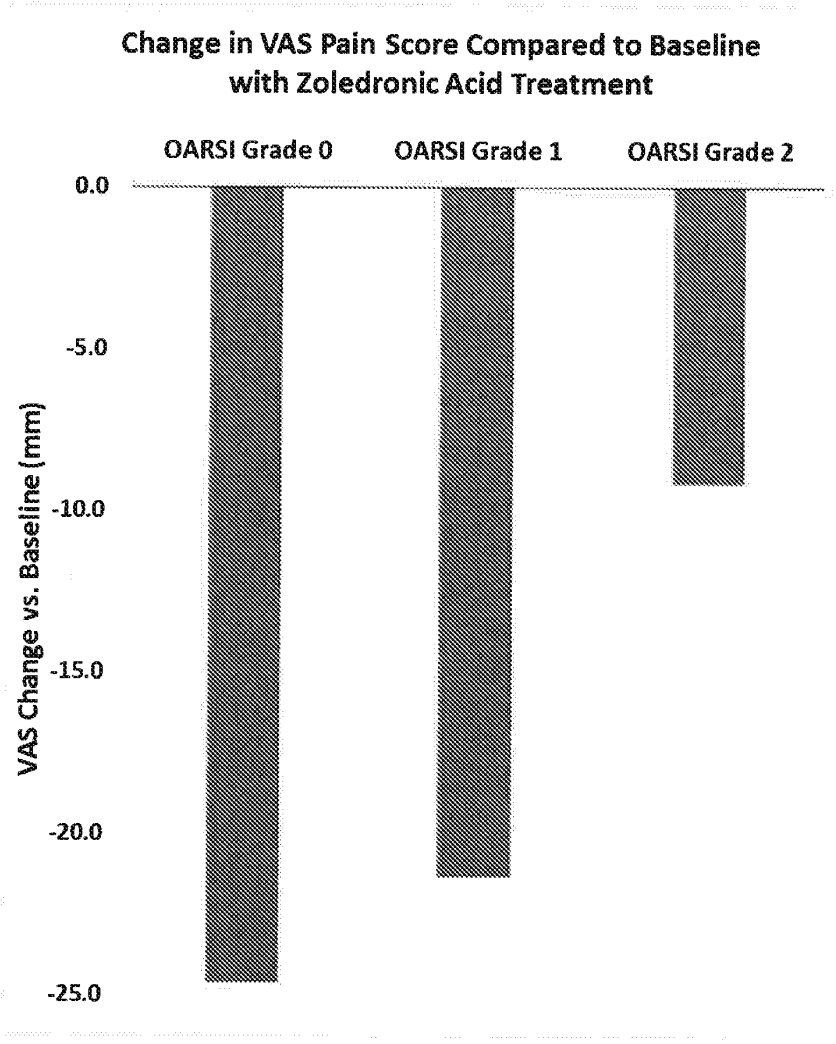

Change in VAS Pain Score Compared to Baseline with Zoledronic Acid Treatment
OARSI Grade 0
OARSI Grade 1
OARSI Grade 2
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
VAS Change vs. Baseline (mm)

FIG. 11

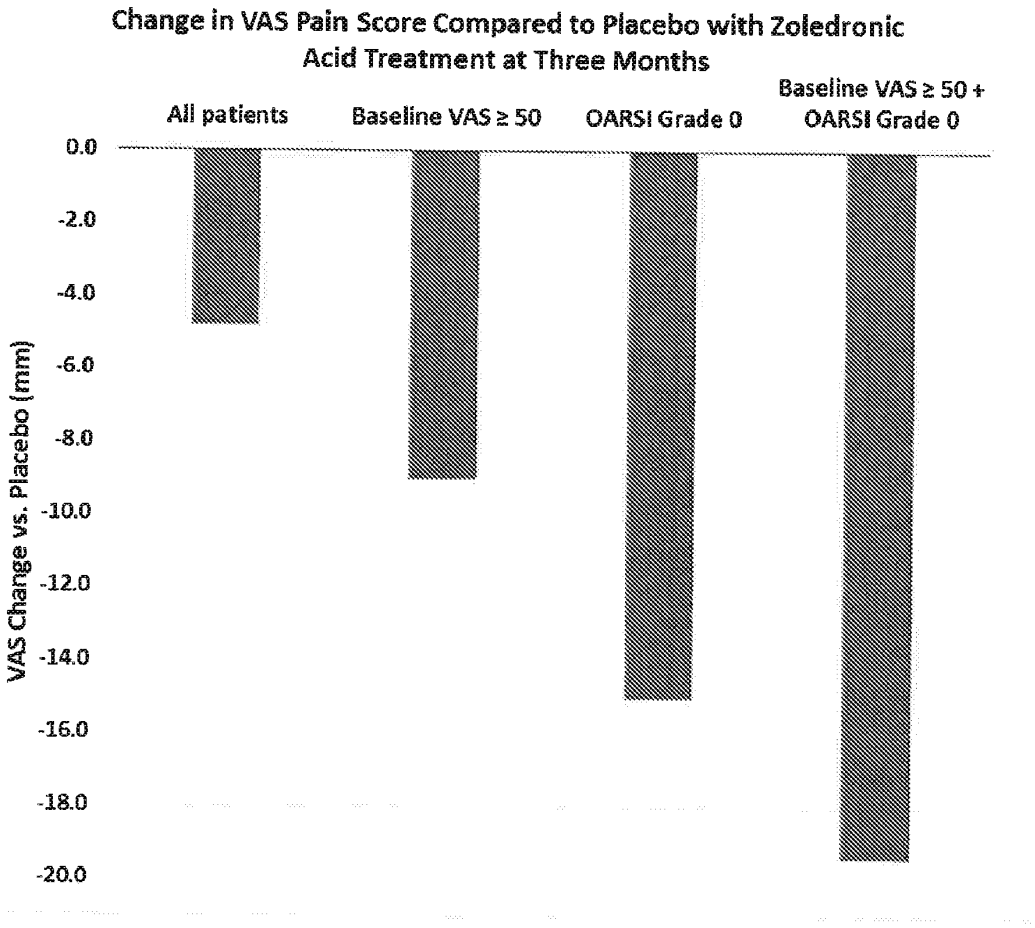

Change in VAS Pain Score Compared to Placebo with Zoledronic Acid Treatment at Three Months
All patients
Baseline VAS ≥ 50
OARSI Grade 0
Baseline VAS ≥ 50 + OARSI Grade 0
VAS Change vs. Placebo (mm)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-18.0
-20.0

FIG. 12

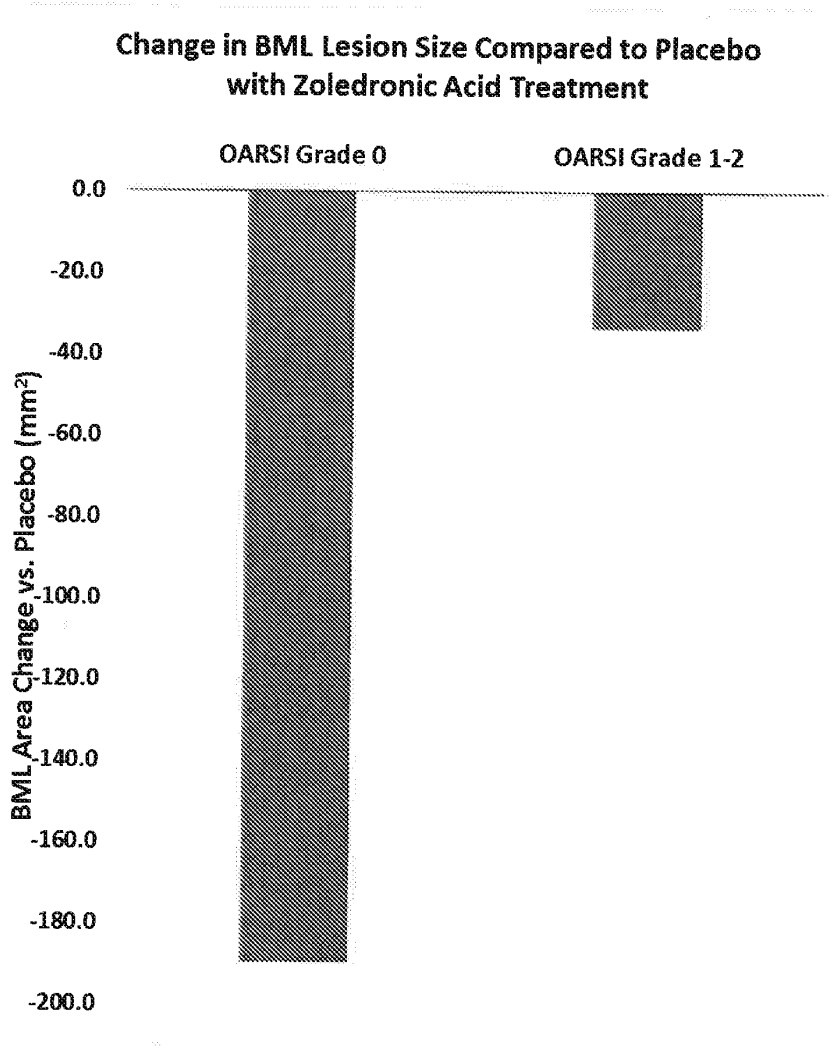

Change in BML Lesion Size Compared to Placebo with Zoledronic Acid Treatment
OARSI Grade 0
OARSI Grade 1-2
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
-160.0
-180.0
-200.0
BML Area Change vs. Placebo (mm²)

FIG. 13

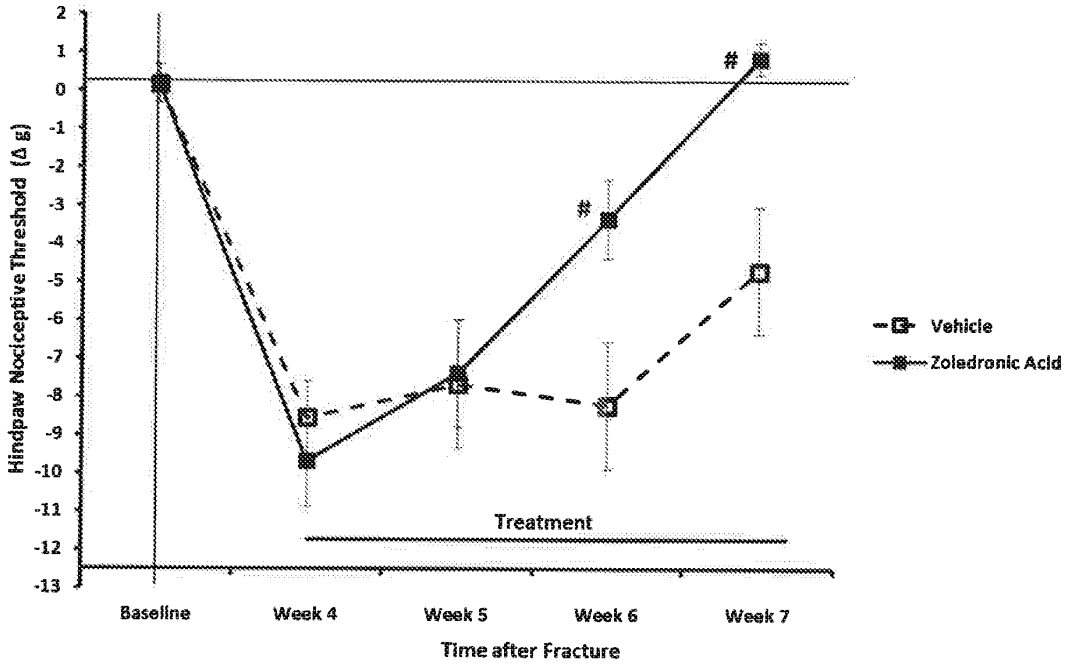

Hindpaw Nociceptive Threshold (Δ g)
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
#
#
Treatment
Baseline
Week 4
Week 5
Week 6
Week 7
Time after Fracture
Vehicle
Zoledronic Acid

FIG. 14

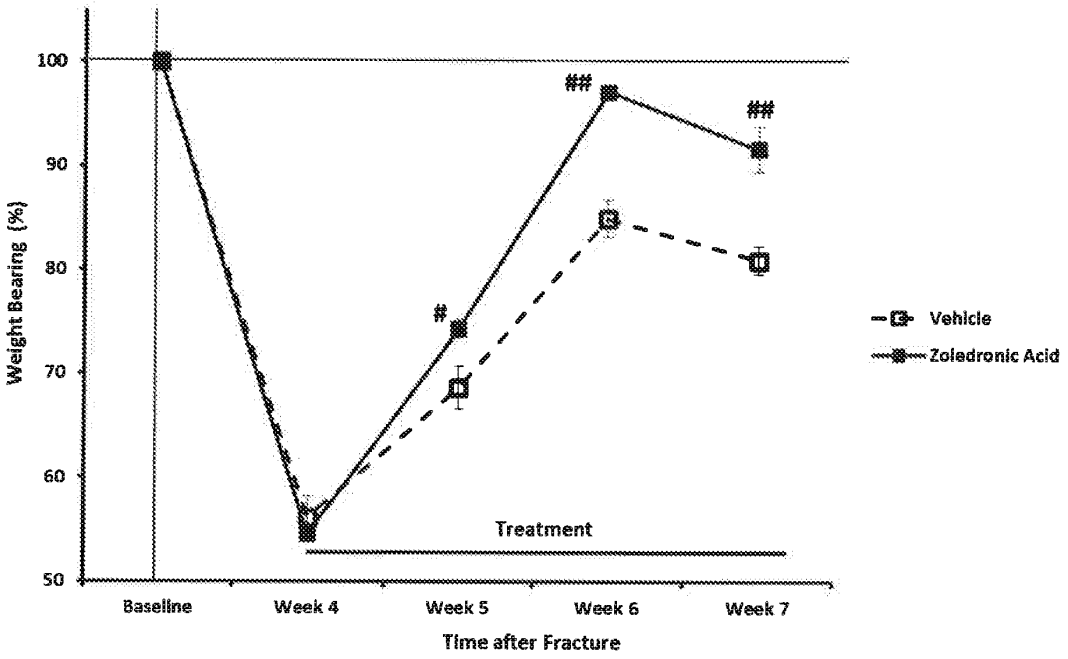

100
90
80
70
60
50
Weight Bearing (%)
#
##
##
Treatment
Baseline
Week 4
Week 5
Week 6
Week 7
Time after Fracture
Vehicle
Zoledronic Acid

FIG. 15

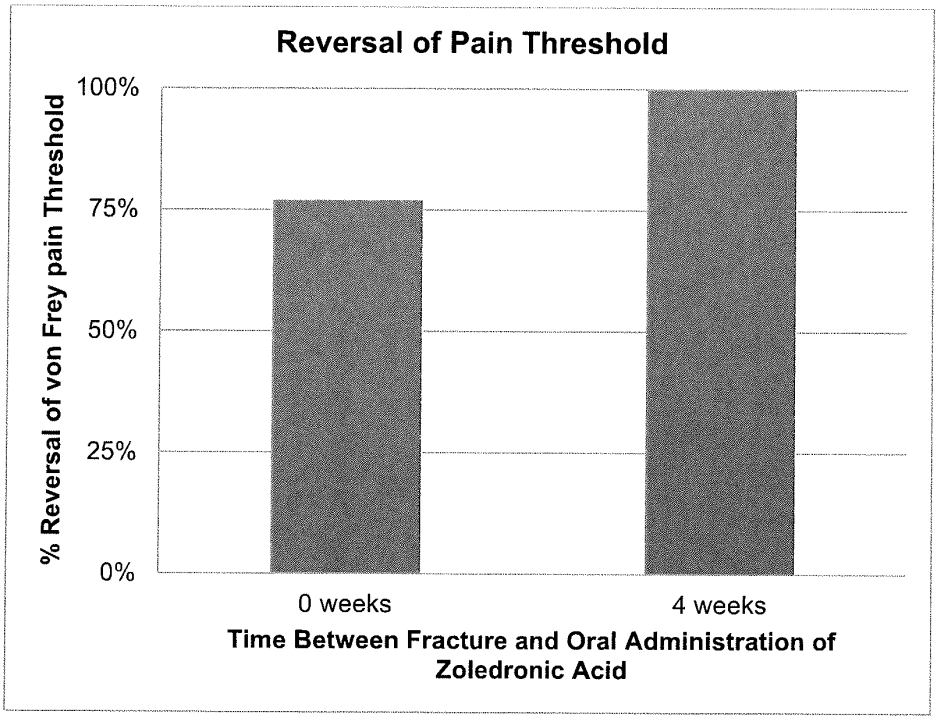

Reversal of Pain Threshold
% Reversal of von Frey pain Threshold
100%
75%
50%
25%
0%
0 weeks
4 weeks
Time Between Fracture and Oral Administration of Zoledronic Acid

FIG. 16

Electronic Patent Application Fee Transmittal	
Application Number:	
Filing Date:	
Title of Invention:	NERIDRONIC ACID FOR TREATING COMPLEX REGIONAL PAIN SYNDROME
First Named Inventor/Applicant Name:	Herriot Tabuteau
Filer:	Brent Arthur Johnson/Maria Nadal
Attorney Docket Number:	A3226.10005US49
Filed as Small Entity	

Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	70	70
UTILITY SEARCH FEE	2111	1	300	300
UTILITY EXAMINATION FEE	2311	1	360	360
REQUEST FOR PRIORITIZED EXAMINATION	2817	1	2000	2000
Pages:				
UTILITY APPL SIZE FEE PER 50 SHEETS >100	2081	1	200	200
Claims:				
CLAIMS IN EXCESS OF 20	2202	10	40	400

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous-Filing:				
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	2830	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**3400**

Electronic Acknowledgement Receipt	
EFS ID:	31019769
Application Number:	15820305
International Application Number:	
Confirmation Number:	1046
Title of Invention:	NERIDRONIC ACID FOR TREATING COMPLEX REGIONAL PAIN SYNDROME
First Named Inventor/Applicant Name:	Herriot Tabuteau
Customer Number:	97149
Filer:	Brent Arthur Johnson/Maria Nadal
Filer Authorized By:	Brent Arthur Johnson
Attorney Docket Number:	A3226.10005US49
Receipt Date:	21-NOV-2017
Filing Date:	
Time Stamp:	19:54:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$3400
RAM confirmation Number	112217INTEFSW20033501
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	A3226-10005US49_AUTHORIZATION_TO_CHARGE_TRACK1.pdf	39348 a3e40130d6851e93c5ee9a2da2f82eac2ed26149	no	1
Warnings:					
Information:					
2	TrackOne Request	A3226-10005US49_TRACK1_FORM.pdf	124618 799592b55f0a8a9071e441f5418502fa0344196d	no	2
Warnings:					
Information:					
3	Oath or Declaration filed	A3226-10005US49_DECLARATION.pdf	210326 e69a0fbc0fb8b7d059639663a0ea9fc50747b258	no	1
Warnings:					
Information:					
4	Application Data Sheet	A3226-10005US49_ADS.pdf	1830303 c9417adb6dbdb3c0de81746ffdf71c6a24a16a09	no	11
Warnings:					
Information:					
5		A33226-10005US49_CON_APPLICATION.pdf	744726 4337361eda6a41e60136c0e4885690dc41f8baa9	yes	117

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	114
Claims	115	116
Abstract	117	117

Warnings:					
Information:					
6	Drawings-only black and white line drawings	A3226-10005US49_DRAWINGS.pdf	902455 ee9bea28f5f7a3a2b18d1549beefbf4b098f7904	no	17
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	43247 951693165a7ee92163e5758844359c450f41c84a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3895023		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Confirmation No.	**:**	
Appln. No.	**:**	
Applicant	**:**	**Antecip Bioventures II LLC**
First Inventor	**:**	**Herriot Tabuteau**
Filed	**:**	
TC/A.U.	**:**	
Examiner	**:**	
Docket No.	**:**	**A3226.10005US49**
Customer No.	**:**	**97149**
Title	**:**	**Neridronic Acid for Treating Complex Regional Pain Syndrome**

AUTHORIZATION TO CHARGE FEES

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner,

In the event that any of the following are not paid by EFS-Web, please charge the fee to deposit account No. 50-5394.

1. The processing fee set forth in 37 CFR 1.17(i)(1);
2. The prioritized examination fee set forth in 37 CFR 1.17(c);
3. The publication fee, which is currently $0;
4. The basic filing fee;
5. The search fee;
6. The examination fee; and
7. Any excess claim fees or application size fee.

The Commissioner is authorized to charge or credit any fee which may be required in connection with the Track One application filing to deposit account No. 50-5394.

Respectfully submitted,

Dated: 21 November 2017

/Yuefen Zhou/
Yuefen Zhou, Ph.D.
Registration No. 73398
CUSTOMER NUMBER: 97149

MASCHOFF BRENNAN
20 Pacifica, Suite 1130
Irvine, California 92618
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Email: Docket@mabr.com

DocCode – SCORE

SCORE Placeholder Sheet for IFW Content

Application Number: 15820305 Document Date: 11/21/2017

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

- Drawing

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Form Revision Date: August 26, 2013

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/820,305

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	30 minus 20 =	* 10	x 40 =	400	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*	x 210 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			200			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	1330		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/820,305	11/21/2017	1629	1330	A3226.10005US49	30	2

CONFIRMATION NO. 1046

97149
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

FILING RECEIPT

Date Mailed: 12/07/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Herriot Tabuteau, New York, NY;

Applicant(s)

ANTECIP BIOVENTURES II LLC, New York, NY;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 15/703,891 09/13/2017
which is a CON of 15/360,886 11/23/2016 PAT 9770457
which is a CIP of 15/217,773 07/22/2016 PAT 9623038
which is a CON of 14/967,224 12/11/2015 PAT 9408861
which is a CON of 14/604,524 01/23/2015 PAT 9211257
which is a CIP of 14/536,526 11/07/2014 ABN
which is a CIP of 14/446,184 07/29/2014 PAT 9006279
which is a DIV of 14/288,716 05/28/2014 PAT 8835650
which claims benefit of 61/933,608 01/30/2014
and said 14/536,526 11/07/2014
is a CIP of 14/279,229 05/15/2014 PAT 9034889
which is a CON of 14/063,979 10/25/2013 PAT 8802658
which is a CIP of 13/894,274 05/14/2013 ABN
which claims benefit of 61/803,721 03/20/2013
and claims benefit of 61/767,647 02/21/2013
and claims benefit of 61/767,676 02/21/2013
and claims benefit of 61/764,563 02/14/2013
and claims benefit of 61/762,225 02/07/2013
and claims benefit of 61/655,541 06/05/2012

and claims benefit of 61/655,527 06/05/2012
and claims benefit of 61/654,383 06/01/2012
and claims benefit of 61/654,292 06/01/2012
and claims benefit of 61/647,478 05/15/2012
and claims benefit of 61/646,538 05/14/2012
and said 15/360,886 11/23/2016
is a CIP of PCT/US2015/032739 05/27/2015
which is a CON of PCT/US2014/050427 08/08/2014
which is a CON of 14/279,241 05/15/2014 ABN
and said 15/703,891 09/13/2017
is a CIP of 15/647,140 07/11/2017 PAT 9820999
which claims benefit of 62/378,140 08/22/2016

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 12/06/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/820,305**

Projected Publication Date: 03/15/2018

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

Neridronic Acid for Treating Complex Regional Pain Syndrome

Preliminary Class

514

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international

patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

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OFFICE OF PETITIONS

Doc Code: TRACK1.GRANT

Decision Granting Request for Prioritized Examination (Track I or After RCE)	Application No.: 15/820,305

1. THE REQUEST FILED November 21, 2017 IS **GRANTED.**

The above-identified application has met the requirements for prioritized examination

A. ☒ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination.** The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;
B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims**, or a multiple dependent claim;
C. filing a **request for continued examination**;
D. filing a notice of appeal;
E. filing a request for suspension of action;
F. mailing of a notice of allowance;
G. mailing of a final Office action;
H. completion of examination as defined in 37 CFR 41.102; or
I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to Brian W. Brown at 571-272-5338.

/Brian W. Brown/
[*Signature*]

Petitions Examiner, Office of Petitions
(Title)

U.S. Patent and Trademark Office
PTO-2298 (Rev. 02-2012)

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15820305
Filing Date	2017-11-21
First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4939130		1990-07-03	Jaeggi et al.	
	2	5869471		1999-02-09	Hovancik et al.	
	3	6015801		2000-01-18	Daifotis	
	4	6419955		2002-07-16	Gabel et al.	
	5	6943155		2005-09-13	Lichtenberger	
	6	7658939		2010-02-09	Oshlack et al.	
	7	7704977		2010-04-27	Leonard	
	8	8053429		2011-11-08	Cumming et al.	

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	9	8119159		2012-02-21	Cumming et al.	
	10	8323689		2012-12-04	Cumming et al.	
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	12	8399023		2013-03-19	Hanna et al.	
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	14	8802658		2014-08-12	Tabuteau	
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	17	8835650		2014-09-16	Tabuteau	
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	19	8865757		2014-10-21	Tabuteau	

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	Attorney Docket Number	A3226.10005US49

	20	8883201		2014-11-11	Leonard	
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	22	8901161		2014-12-02	Tabuteau	
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	24	8933057		2015-01-13	Hanna et al.	
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	26	9006279		2015-04-14	Tabuteau	
	27	9034889		2015-05-19	Tabuteau	
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	31	9205045		2015-12-08	Tabuteau	
	32	9211257		2015-12-15	Tabuteau	
	33	9216153		2015-12-22	Tabuteau	
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	35	9265778		2016-02-23	Tabuteau	
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	42	9301964		2016-04-05	Tabuteau	
	43	9408860		2016-08-09	Tabuteau	
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	46	9427403		2016-08-30	Tabuteau	
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	49	9522157		2016-12-20	Tabuteau	
	50	9539268		2017-01-10	Tabuteau	
	51	9585901		2017-03-07	Tabuteau	
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	53	9610300		2017-04-04	Tabuteau	
	54	9616077		2017-04-11	Tabuteau	
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	64	9694023		2017-07-04	Tabuteau	
	65	9700570		2017-07-11	Tabuteau	
	66	9707245		2017-07-18	Tabuteau	
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	70	9782421		2017-10-10	Tabuteau	
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	72	9795622		2017-10-24	Tabuteau	
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	75	9827256		2017-11-28	Tabuteau	
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20040063670		2004-04-01	Fox et al.	
	2	20100215743		2010-08-26	Leonard	
	3	20110028435		2011-02-03	Hanna et al.	
	4	20110098252		2011-04-28	Pappagallo	
	5	20120190647		2012-07-26	Hanna et al.	
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	8	20130303485		2013-11-14	Tabuteau	
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	19	20140249111		2014-09-04	Tabuteau	
	20	20140249112		2014-09-04	Tabuteau	
	21	20140249113		2014-09-04	Tabuteau	
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	23	20140256683		2014-09-11	Tabuteau	
	24	20140329773		2014-11-06	Tabuteau	
	25	20140348916		2014-11-27	Tabuteau	
	26	20140349974		2014-11-27	Tabuteau	
	27	20150051175		2015-02-19	Tabuteau	
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	29	20150133403		2015-05-14	Tabuteau	

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	30	20150141373		2015-05-21	Tabuteau	
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	34	20150164929		2015-06-18	Tabuteau	
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	40	20160095872		2016-04-07	Tabuteau	

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	41	20160113950		2016-04-28	Tabuteau	
	42	20160151398		2016-06-02	Tabuteau	
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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
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	39	US Patent Application Number: 14/639,013 Filed: 3/13/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	40	US Patent Application Number: 14/686,551 Filed: 4/14/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	41	US Patent Application Number: 14/967,224 Filed: 12/11/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	42	US Patent Application Number: 14/967,234 Filed: 12/11/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	43	US Patent Application Number: 14/968,514 Filed: 12/14/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	44	US Patent Application Number: 15/009,712 Filed: 1/28/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	45	US Patent Application Number: 15/014,994 Filed: 2/3/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	46	US Patent Application Number: 15/042,017 Filed: 2/11/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	47	US Patent Application Number: 15/043,141 Filed: 2/12/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	48	US Patent Application Number: 15/043,281 Filed: 2/12/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	49	US Patent Application Number: 15/043,419 Filed: 2/12/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	50	US Patent Application Number: 15/055,386 Filed: 2/26/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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☒ A certification statement is not submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

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	1	US Patent Application Number: 15/074,367 Filed: 3/18/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	2	US Patent Application Number: 15/074,380 Filed: 3/18/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	3	US Patent Application Number: 15/083,105 Filed: 03/28/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	4	US Patent Application Number: 15/136,092 Filed: 04/22/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	5	US Patent Application Number: 15/164,651 Filed: 05/25/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	6	US Patent Application Number: 15/188,725 Filed: 06/21/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	7	US Patent Application Number: 15/211,827 Filed: 07/15/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	8	US Patent Application Number: 15/217,752 Filed: 07/22/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	9	US Patent Application Number: 15/217,773 Filed: 07/22/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	10	US Patent Application Number: 15/223,487 Filed: 07/29/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	11	US Patent Application Number: 15/223,548 Filed: 07/29/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	26	US Patent Application Number: 15/335,381 Filed: 10/26/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	27	US Patent Application Number: 15/347,696 Filed: 11/09/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	28	US Patent Application Number: 15/348,808 Filed: 11/10/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	29	US Patent Application Number: 15/348,842 Filed: 11/10/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	30	US Patent Application Number: 15/349,926 Filed: 11/11/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	31	US Patent Application Number: 15/352,461 Filed: 11/15/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	32	US Patent Application Number: 15/353,550 Filed: 11/16/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	33	US Patent Application Number: 15/354,862 Filed: 11/17/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	Attorney Docket Number	A3226.10005US49

	34	US Patent Application Number: 15/354,908 Filed: 11/17/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	35	US Patent Application Number: 15/356,434 Filed: 11/18/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	36	US Patent Application Number: 15/357,769 Filed: 11/21/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	37	US Patent Application Number: 15/357,932 Filed: 11/21/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	38	US Patent Application Number: 15/360,886 Filed: 11/23/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	39	US Patent Application Number: 15/364,117 Filed: 11/29/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	40	US Patent Application Number: 15/365,748 Filed: 11/30/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	41	US Patent Application Number: 15/367,048 Filed: 12/01/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	42	US Patent Application Number: 15/368,355 Filed: 12/02/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	43	US Patent Application Number: 15/371,052 Filed: 12/06/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	44	US Patent Application Number: 15/377,907 Filed: 12/13/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	45	US Patent Application Number: 15/378,939 Filed: 12/14/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	46	US Patent Application Number: 15/380,824 Filed: 12/15/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	47	US Patent Application Number: 15/384,125 Filed: 12/19/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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	50	GRÜNENTHAL GMBH, Efficacy and Safety of Intravenous Neridronic Acid in CRPS-I, ClinicalTrials.gov, 6 pgs., last accessed on November 11, 2016, available at: https://clinicaltrials.gov/ct2/show/NCT02402530.	

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	Application Number	15820305
	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

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	14	US Patent Application Number: 15/403,073 Filed: 01/10/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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	23	US Patent Application Number: 15/623,274 Filed 06/14/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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	40	US Patent Application Number: 15/707,673 Filed 09/18/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	41	US Patent Application Number: 15/710,759 Filed 09/20/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	42	Mackey et al., Pharmacologic Therapies for Complex Regional Pain Syndrome, Current Pain and Headache Reports, 11 (1), 38-43, March 2007.	
	43	US Patent Application Number: 15/716,334 Filed 09/26/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	44	GRÜNENTHAL GMBH, Petition for Post Grant Review of U.S. Patent No. 9,539,268, October 10, 2017.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15820305
	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	45	US Patent Application Number: 15/782,480 Filed 10/12/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	46	US Patent Application Number: 15/787,612 Filed 10/18/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	47	GRÜNENTHAL GMBH, Declaration of Stephen Bruehl, for Petition for Post Grant Review of U.S. Patent No. 9,539,268, October 10, 2017.	
	48	GRÜNENTHAL GMBH, Declaration of Clive G. Wilson, for Petition for Post Grant Review of U.S. Patent No. 9,539,268, October 10, 2017.	
	49	Catrina et al., Mechanisms Leading from Systemic Auto Immunity to Joint-specific Disease in Rheumatoid Arthritis, NATURAL REVIEW, RHEUMATOLOGY, 13(2), 79-86, December, 2016.	
	50	Neogi et al., The Effect of Alendronate on Progression of Spinal Osteophytes and Disc-space Narrowing, ANNALS RHEUMATIC DISEASES, 67, 1427-30, February, 2008.	

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	Art Unit	1628
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	Attorney Docket Number	A3226.10005US49

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Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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Application Number	15820305
Filing Date	2017-11-21
First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

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	1	Almarestani et al., Imaging Studies in Freund's Complete Adjuvant Model of Regional Polyarthritis, a Model Suitable for the Study of Pain Mechanisms, in the Rat, ARTHRITIS & RHEUMATISM, 63(6), 1573-81, June 2011.	
	2	Chillingworth & Donaldson, Characterisation of a Freund's complete adjuvant-induced model of chronic arthritis in mice, J. NEUROSCI.METHODS,128(1-2), 45-52, September 2003.	
	3	Rollins, Chapter 38: Preformulation, in REMINGTON'S PHARM. SCI., 700-20, 2000 (Limmer et al. eds., 20th ed. 2000).	
	4	Malinowski, Chapter 53: Bioavailability & Bioequivalence Testing, in REMINGTON'S PHARM. SCI., 995-1004, 2000 (Limmer et al. eds., 20th ed. 2000).	
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	9	McQueen et al., Zoledronic Acid Does not Reduce MRI ErosiveProgression in PsA but may Suppress Bone Oedema: the Zoledronic Acid in Psoriatic Arthritis (ZAPA) Study, ANNALS RHEUMATIC DISEASES, 70, 1091-94, February, 2011.	
	10	US Patent Application Number: 15/801,028 Filed 11/01/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	11	US Patent Application Number: 15/801,049 Filed 11/01/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	Art Unit	1628
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	Attorney Docket Number	A3226.10005US49

	12	US Patent Application Number: 15/804,781 Filed 11/06/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	13	US Patent Application Number: 15/806,236 Filed 11/07/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	14	US Patent Application Number: 15/808,794 Filed 11/09/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	15	US Patent Application Number: 15/814,745 Filed 11/16/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	16	US Patent Application Number: 15/820,305 Filed 11/21/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	17	Grunenthal GMBH v. ANTECIP BIOVENTURES II LLC, Case PGR2017-00022, Patent 9,408,862, Decision, Institution of Post-Grant Review, pp. 1-46, November 15, 2017.	
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	19	US Patent Application Number: 15/840,066 Filed 12/13/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	20	US Patent Application Number: 15/850,503 Filed 12/21/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	21	Coderre et al., A Hypothesis for the Cause of Complex Regional Pain Syndrome-Type I (Reflex Sympathetic Dystrophy): Pain Due to Deep-Tissue Microvascular Pathology, Pain Medicine, 11(8), 1224-1238, August 1, 2010.	

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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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EFS ID:	31536230
Application Number:	15820305
International Application Number:	
Confirmation Number:	1046
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Customer Number:	97149
Filer:	Brent Arthur Johnson/Maria Nadal
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Attorney Docket Number:	A3226.10005US49
Receipt Date:	18-JAN-2018
Filing Date:	21-NOV-2017
Time Stamp:	13:25:49
Application Type:	Utility under 35 USC 111(a)

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Warnings:					
Information:					
14	Non Patent Literature	Declaration_Bruehl_10102017.pdf	13834325 42019d51f0934fc4fe4a3a986df552280878748e	no	37
Warnings:					
Information:					
15	Non Patent Literature	Declaration_Wilson_10102017.pdf	25500683 cd359ab62146fe9c97cc9594408534b2c7c0a40f	no	72
Warnings:					
Information:					
16	Non Patent Literature	Goldberg2005.pdf	383511 f2f89ea111c028c42fd58f2d3e4d6aeea3e7d7af	no	5
Warnings:					
Information:					
17	Non Patent Literature	Lui1986.pdf	988851 02f9f8e790033f2419d75c5e33867eb36069420e	no	4
Warnings:					
Information:					
18	Non Patent Literature	Malinowski2000.pdf	2340215 8a8a579ea8f696b96193814f967709c108f32ad4	no	26
Warnings:					
Information:					
19	Non Patent Literature	McQueen2011.pdf	677565 a0b7f1fe4c24a977cd5932a420e5afddf35b737a	no	5
Warnings:					
Information:					

20	Non Patent Literature	Neogi2008.pdf	689521 36f2c323a629f167f28f71f740a315db89788dfb	no	5
Warnings:					
Information:					
21	Non Patent Literature	PGR2017-00022_DI.pdf	2288226 98e78a70f360797fa783d3e83980ef60d5c34ee6	no	46
Warnings:					
Information:					
22	Non Patent Literature	Rollins2000Ch38.pdf	3560885 99e6ca6ce29b5e76745e8177ea15acd1ddf54654	no	36
Warnings:					
Information:					
23	Non Patent Literature	Rollins2000Ch59.pdf	2655038 132fd80f324b31e8237f119efe6757cd900a4f1f	no	26
Warnings:					
Information:					
24	Non Patent Literature	Yamada1989.pdf	913950 099db57f20cf516e80f2f5d1dbaf373c7673cc28	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	66754655		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Confirmation No.	:	**1046**
Appln. No.	:	15/820,305
Applicant	:	Antecip Bioventures II LLC
First Inventor	:	Herriot Tabuteau
Filed	:	2017-11-21
TC/A.U.	:	1628
Examiner	:	Rei Tsang Shiao
Docket No.	:	A3226.10005US49
Customer No.	:	**97149**
Title	:	Neridronic Acid for Treating Complex Regional Pain Syndrome

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INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. 1.97

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner,

Applicant hereby submits an Information Disclosure Statement along with attached forms PTO/SB/08 and references for the above mentioned application. Any references not submitted herein have been submitted previously, pursuant to 37 C.F.R. §1.98 (d), in the parent application of U.S. Pat. App. No. 15/703,891.

Applicant respectfully requests that the listed information be considered by the Examiner and be made of record in the above-identified application. Applicant further requests that the Examiner initial and return the attached form(s) PTO/SB/08 in accordance with MPEP § 609.02.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

Authorization

The Commissioner is authorized to charge any fee which may be required in connection with this IDS submission to deposit account No. 50-5394.

Respectfully submitted,

Dated: 18 January 2018

/Yuefen Zhou/
Yuefen Zhou, Ph.D.
Reg. No. 73398
Customer Number 97149

Maschoff Brennan
20 Pacifica, Suite 1130
Irvine, California 92618
Telephone: (949) 202-1899
Facsimile: (949) 453-1104
Email: D@mabr.com

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B or equivalent) to identify the application to which the Power of Attorney directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

Application Number	15/820,305		
Filing Date	11-21-2017		
First Named Inventor	Herriot Tabuteau		
Title	Neridronic Acid for Treating Complex Regional Pain Syndrome		
Art Unit	1628		
Examiner Name	Rei Tsang Shiao		
Attorney Docket Number	A3226.10005US49		
SIGNATURE of Applicant or Patent Practitioner			
Signature	/Yuefen Zhou/	2018-01-25 **Date**	2018-01-25
Name	Yuefen Zhou	**Telephone**	(435) 252-1360
Registration Number	73398		

MASCHOFF BRENNAN, PLLC
1389 Center Drive, SUITE 300
PARK CITY, UTAH 84098, USA

PTO/AIA/80 (07-17)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[x] Practitioners associated with Customer Number: 97149

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number

Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[x] The address associated with Customer Number: 97149

OR

[ ]

Firm or individual name		
Address		
City	State	Zip
Country		
Telephone	Email	

Assignee name and address: Anterp Bioventures II LLC
630 Fifth Avenue, Suite 2000
New York City, New York 10111

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature /Herriot Tabuteau/	Date 07/13/2017
Name Herriot Tabuteau	Telephone 646-431-1431
Title Managing Member	

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Herriot Tabuteau

Application No./Patent No.: 15/820,305 Filed/Issue Date: 11-21-2017

Titled: Neridronic Acid for Treating Complex Regional Pain Syndrome

Antecip Bioventures II LLC, a limited liability corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Yuefen Zhou/	2018-01-25
Signature	Date
Yuefen Zhou	73398
Printed or Typed Name	Title or Registration Number

Docket No. A3226.0

ASSIGNMENT

THIS ASSIGNMENT is made by **Herriot Tabuteau** (hereafter, together with any successors, legal representatives, or assigns thereof, "ASSIGNOR") to **Antecip Bioventures II LLC**, a legal entity having its principal place of business at 630 Fifth Avenue, Suite 2000, New York, New York 10111 (hereafter, together with any successors, legal representatives, or assigns thereof, "ASSIGNEE").

WHEREAS, ASSIGNOR has invented and owns rights in, to and under new and useful inventions for which an application(s) for or Letters Patent has been filed as indicated on **Exhibit A** (hereafter "Inventions");

WHEREAS, ASSIGNOR believes himself to be the original and true inventor of the Inventions;

WHEREAS, ASSIGNEE desires to acquire the Inventions and improvements thereto;

AND WHEREAS, ASSIGNOR and ASSIGNEE desire to have a recordable instrument assigning ASSIGNEE as owners of the entire right, title and interest in, to, and under the Inventions and improvements thereto owned by ASSIGNOR;

NOW THEREFORE, for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, ASSIGNOR does hereby sell, assign, transfer, convey, endorse, and hereby set over unto ASSIGNEE the full and exclusive right, title and interest in, to and under the Inventions to be held and enjoyed by ASSIGNEE, as fully and entirely as the same would have been held and enjoyed by ASSIGNOR had this assignment and sale not been made including the full and exclusive right, title and interest in, to and under 1) any patent application, or any other legal instrument equivalent thereof, including, without limitation, continuation, division, continuation-in-part, substitute, reexamination, renewal, inventor's certificate, and utility model, which has been or may be submitted therefor and thereon anywhere in the World, such term defined herein as including the United States of America, its territorial possessions, and any and all foreign countries under national laws or under the provisions of the International Convention for the Protection of Industrial Property, the Patent Cooperation Treaty, or any other international treaty equivalent thereof; 2) any Letters Patent, or any other legal instrument equivalent thereof, which has been or may be granted therefor and thereon, in the World, for the full term or terms for which the same may be granted; 3) any reissue, extension, or any other legal instrument equivalent thereof, on any patent application or Letters Patent which has been or may be granted therefor and thereon in the World; and 4) any right to claim priority to a filing date, or any other legal equivalent thereof, which has been or may be claimed by any patent application or Letters Patent therefor and thereon in the World.

ASSIGNOR hereby covenants and agrees to perform any lawful action when deemed essential by and to ASSIGNEE's full enjoyment, protection, enforcement and title in, to and under the Inventions and rights hereby transferred, including, but not limited to, promptly communicating and providing any and all known and accessible facts, data or any other pertinent information; promptly executing and delivering any and all papers, documents, forms, declarations, oaths, affidavits or any other legal instrument; promptly assisting and participating in any and all depositions, hearings, proceedings, trials, appeals, or any other legal procedure; promptly testifying under oath in any and all interference, post grant review, litigation or any other

administrative or judicial proceeding; and promptly completing any and all actions necessary or desirable to carry out any and all purposes thereof, relating to any and all proceedings in connection with the submission, procurement, issuance, maintenance, enforcement or defense of the inventions and rights hereby transferred.

A Notary Public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached and not the truthfulness accuracy or validity of that document.

IN TESTIMONY WHEREOF, I hereunder set my hand this 1 day of Dec., 2017.

ASSIGNOR

Herriot Tabuteau

Signature

State of)
) ss.:
County of)

On this ____ day of _____, 2017, before me, _____, personally appeared **Herriot Tabuteau**, who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

Witness my hand and official seal.

Notary Public

A Notary Public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached and not the truthfulness accuracy or validity of that document.

ACKNOWLEDGED AND CONFIRMED, I hereunder set my hand this 1 day of Dec, 2017, as a duly authorized representative of ASSIGNEE.

ASSIGNEE

Name: Herriot Tabuteau, MD
Title: Managing Member

State of)
) ss.:
County of)

On this ____ day of _____, 2017, before me, _____, personally appeared **Herriot Tabuteau** who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

Witness my hand and official seal.

Notary Public

EXHIBIT A

Patent Rights: Patents and Patent Applications

Title	Serial No.	Filing Date
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/446,971	01 Mar 2017
COMPOSITIONS AND METHODS FOR INCREASING THE METABOLIC LIFETIME OF DEXTROMETHORPHAN AND RELATED PHARMACODYNAMIC EFFECTS	15/454,874	09 Mar 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/459,992	15 Mar 2017
COMPOSITIONS AND METHODS FOR INCREASING THE METABOLIC LIFETIME OF DEXTROMETHORPHAN AND RELATED PHARMACODYNAMIC EFFECTS	PCT/US2017/024140	24 Mar 2017
OSTEOCLAST INHIBITORS FOR KNEE CONDITIONS	15/481,330	06 Apr 2017
OSTEOCLAST INHIBITORS SUCH AS ZOLEDRONIC ACID FOR LOW BACK PAIN TREATMENT	15/484,766	11 Apr 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/498,251	26 Apr 2017

Title	Serial No.	Filing Date
NERIDRONIC ACID MOLECULAR COMPLEX FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/587,246	04 May 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/587,108	04 May 2017
PHARMACEUTICAL COMPOSITIONS COMPRISING FROVATRIPTAN	62/504,105	10 May 2017
COMPOSITIONS AND METHODS FOR INCREASING THE METABOLIC LIFETIME OF DEXTROMETHORPHAN AND RELATED PHARMACODYNAMIC EFFECTS	15/599,163	18 May 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/599,319	18 May 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/604,394	24 May 2017
METHODS FOR THE SAFE ADMINISTRATION OF IMIDAZOLE OR IMIDAZOLIUM COMPOUNDS	15/605,730	25 May 2017
COMPOSITIONS COMPRISING RANK/RANKL ANTAGONISTS AND RELATED COMPOUNDS FOR TREATING PAIN	15/619,293	09 Jun 2017
COMPOSITIONS AND METHODS FOR INCREASING THE METABOLIC LIFETIME OF DEXTROMETHORPHAN AND RELATED PHARMACODYNAMIC	15/621,882	13 Jun 2017

Title	Serial No.	Filing Date
EFFECTS		
COMPOSITIONS FOR ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING LOW BACK PAIN	15/623,274	14 Jun 2017
OSTEOCLAST INHIBITORS FOR KNEE CONDITIONS	15/624,471	15 Jun 2017
OSTEOCLAST INHIBITORS FOR KNEE CONDITIONS	15/624,428	15 Jun 2017
COMPOSITIONS AND METHODS FOR INCREASING THE METABOLIC LIFETIME OF DEXTROMETHORPHAN AND RELATED PHARMACODYNAMIC EFFECTS	15/645,939	10 Jul 2017
COMPOSITIONS AND METHODS FOR INCREASING THE METABOLIC LIFETIME OF DEXTROMETHORPHAN AND RELATED PHARMACODYNAMIC EFFECTS	15/647,069	11 Jul 2017
CO-ADMINISTRATION OF STEROIDS AND ZOLEDRONIC ACID TO PREVENT AND TREAT PAIN	15/647,140	11 Jul 2017
COMPOSITIONS AND METHODS FOR INCREASING THE METABOLIC LIFETIME OF DEXTROMETHORPHAN AND RELATED PHARMACODYNAMIC EFFECTS	15/647,852	12 Jul 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/672,147	08 Aug 2017

Title	Serial No.	Filing Date
COMPOSITIONS COMPRISING RANK/RANKL ANTAGONISTS AND RELATED COMPOUNDS FOR TREATING PAIN	15/672,126	08 Aug 2017
BUPROPION AS A MODULATOR OF DRUG ACTIVITY	15/688,660	28 Aug 2017
COMPOSITIONS AND METHODS FOR INCREASING THE METABOLIC LIFETIME OF DEXTROMETHORPHAN AND RELATED PHARMACODYNAMIC EFFECTS	15/691,532	30 Aug 2017
BUPROPION AS A MODULATOR OF DRUG ACTIVITY	15/691,549	30 Aug 2017
COMPOSITIONS AND METHODS COMPRISING BUPROPION OR RELATED COMPOUNDS FOR SUSTAINED DELIVERY OF DEXTROMETHORPHAN	15/695,995	05 Sep 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/697,267	06 Sep 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING ANKYLOSING SPONDYLITIS	15/697,211	05 Sept 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/702,616	12 Sep 2017
OSTEOCLAST INHIBITORS FOR KNEE CONDITIONS	15/703,891	13 Sep 2017

Title	Serial No.	Filing Date
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/707,673	18 Sep 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING ARTHRITIS	15/707,238	18 Sep 2017
NERIDRONIC ACID FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/710,759	20 Sep 2017
OSTEOCLAST INHIBITORS FOR JOINT CONDITIONS	15/716,334	26 Sep 2017
CO-ADMINISTRATION OF STEROIDS AND ZOLEDRONIC ACID TO PREVENT AND TREAT PAIN	15/782,480	12 Oct 2017
COMPOSITIONS FOR ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING LOWER BACK PAIN	15/787,612	18 Oct 2017
BUPROPION AND DEXTROMETHORPHAN FOR TREATING NICOTINE ADDICTION	62/576,538	24 Oct 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/801,049	01 Nov 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/801,028	01 Nov 2017
NERIDRONIC ACID FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/804,781	06 Nov 2017

Title	Serial No.	Filing Date
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/806,236	07 Nov 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/808,794	09 Nov 2017
COMPOSITIONS FOR ORAL ADMINISTRATION OF ZOLEDRONIC ACID OR RELATED COMPOUNDS FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/814,745	16 Nov 2017
NERIDRONIC ACID FOR TREATING COMPLEX REGIONAL PAIN SYNDROME	15/820,305	21 Nov 217
COMPOSITIONS AND METHODS FOR INCREASING THE METABOLIC LIFETIME OF DEXTROMETHORPHAN AND RELATED PHARMACODYNAMIC EFFECTS	15/821,563	22 Nov 2017

Electronic Acknowledgement Receipt	
EFS ID:	31606982
Application Number:	15820305
International Application Number:	
Confirmation Number:	1046
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Customer Number:	97149
Filer:	Brent Arthur Johnson/Maria Nadal
Filer Authorized By:	Brent Arthur Johnson
Attorney Docket Number:	A3226.10005US49
Receipt Date:	25-JAN-2018
Filing Date:	21-NOV-2017
Time Stamp:	15:30:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	A3226-10005US49_POA_1-25-2018.pdf	1733855 9302edb3fe85e0ecc2cd719051bc4908754a5730	no	13

Warnings:

Information:	
Total Files Size (in bytes):	1733855

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 1046

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
15/820,305	11/21/2017 RULE	514	1628	A3226.10005US49

APPLICANTS
ANTECIP BIOVENTURES II LLC, New York, NY;

INVENTORS
Herriot Tabuteau, New York, NY;

**** CONTINUING DATA ***************************
This application is a CON of 15/703,891 09/13/2017
which is a CON of 15/360,886 11/23/2016 PAT 9770457
which is a CIP of 15/217,773 07/22/2016 PAT 9623038
which is a CON of 14/967,224 12/11/2015 PAT 9408861
which is a CON of 14/604,524 01/23/2015 PAT 9211257
which is a CIP of 14/536,526 11/07/2014 ABN
which is a CIP of 14/446,184 07/29/2014 PAT 9006279
which is a DIV of 14/288,716 05/28/2014 PAT 8835650
which claims benefit of 61/933,608 01/30/2014
and said 14/536,526 11/07/2014
is a CIP of 14/279,229 05/15/2014 PAT 9034889
which is a CON of 14/063,979 10/25/2013 PAT 8802658
which is a CIP of 13/894,274 05/14/2013 ABN
which claims benefit of 61/803,721 03/20/2013
and claims benefit of 61/767,647 02/21/2013
and claims benefit of 61/767,676 02/21/2013
and claims benefit of 61/764,563 02/14/2013
and claims benefit of 61/762,225 02/07/2013
and claims benefit of 61/655,541 06/05/2012
and claims benefit of 61/655,527 06/05/2012
and claims benefit of 61/654,383 06/01/2012
and claims benefit of 61/654,292 06/01/2012
and claims benefit of 61/647,478 05/15/2012
and claims benefit of 61/646,538 05/14/2012
and said 15/360,886 11/23/2016
is a CIP of PCT/US2015/032739 05/27/2015
which is a CON of PCT/US2014/050427 08/08/2014
which is a CON of 14/279,241 05/15/2014 ABN
and said 15/703,891 09/13/2017
is a CIP of 15/647,140 07/11/2017 PAT 9820999
which claims benefit of 62/378,140 08/22/2016

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
12/06/2017

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /REI-TSANG SHIAO/ Examiner's Signature	☐ Met after Allowance RS Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		NY	17	30	2

BIB (Rev. 05/07).

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/820,305	Tabuteau, Herriot
	Examiner	Art Unit
	REI TSANG SHIAO	1628

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
514	108	12/22/2017	RS

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
STN, structure, inventor names	12/20/2017	RS
EAST class/subclass	12/22/2017	RS
PALM inventor names	12/22/2017	RS

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/REI TSANG SHIAO/ Primary Examiner, Art Unit 1628	

Notice of References Cited	Application/Control No. 15/820,305	Applicant(s)/Patent Under Reexamination Tabuteau, Herriot	
	Examiner REI TSANG SHIAO	Art Unit 1628	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-9289384-B2	03-2016	Tabuteau; Herriot	A61K9/0053	1/1
*	B	US-9289385-B2	03-2016	Tabuteau; Herriot	A61K9/0053	1/1
*	C	US-9216153-B2	12-2015	Tabuteau; Herriot	A61K9/0053	1/1
*	D	US-9211257-B2	12-2015	Tabuteau; Herriot	A61K9/0053	1/1
	E					
	F					
	G					
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	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/820,305	11/21/2017	Herriot Tabuteau	A3226.10005US49	1046

97149 7590 01/26/2018

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UTAH 84098

EXAMINER	
SHIAO, REI TSANG	

ART UNIT	PAPER NUMBER
1628	

NOTIFICATION DATE	DELIVERY MODE
01/26/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket@mabr.com
info@mabr.com

Office Action Summary	Application No. 15/820,305	Applicant(s) Tabuteau, Herriot	
	Examiner REI TSANG SHIAO	Art Unit 1628	AIA Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 11/21/2017 .

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____ .

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-30 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-30 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 21 November 2017 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

1. This application claims priority of the provisional applications: 61/646,538 with a filing date 05/14/2012; 61/647,478 with a filing date 05/15/2012; 61/654,292 with a filing date 06/01/2012; 61/654,383 with a filing date 06/01/2012; 61/655,527 with a filing date 06/05/2012; 61/655,541 with a filing date 06/05/2012; 61/764,563 with a filing date 02/14/2013; 61/762,225 with a filing date 02/07/2013; 61/767,647 with a filing date 02/21/2013; 61/767,676 with a filing date 02/21/2013; and 61/803,721 with a filing date 03/20/2013.

2. Claims 1-30 are pending in the application.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double

patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3.1 Claims 1-30 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of Tabuteau et al. US 9,289,384, US 9,289,385, US 9,216,153 or US 9,211,257 respectively. Although the conflicting claims are not identical, they are not patentably distinct from each other and reasons are as follows.

Applicants claim methods of use for treating pain using neridronic acid, see claim 1 or 17. Dependent claims 2-16 and 18-30 further limit the scope of methods of use, i.e., treating dose or strategy.

Tabuteau et al. '384 claims methods of use for treating join knee pain using zoledronic acid or neridronic acid, see column 60.

Tabuteau et al. '385 claims methods of use for treating knee pain using zoledronic acid, or neridronic acid, see column 60.

Tabuteau et al. '153 claims methods of use for treating knee pain using zoledronic acid or neridronic acid, see column 56.

Tabuteau et al. '257 claims methods of use for treating bone marrow lesion of the knee (i.e., knee pain) using zoledronic acid or neridronic acid see column 55.

The difference between instant claims and Tabuteau et al. '385, '384, '257 or '153 is that the instant claims use neridronic acid, while Tabuteau

et al. '385, '384, '153 or '257 uses zoledronic acid or neridronic acid. Tabuteau et al. '385, '384, '153, or '257 methods of use overlap with the instant invention.

One having ordinary skill in the art would find the claims 1-30 prima facie obvious because one would be motivated to employ the methods of use of Tabuteau et al. '385, '384, '153 or '257 to obtain instant invention. Dependent claims 2-16 and 17-30 are also rejected along with claim 1 or 17 under the obviousness-type double patenting.

The motivation to make the claimed methods of use derived from the known methods of use of Tabuteau et al. '385, '384, '153 or '257 would possess similar activity to that which is claimed in the reference.

3.2 Claims 1-30 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of Tabuteau et al. co-pending application No. 15/438,513, 15/454,874, 15/481,330, 15/703,891, 15/716,334 or 15/804,781 respectively. Although the conflicting claims are not identical, they are not patentably distinct from each other and reasons are as follows.

Applicants claim methods of use for treating pain syndrome using neridronic acid, see claim 1 or 17. Dependent claims 2-16 and 17-30 further limit the scope of methods of use, i.e., treating dose or strategy.

Tabuteau et al. '513 claims methods of use for treating back pain using neridronic acid or zoledronic acid, see claim 1 or 15.

Tabuteau et al. '874 claims methods of use for treating bone marrow leision (i.e., joint knee pain) using neridronic acid, see claim 1.

Tabuteau et al. '330 claims methods of use for treating knee pain using neridronic acid, see claim 1.

Tabuteau et al. '891 claims methods of use for treating pain syndrome using neridronic acid, see claim 1.

Tabuteau et al. '334 claims methods of use for treating pain syndrome using neridronic acid, see claim 1.

Tabuteau et al. '781 claims methods of use for treating pain syndrome using neridronic acid, see claim 1.

The difference between instant claims and Tabuteau et al. '513, '874, '330, '891, '334 or '781 is that the instant claims use neridronic acid, while Tabuteau et al. '513, '874, '330, '891, '334 or '781 is using neridronic acid or zoledronic acid. Tabuteau et al. '513, '874, '330, '891, '334 or '781 methods of use inherently overlap with the instant invention.

One having ordinary skill in the art would find the claims 1-30 prima facie obvious because one would be motivated to employ the methods of use of Tabuteau et al. '513, '874, '330, '891, '334 or '781 to obtain instant invention. Dependent claims 2-16 and 17-30 are also rejected along with claim 1 or 17 under the obviousness-type double patenting.

The motivation to make the claimed methods of use derived from the known methods of use of Tabuteau et al. '513, '874, '330, '891 '334 or '781 would possess similar activity to that which is claimed in the reference.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to REI TSANG SHIAO whose telephone number is (571)272-0707. The examiner can normally be reached on 8:30 am-5:00 pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wu-Cheng Shen can be reached on 571-272-3157. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/REI TSANG SHIAO/

Rei-tsang Shiao, Ph.D.
Primary Examiner, Art Unit 1628

January 22, 2018

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/820,305	Tabuteau, Herriot
	Examiner	**Art Unit**
	REI TSANG SHIAO	1628

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	12/22/2017								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
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	7	✓								
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	27	✓								
	28	✓								
	29	✓								
	30	✓								

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	678	514/108	US-PGPUB; USPAT; USOCR	OR	OFF	2017/12/22 13:27

EAST Search History (Interference)

<This search history is empty>

12/22/2017 1:28:03 PM

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/820,305	11/21/2017	Herriot Tabuteau	A3226.10005US49

CONFIRMATION NO. 1046

97149
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

POA ACCEPTANCE LETTER

OC000000097076931

Date Mailed: 02/01/2018

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/25/2018.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/agizaw/

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15820305
Filing Date	2017-11-21
First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	9855213		2018-01-02	Tabuteau	
	2	9861648		2018-01-09	Tabuteau	
	3	9867839		2018-01-16	Tabuteau	
	4	9867840		2018-01-16	Tabuteau	
	5	9877977		2018-01-30	Tabuteau	
	6	9884069		2018-02-06	Tabuteau	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15820305
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	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	1	20180000848		2018-01-04	Tabuteau	
	2	20180015110		2018-01-18	Tabuteau	
	3	20180015112		2018-01-18	Tabuteau	
	4	20180021358		2018-01-25	Tabuteau	
	5	20180028544		2018-02-01	Tabuteau	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Suresh, Migrating Bone Marrow Edema Syndrome: A Cause of Recurring Knee Pain, Acta Orthopaedica et Traumatologica Turcica, 44(4), 340-343, 2010.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15820305
	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	2	Miettunen et al., Dramatic Pain Relief and Resolution of Bone Inflammation Following Pamidronate in 9 Pediatric Patients with Persistent Chronic Recurrent Multifocal Osteomyelitis (CRMO), Pediatric Rheumatology, 7(1), 2, December 2009.	
	3	US Patent Application Number: 15/877,067 Filed 01/22/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	4	US Patent Application Number: 15/879,107 Filed 01/24/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	5	US Patent Application Number: 15/887,271 Filed 02/02/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	6	US Patent Application Number: 15/897,947 Filed 02/15/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15820305
	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-02-20
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal	
Application Number:	15820305
Filing Date:	21-Nov-2017
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Filer:	Brent Arthur Johnson/Maria Nadal
Attorney Docket Number:	A3226.10005US49
Filed as Small Entity	
Filing Fees for Utility under 35 USC 111(a)	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	120	120
		Total in USD ($)		**120**

Electronic Acknowledgement Receipt	
EFS ID:	31830304
Application Number:	15820305
International Application Number:	
Confirmation Number:	1046
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Customer Number:	97149
Filer:	Brent Arthur Johnson/Maria Nadal
Filer Authorized By:	Brent Arthur Johnson
Attorney Docket Number:	A3226.10005US49
Receipt Date:	20-FEB-2018
Filing Date:	21-NOV-2017
Time Stamp:	13:19:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$120
RAM confirmation Number	022018INTEFSW13210800
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	A3226-10005US49_IDS_02-20-2018.pdf	612940 d78037bbc621229127dacd1156301add653eb645	no	5
Warnings:					
Information:					
2	Non Patent Literature	Suresh2010.pdf	127278 827d237255db00f8a211d6579c4ae004467d7a74	no	4
Warnings:					
Information:					
3	Non Patent Literature	Malinowski2000.pdf	2185422 75400e16cc701bf4253f814b75ee3b740c803662	no	25
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30767 47d78d455ab736a967463294ec7da0c47618c84a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	2956407		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: DIST.E.FILE Document Description: Electronic Terminal Disclaimer - Filed	PTO/SB/25 PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A PROVISIONAL DOUBLE PATENTING REJECTION OVER A PENDING "REFERENCE" APPLICATION AND TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	15820305
Filing Date	21-Nov-2017
First Named Inventor	Herriot Tabuteau
Attorney Docket Number	A3226.10005US49
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
ANTECIP BIOVENTURES II LLC	100 %

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending reference Application Number(s)

15481330 filed on 04/06/2017

15703891 filed on 09/13/2017

15716334 filed on 09/26/2017

15804781 filed on 11/06/2017

as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the reference application are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term of any patent granted on said reference application, "as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application," in the event that any such patent granted on the pending reference application: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

9289384

9289385

9216153

9211257

9867839

9844559

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

◉ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

○ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.

Applicants claims the following fee status:

◉ Small Entity

○ Micro Entity

○ Regular Undiscounted

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

- (●) An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

  Registration Number 73398

- ( ) A sole inventor
- ( ) A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application
- ( ) A joint inventor; all of whom are signing this request

Signature	/Yuefen Zhou/
Name	Yuefen Zhou

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	15820305
Filing Date:	21-Nov-2017
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Filer:	Brent Arthur Johnson/Maria Nadal
Attorney Docket Number:	A3226.10005US49

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	2814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**160**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 15820305

Filing Date: 21-Nov-2017

Applicant/Patent under Reexamination: Tabuteau

Electronic Terminal Disclaimer filed on February 27, 2018

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	31897538
Application Number:	15820305
International Application Number:	
Confirmation Number:	1046
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Customer Number:	97149
Filer:	Brent Arthur Johnson/Maria Nadal
Filer Authorized By:	Brent Arthur Johnson
Attorney Docket Number:	A3226.10005US49
Receipt Date:	27-FEB-2018
Filing Date:	21-NOV-2017
Time Stamp:	19:40:27
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$160
RAM confirmation Number	022818INTEFSW19402500
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	42148 bba388efd49a5a08a590925816a94900a00a130d	no	3
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30872 70f604fdbd3eb0041a8a42e59bc4c2729e305731	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	73020		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Confirmation No.	:	**1046**
App. No.	:	15/820,305
Applicant	:	Antecip Bioventures II LLC
First Inventor	:	Herriot Tabuteau
Filed	:	November 21, 2017
TC/A.U.	:	1628
Examiner	:	Rei Tsang Shiao
Docket No.	:	A3226.10005US49
Customer No.	:	**97149**
Title	:	Neridronic Acid for Treating Complex Regional Pain Syndrome

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RESPONSE TO NON-FINAL OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner,

In response to the Office Action dated January 26, 2018, the following is submitted.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks begin on page 5 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method of treating allodynia associated with complex regional pain syndrome, comprising parenterally administering neridronic acid in a salt form or an acid form to a human being suffering from allodynia associated with complex regional pain syndrome.

2. (Original) The method of claim 1, wherein a total of about 200 mg to about 500 mg of the neridronic acid is administered parenterally to the human being.

3. (Original) The method of claim 1, wherein a total of about 400 mg of the neridronic acid is administered parenterally to the human being.

4. (Original) The method of claim 1, wherein a total of about 100 mg to about 200 mg of the neridronic acid is administered parenterally to the human being within a period of about 1 month.

5. (Original) The method of claim 1, wherein a total of about 250 mg of the neridronic acid is administered parenterally to the human being within a period of about 1 month.

6. (Original) The method of claim 2, wherein the neridronic acid is administered in divided parenteral doses.

7. (Currently Amended) The method of claim 6, wherein each ~~division of the~~ divided parenteral dose[[s]] contains about 10 mg to about 150 mg of the neridronic acid.

8. (Currently Amended) The method of claim 6, wherein each ~~division of the~~ divided parenteral dose[[s]] contains about 62 mg to about 63 mg of the neridronic acid.

9. (Original) The method of claim 1, wherein the complex regional pain syndrome is associated with an inciting traumatic event.

10. (Original) The method of claim 1, wherein the human being has suffered from complex regional pain syndrome for at least 6 months.

11. (Original) The method of claim 1, wherein the human being has suffered from complex regional pain syndrome for about 6 months to about 12 months.

12. (Original) The method of claim 1, wherein the human being has suffered from complex regional pain syndrome for about 1 year to about 2 years.

13. (Original) The method of claim 1, wherein the human being has an age of about 30 years to about 40 years.

14. (Currently Amended) The method of claim 1, wherein the human being has a pain intensity of at least 7 cm on the 10 cm visual analogue scale (VAS) or at least 7 on the 0-10 numeric rating scale (NRS).

15. (Original) The method of claim 1, wherein the human being has a pain intensity of at least 8 cm on the 10 cm VAS or at least 8 on the 0-10 NRS.

16. (Original) The method of claim 1, wherein the human being has a pain intensity of at least 9 cm on the 10 cm VAS or at least 9 on the 0-10 NRS.

17. (Original) A method of treating autonomic motor change associated with complex regional pain syndrome (CRPS), comprising administering neridronic acid in a salt form or an acid form to a human being suffering from autonomic motor change associated with CRPS.

18. (Original) The method of claim 17, wherein a total of about 200 mg to about 500 mg of the neridronic acid is administered parenterally to the human being.

19. (Original) The method of claim 17, wherein a total of about 400 mg of the neridronic acid is administered parenterally to the human being.

20. (Original) The method of claim 17, wherein a total of about 100 mg to about 200 mg of the neridronic acid is administered parenterally to the human being within a period of about 1 month.

21. (Original) The method of claim 17, wherein a total of about 250 mg of the neridronic acid is administered parenterally to the human being within a period of about 1 month.

22. (Original) The method of claim 18, wherein the neridronic acid is administered in divided parenteral doses.

23. (Original) The method of claim 22, wherein each divided parenteral dose contains about 10 mg to about 150 mg of the neridronic acid.

24. (Original) The method of claim 22, wherein each divided parenteral dose contains about 62 mg to about 63 mg of the neridronic acid.

25. (Original) The method of claim 17, wherein the complex regional pain syndrome is associated with an inciting traumatic event.

26. (Original) The method of claim 17, wherein the human being has suffered from complex regional pain syndrome for at least 6 months.

27. (Original) The method of claim 17, wherein the human being has suffered from complex regional pain syndrome for about 6 months to about 12 months.

28. (Original) The method of claim 17, wherein the human being has suffered from complex regional pain syndrome for about 1 year to about 2 years.

29. (Original) The method of claim 17, wherein the human being has an age of about 30 years to about 40 years.

30. (Original) The method of claim 17, wherein the human being has a pain intensity of at least 8 cm on the 10 cm VAS or at least 8 on the 0-10 NRS.

REMARKS

Status of the Claims

Claims 1-30 are currently pending. Claims 1, 7-8, and 14 are amended to correct typographic errors. The amendments do not introduce new matter.

Double Patenting Rejections

Claims 1-30 are rejected under the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claim 1 of:

1. U.S. Pat. No. 9,289,384 to Tabuteau;
2. U.S. Pat. No. 9,289,385 to Tabuteau;
3. U.S. Pat. No. 9,216,153 to Tabuteau;
4. U.S. Pat. No. 9,211,257 to Tabuteau;
5. U.S. Pat. App. No. 15/438,513, now U.S. Pat. No. 9,867,839 to Tabuteau;
6. U.S. Pat. App. No. 15/454,874, now U.S. Pat. No. 9,844,559 to Tabuteau;
7. U.S. Pat. App. No. 15/481,330 to Tabuteau;
8. U.S. Pat. App. No. 15/703,891 to Tabuteau;
9. U.S. Pat. App. No. 15/716,334 to Tabuteau; and
10. U.S. Pat. App. No. 15/804,781 to Tabuteau.

Although Applicant does not admit the correctness of the rejections, a terminal disclaimer has been filed electronically to expedite the prosecution.

CONCLUSION

Applicant believes that the pending claims are in good order for allowance and, as such, allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to contact Applicant's undersigned Agent at (949) 202-1899 or jzhou@mabr.com.

The Commissioner is authorized to charge any fee which may be required in connection with this Response to deposit account No. 50-5394.

Respectfully submitted,

Dated: 27 February 2018

/Yuefen Zhou/
Yuefen Zhou, Ph.D.
Registration No. 73398
CUSTOMER NUMBER: 97149

Maschoff Brennan
20 Pacifica, Suite 1130
Irvine, California 92618
Telephone: (949) 202-1899
Facsimile: (949) 453-1104
Email: Docket@mabr.com

Electronic Acknowledgement Receipt

EFS ID:	31897711
Application Number:	15820305
International Application Number:	
Confirmation Number:	1046
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Customer Number:	97149
Filer:	Brent Arthur Johnson/Maria Nadal
Filer Authorized By:	Brent Arthur Johnson
Attorney Docket Number:	A3226.10005US49
Receipt Date:	27-FEB-2018
Filing Date:	21-NOV-2017
Time Stamp:	19:49:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		A3226-10005US49_RESPONSE_OA_1-26-2018.pdf	61520 c7b6f81ffe0b24ad65ec3cd55299a280a8da ee98	yes	6

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	4
	Applicant Arguments/Remarks Made in an Amendment	5	6
Warnings:			
Information:			
	Total Files Size (in bytes):	61520	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
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PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/820,305	Filing Date 11/21/2017	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $210 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	02/27/2018	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 30	Minus	** 30	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	trina riddick
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/820,305	11/21/2017	Herriot Tabuteau	A3226.10005US49

CONFIRMATION NO. 1046

97149
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

PUBLICATION NOTICE

Title: Neridronic Acid for Treating Complex Regional Pain Syndrome

Publication No.US-2018-0071322-A1
Publication Date:03/15/2018

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

97149 7590 05/04/2018

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UTAH 84098
UNITED STATES OF AMERICA

EXAMINER
SHIAO, REI TSANG

ART UNIT	PAPER NUMBER
1628	

DATE MAILED: 05/04/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/820,305	11/21/2017	Herriot Tabuteau	A3226.10005US49	1046

TITLE OF INVENTION: Neridronic Acid for Treating Complex Regional Pain Syndrome

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	08/06/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

97149 7590 05/04/2018
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UTAH 84098
UNITED STATES OF AMERICA

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/820,305	11/21/2017	Herriot Tabuteau	A3226.10005US49	1046

TITLE OF INVENTION: Neridronic Acid for Treating Complex Regional Pain Syndrome

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	08/06/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
SHIAO, REI TSANG	1628	514-108000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/820,305	11/21/2017	Herriot Tabuteau	A3226.10005US49	1046

97149 7590 05/04/2018

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UTAH 84098
UNITED STATES OF AMERICA

EXAMINER	
SHIAO, REI TSANG	
ART UNIT	**PAPER NUMBER**
1628	

DATE MAILED: 05/04/2018

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	**Application No.** 15/820,305	**Applicant(s)** Tabuteau, Herriot	
	Examiner REI TSANG SHIAO	**Art Unit** 1628	**AIA Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to amendment filed on 2/27/2018.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-30 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file areply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 1/18/18,2/20/18.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/REI TSANG SHIAO/
Primary Examiner, Art Unit 1628

*The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

1. This application claims priority of the provisional applications: 61/646,538 with a filing date 05/14/2012; 61/647,478 with a filing date 05/15/2012; 61/654,292 with a filing date 06/01/2012; 61/654,383 with a filing date 06/01/2012; 61/655,527 with a filing date 06/05/2012; 61/655,541 with a filing date 06/05/2012; 61/764,563 with a filing date 02/14/2013; 61/762,225 with a filing date 02/07/2013; 61/767,647 with a filing date 02/21/2013; 61/767,676 with a filing date 02/21/2013; and 61/803,721 with a filing date 03/20/2013.

2. Amendment of claims 1, 7-8 and14, and a terminal disclaimer in the amendment filed on 02/27/2018 is acknowledged. Claims 1-30 are pending in the application.

Reasons for Allowance

3. Since a terminal disclaimer against Tabuteau et al. '153, '384, '385, '257, '513, '874, '330, '891, '334, or '781 has been filed and approved in the Office, therefore the rejection of claims 1-30 under the obviousness-type double patenting over Tabuteau et al. . '153, '384, '385, '257, '513, '874, '330, '891, '334, or '781 has been overcome in the amendment filed on 02/27/2018.

4. Claims 1-30 are neither anticipated nor rendered obvious over the art of record, and therefore are allowable. A suggestion for modification of a reference to obtain the instant methods of use has not been found. Claims 1-30 are allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance".

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to REI TSANG SHIAO whose telephone number is (571)272-0707. The examiner can normally be reached on 8:30 am-5:00 pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wu-Cheng Shen can be reached on 571-272-3157. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/REI TSANG SHIAO/

Rei-tsang Shiao, Ph.D.
Primary Examiner, Art Unit 1628

May 01, 2018

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/820,305	Tabuteau, Herriot
	Examiner	**Art Unit**
	REI TSANG SHIAO	1628

CPC - Searched*		
Symbol	**Date**	**Examiner**

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
514	108	04/02/2018	RS

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
STN, structure, inventor names	12/20/2017	RS
EAST class/subclass	12/22/2017	RS
PALM inventor names	12/22/2017	RS

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
514	108	04/02/2018	RS

/REI TSANG SHIAO/ Primary Examiner, Art Unit 1628	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/820,305	Tabuteau, Herriot
	Examiner	**Art Unit**
	REI TSANG SHIAO	1628

CPC							
Symbol						**Type**	**Version**
A61K	/	31	/	663		F	2013-01-01
A61K	/	31	/	675		I	2013-01-01
A61K	/	31	/	573		I	2013-01-01
A61K	/	9	/	2004		I	2013-01-01
A61K	/	9	/	0019		I	2013-01-01
A61K	/	9	/	0053		I	2013-01-01
A61K	/	9	/	0056		I	2013-01-01
A61K	/	45	/	06		I	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
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NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	30	
/REI TSANG SHIAO/ Primary Examiner, Art Unit 1628	02 April 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	NONE

U.S. Patent and Trademark Office — Part of Paper No.: 20180402

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/820,305	Tabuteau, Herriot
	Examiner	**Art Unit**
	REI TSANG SHIAO	1628

INTERNATIONAL CLASSIFICATION				
CLAIMED				
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US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	30	
/REI TSANG SHIAO/ Primary Examiner, Art Unit 1628	02 April 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	NONE

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	15/820,305	Tabuteau, Herriot
	Examiner	**Art Unit**
	REI TSANG SHIAO	1628

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☑ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	10	10	19	19	28	28								
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6	6	15	15	24	24										
7	7	16	16	25	25										
8	8	17	17	26	26										
9	9	18	18	27	27										

NONE		**Total Claims Allowed:**	
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(Primary Examiner)	(Date)	1	NONE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15820305
Filing Date	2017-11-21
First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

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	1	2011014781	WO		2011-02-03	Hanna et al.		
	2	2012071517	WO		2012-05-31	Hanna et al.		
	3	2013173330	WO		2013-11-21	Tabuteau		

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	10	2000028954	WO		2000-05-25	Harvey		

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
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Examiner Signature	/REI TSANG SHIAO/	Date Considered	04/02/2018

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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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	2	9861648		2018-01-09	Tabuteau	
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	1	20180000848		2018-01-04	Tabuteau	
	2	20180015110		2018-01-18	Tabuteau	
	3	20180015112		2018-01-18	Tabuteau	
	4	20180021358		2018-01-25	Tabuteau	
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	3	US Patent Application Number: 15/877,067 Filed 01/22/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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	5	US Patent Application Number: 15/887,271 Filed 02/02/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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Examiner Signature	/REI TSANG SHIAO/	Date Considered	03/30/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15820305
	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-02-20
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
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Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	2	5869471		1999-02-09	Hovancik et al.	
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	7	7704977		2010-04-27	Leonard	
	8	8053429		2011-11-08	Cumming et al.	

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	9	8119159		2012-02-21	Cumming et al.	
	10	8323689		2012-12-04	Cumming et al.	
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	18	8859530		2014-10-14	Desai	
	19	8865757		2014-10-21	Tabuteau	

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	20	8883201		2014-11-11	Leonard	
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	22	8901161		2014-12-02	Tabuteau	
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	34	9216168		2015-12-22	Tabuteau	
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	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
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	23	US Patent Application Number: 15/438,513 Filed: 02/21/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	24	US Patent Application Number: 15/439,774 Filed: 02/22/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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L2	267	(514/108).CCLS.	USPAT	OR	OFF	2018/04/02 11:33

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First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

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	22	US Patent Application Number: 15/605,730 Filed 05/25/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	23	US Patent Application Number: 15/623,274 Filed 06/14/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	24	US Patent Application Number: 15/624,428 Filed 06/15/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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	37	US Patent Application Number: 15/702,616 Filed 09/12/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	38	US Patent Application Number: 15/703,891 Filed 09/13/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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	45	US Patent Application Number: 15/782,480 Filed 10/12/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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(Not for submission under 37 CFR 1.99)

Application Number	15820305
Filing Date	2017-11-21
First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

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	3	Rollins, Chapter 38: Preformulation, in REMINGTON'S PHARM. SCI., 700-20, 2000 (Limmer et al. eds., 20th ed. 2000).	
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	5	Rollins, Chapter 59: Clinical Pharmacokinetics, in REMINGTON'S PHARM. SCI., 1145-55, 2000 (Limmer et al. eds., 20th ed. 2000).	
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	11	US Patent Application Number: 15/801,049 Filed 11/01/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	12	US Patent Application Number: 15/804,781 Filed 11/06/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	13	US Patent Application Number: 15/806,236 Filed 11/07/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	14	US Patent Application Number: 15/808,794 Filed 11/09/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	15	US Patent Application Number: 15/814,745 Filed 11/16/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	16	US Patent Application Number: 15/820,305 Filed 11/21/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	17	Grunenthal GMBH v. ANTECIP BIOVENTURES II LLC, Case PGR2017-00022, Patent 9,408,862, Decision, Institution of Post-Grant Review, pp. 1-46, November 15, 2017.	
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	20	US Patent Application Number: 15/850,503 Filed 12/21/2017 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

EXAMINER SIGNATURE			
Examiner Signature	/REI TSANG SHIAO/	Date Considered	04/02/2018

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	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

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	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	1	US Patent Application Number: 15/074,367 Filed: 3/18/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	2	US Patent Application Number: 15/074,380 Filed: 3/18/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	3	US Patent Application Number: 15/083,105 Filed: 03/28/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	4	US Patent Application Number: 15/136,092 Filed: 04/22/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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	9	US Patent Application Number: 15/217,773 Filed: 07/22/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	10	US Patent Application Number: 15/223,487 Filed: 07/29/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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	23	HENDREN et al., A Review of the Differences Between Normal and Osteoarthritis Articular Cartilage in Human Knee and Ankle Joints, The Foot, 19(3), 171-176, September, 2009.	
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	25	US Patent Application Number: 15/246,325 Filed: 08/24/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	26	US Patent Application Number: 15/335,381 Filed: 10/26/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	27	US Patent Application Number: 15/347,696 Filed: 11/09/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	28	US Patent Application Number: 15/348,808 Filed: 11/10/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	29	US Patent Application Number: 15/348,842 Filed: 11/10/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	30	US Patent Application Number: 15/349,926 Filed: 11/11/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	31	US Patent Application Number: 15/352,461 Filed: 11/15/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	32	US Patent Application Number: 15/353,550 Filed: 11/16/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	33	US Patent Application Number: 15/354,862 Filed: 11/17/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	34	US Patent Application Number: 15/354,908 Filed: 11/17/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	35	US Patent Application Number: 15/356,434 Filed: 11/18/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	36	US Patent Application Number: 15/357,769 Filed: 11/21/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	37	US Patent Application Number: 15/357,932 Filed: 11/21/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	38	US Patent Application Number: 15/360,886 Filed: 11/23/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	39	US Patent Application Number: 15/364,117 Filed: 11/29/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	40	US Patent Application Number: 15/365,748 Filed: 11/30/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	41	US Patent Application Number: 15/367,048 Filed: 12/01/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	42	US Patent Application Number: 15/368,355 Filed: 12/02/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	43	US Patent Application Number: 15/371,052 Filed: 12/06/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	44	US Patent Application Number: 15/377,907 Filed: 12/13/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	45	US Patent Application Number: 15/378,939 Filed: 12/14/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	46	US Patent Application Number: 15/380,824 Filed: 12/15/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	47	US Patent Application Number: 15/384,125 Filed: 12/19/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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See attached certification statement.

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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

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	Attorney Docket Number	A3226.10005US49

	1	US FOOD AND DRUG ADMINISTRATION, Pharmacology Review of ZOMETA®, 261 pgs., November 2001, available at: http://www.accessdata.fda.gov/drugsatfda_docs/nda/2001/21-223_Zometa.cfm.	
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	3	US Patent Application Number: 13/894,244 Filed: 5/14/2013 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	4	US Patent Application Number: 13/894,252 Filed: 5/14/2013 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	5	US Patent Application Number: 13/894,262 Filed: 5/14/2013 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	6	US Patent Application Number: 13/894,274 Filed: 5/14/2013 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	7	US Patent Application Number: 14/063,979 Filed: 10/25/2013 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	8	US Patent Application Number: 14/106,291 Filed: 12/13/2013 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	9	US Patent Application Number: 14/279,196 Filed: 5/15/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	10	US Patent Application Number: 14/279,206 Filed: 5/15/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	11	US Patent Application Number: 14/279,213 Filed: 5/15/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	12	US Patent Application Number: 14/279,222 Filed: 5/15/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	13	US Patent Application Number: 14/279,226 Filed: 5/15/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	14	US Patent Application Number: 14/279,229 Filed: 5/15/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	15	US Patent Application Number: 14/279,232 Filed: 5/15/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	16	US Patent Application Number: 14/279,236 Filed: 5/15/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	17	US Patent Application Number: 14/279,241 Filed: 5/15/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	18	US Patent Application Number: 14/288,241 Filed: 5/27/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	19	US Patent Application Number: 14/288,713 Filed: 5/28/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	20	US Patent Application Number: 14/288,716 Filed: 5/28/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	21	US Patent Application Number: 14/288,720 Filed: 5/28/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	22	US Patent Application Number: 14/310,811 Filed: 6/20/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	23	US Patent Application Number: 14/336,642 Filed: 7/21/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	24	US Patent Application Number: 14/446,184 Filed: 7/29/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	25	US Patent Application Number: 14/456,939 Filed: 8/11/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	26	US Patent Application Number: 14/457,659 Filed: 8/12/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	27	US Patent Application Number: 14/481,097 Filed: 9/9/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	28	US Patent Application Number: 14/530,556 Filed: 10/31/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	29	US Patent Application Number: 14/536,526 Filed: 11/7/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	30	US Patent Application Number: 14/538,709 Filed: 11/11/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	31	US Patent Application Number: 14/540,333 Filed: 11/13/2014 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	32	US Patent Application Number: 14/604,524 Filed: 1/23/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	33	US Patent Application Number: 14/605,822 Filed: 1/26/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	34	US Patent Application Number: 14/607,947 Filed: 1/28/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	35	US Patent Application Number: 14/607,985 Filed: 1/28/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	36	US Patent Application Number: 14/608,855 Filed: 1/29/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	37	US Patent Application Number: 14/625,457 Filed: 2/18/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	38	US Patent Application Number: 14/635,857 Filed: 3/2/2015 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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	44	US Patent Application Number: 15/009,712 Filed: 1/28/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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	46	US Patent Application Number: 15/042,017 Filed: 2/11/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	47	US Patent Application Number: 15/043,141 Filed: 2/12/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	48	US Patent Application Number: 15/043,281 Filed: 2/12/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	49	US Patent Application Number: 15/043,419 Filed: 2/12/2016 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-01-18
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.S/

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Application Number	15820305
Filing Date	2017-11-21
First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

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	1	9931352		2018-04-03	Tabuteau	
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	3	9949993		2018-04-24	Tabuteau	
	4	9956234		2018-05-01	Tabuteau	
	5	9956237		2018-05-01	Tabuteau	
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	1	20180110789		2018-04-26	Tabuteau		
	2	20180133232		2018-05-17	Tabuteau		
	3	20180140621		2018-05-24	Tabuteau		

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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-06-29
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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Art Unit	1628
Examiner Name	Rei Tsang Shiao
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Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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	3	9925203		2018-03-27	Tabuteau	
	4	7645459		2010-01-12	Dansereau	

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	3	20180055767		2018-03-01	Tabuteau	
	4	20180055862		2018-03-01	Tabuteau	
	5	20180064734		2018-03-08	Tabuteau	
	6	20180064735		2018-03-08	Tabuteau	
	7	20180064736		2018-03-08	Tabuteau	
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	1	US Patent Application Number: 15/934,785 Filed 03/23/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-06-29
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal	
Application Number:	15820305
Filing Date:	21-Nov-2017
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Filer:	Brent Arthur Johnson/Maria Nadal
Attorney Docket Number:	A3226.10005US49
Filed as Small Entity	
Filing Fees for Utility under 35 USC 111(a)	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	120	120
		Total in USD ($)		**120**

Electronic Acknowledgement Receipt	
EFS ID:	33057901
Application Number:	15820305
International Application Number:	
Confirmation Number:	1046
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Customer Number:	97149
Filer:	Brent Arthur Johnson/Maria Nadal
Filer Authorized By:	Brent Arthur Johnson
Attorney Docket Number:	A3226.10005US49
Receipt Date:	29-JUN-2018
Filing Date:	21-NOV-2017
Time Stamp:	20:07:13
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$120
RAM confirmation Number	070218INTEFSW20092600
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	A3226-10005US49_IDS_TRANSMITTAL.pdf	50496 8a466a0135cb1dd10e3e4aae06b1510002b41490	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	A3226-10005US49_IDS-1_06-29-2018.pdf	612869 ccf941dafa24c68168d1e9fc01fdd89eccaa99ae	no	5
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	A3226-10005US49_IDS-2_06-29-2018.pdf	612640 a91d92d5a8d7a23f8541fb49df3e9369f6b0345a	no	5
Warnings:					
Information:					
4	Non Patent Literature	PGR2018-00001_DI-.pdf	18280870 dc8cae68893a4d209bb21a22abaf6e29c3369fc4	no	39
Warnings:					
Information:					
5	Non Patent Literature	GMBH_Petition_04-18-2018.pdf	3410991 3271c7b50aa06a22307157d7eadf4d05c4589442	no	81
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	30767 2a00872f226e61873eabee0df7fe16ba0a6ca8d6	no	2
Warnings:					
Information:					

Total Files Size (in bytes):	22998633

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Confirmation No.	:	**1046**
App. No.	:	15/820,305
Applicant	:	Antecip Bioventures II LLC
First Inventor	:	Herriot Tabuteau
Filed	:	2017-11-21
TC/A.U.	:	1628
Examiner	:	Rei Tsang Shiao
Docket No.	:	A3226.10005US49
Customer No.	:	**97149**
Title	:	Neridronic Acid for Treating Complex Regional Pain Syndrome

---

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. 1.97

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner,

Applicant hereby submits an Information Disclosure Statement along with attached forms PTO/SB/08 and references for the above mentioned application.

Applicant would like to point out the following document which was filed in a Post Grant Review petition against a related patent. Applicant invites the Examiner to contact the Applicant's Patent Attorney Dr. Brent Johnson at 949-202-1903 or bjohnson@mabr.com with any questions with respect to this document.

1. GRÜNENTHAL GMBH, Petition for Post Grant Review of U.S. Patent No. 9,707,245, April 18, 2018.

Applicant respectfully requests that the listed information be considered by the Examiner and be made of record in the above-identified application. Applicant further requests that the Examiner initial and return the attached form(s) PTO/SB/08 in accordance with MPEP § 609.02.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

Authorization

The Commissioner is authorized to charge any fee which may be required in connection with this IDS submission to deposit account No. 50-5394.

Respectfully submitted,

Dated: 29 June 2018

/Yuefen Zhou/
Yuefen Zhou, Ph.D.
Reg. No. 73398
Customer Number 97149

Maschoff Brennan
20 Pacifica, Suite 1130
Irvine, California 92618
Telephone: (949) 202-1903
Facsimile: (949) 453-1104
Email: Docket@mabr.com

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15820305
Filing Date	2017-11-21
First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	9931352		2018-04-03	Tabuteau	
	2	9943531		2018-04-17	Tabuteau	
	3	9949993		2018-04-24	Tabuteau	
	4	9956234		2018-05-01	Tabuteau	
	5	9956237		2018-05-01	Tabuteau	
	6	9956238		2018-05-01	Tabuteau	

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U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15820305
	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	1	20180110789		2018-04-26	Tabuteau	
	2	20180133232		2018-05-17	Tabuteau	
	3	20180140621		2018-05-24	Tabuteau	

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FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	US Patent Application Number:15/952,017 Filed 04/12/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	2	US Patent Application Number:15/954,457 Filed 04/16/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	3	GRÜNENTHAL GMBH, Petition for Post-Grant Review of Patent 9,707,245, April 18, 2018.	

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	Application Number	15820305
	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	4	US Patent Application Number: 15/962,854 Filed 04/25/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	5	US Patent Application Number: 15/963,878 Filed 04/26/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	6	Grunenthal GMBH v. ANTECIP BIOVENTURES II LLC, Case PGR2018-00001, Patent US 9,539,268, Decision, Institution of Post-Grant Review, pp. 1-39, May 01, 2018.	
	7	US Patent Application Number: 15/977,413 Filed 05/11/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	8	US Patent Application Number: 15/982,794 Filed 05/17/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	9	US Patent Application Number: 15/989,641 Filed 05/25/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

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EXAMINER SIGNATURE

Examiner Signature	/REI TSANG SHIAO/	Date Considered	07/03/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☒ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-06-29
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15820305
Filing Date	2017-11-21
First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	9895383		2018-02-20	Tabuteau	
	2	9901589		2018-02-27	Tabuteau	
	3	9925203		2018-03-27	Tabuteau	
	4	7645459		2010-01-12	Dansereau	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20180042947		2018-02-15	Tabuteau	
	2	20180050053		2018-02-22	Tabuteau	

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	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	3	20180055767		2018-03-01	Tabuteau	
	4	20180055862		2018-03-01	Tabuteau	
	5	20180064734		2018-03-08	Tabuteau	
	6	20180064735		2018-03-08	Tabuteau	
	7	20180064736		2018-03-08	Tabuteau	
	8	20180071321		2018-03-15	Tabuteau	
	9	20180071322		2018-03-15	Tabuteau	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

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	Attorney Docket Number	A3226.10005US49

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	US Patent Application Number: 15/934,785 Filed 03/23/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/REI TSANG SHIAO/	Date Considered	07/03/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-06-29
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.S/

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15820305
Filing Date	2017-11-21
First Named Inventor	Herriot Tabuteau
Art Unit	1628
Examiner Name	Rei Tsang Shiao
Attorney Docket Number	A3226.10005US49

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	9931352		2018-04-03	Tabuteau	
	2	9943531		2018-04-17	Tabuteau	
	3	9949993		2018-04-24	Tabuteau	
	4	9956234		2018-05-01	Tabuteau	
	5	9956237		2018-05-01	Tabuteau	
	6	9956238		2018-05-01	Tabuteau	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15820305
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	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	1	20180110789		2018-04-26	Tabuteau	
	2	20180133232		2018-05-17	Tabuteau	
	3	20180140621		2018-05-24	Tabuteau	

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FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	US Patent Application Number:15/952,017 Filed 04/12/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	2	US Patent Application Number:15/954,457 Filed 04/16/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	3	GRÜNENTHAL GMBH, Petition for Post-Grant Review of Patent 9,707,245, April 18, 2018.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15820305
	Filing Date	2017-11-21
	First Named Inventor	Herriot Tabuteau
	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

	4	US Patent Application Number: 15/962,854 Filed 04/25/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	5	US Patent Application Number: 15/963,878 Filed 04/26/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	6	Grunenthal GMBH v. ANTECIP BIOVENTURES II LLC, Case PGR2018-00001, Patent US 9,539,268, Decision, Institution of Post-Grant Review, pp. 1-39, May 01, 2018.	
	7	US Patent Application Number: 15/977,413 Filed 05/11/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	8	US Patent Application Number: 15/982,794 Filed 05/17/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	
	9	US Patent Application Number: 15/989,641 Filed 05/25/2018 First Named Inventor: Herriot Tabuteau Assignee: Antecip Bioventures II LLC	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/REI TSANG SHIAO/	Date Considered	07/03/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Application Number	15820305
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	Art Unit	1628
	Examiner Name	Rei Tsang Shiao
	Attorney Docket Number	A3226.10005US49

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☒ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yuefen Zhou/	Date (YYYY-MM-DD)	2018-06-29
Name/Print	Yuefen Zhou, Ph.D.	Registration Number	73398

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.S/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Confirmation No.	:	**1046**
Appln. No.	:	15/820,305
Applicant	:	Antecip Bioventures II LLC
First Inventor	:	Herriot Tabuteau
Filed	:	November 21, 2017
TC/A.U.	:	1628
Examiner	:	Rei Tsang Shiao
Docket No.	:	A3226.10005US49
Customer No.	:	**97149**
Title	:	Neridronic Acid for Treating Complex Regional Pain Syndrome

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AMENDMENT UNDER 37 CFR §1.312

Mail Stop Amendment
Office of Data Management
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Applicant submits the following Amendment under 37 CFR §1.312 in the above referenced patent application. A Notice of Allowance was issued in the above-referenced application on May 04, 2018.

Amendments to the Specification begin on page 2 of this paper.

Remarks are on page 4 of this paper.

Amendment to the Specification:

Please replace paragraph [1] in the Section of "CROSS-REFERENCE TO RELATED APPLICATIONS" with the following amended paragraph:

[1] This application is a continuation of U.S. Pat. App. No. 15/703,891, filed September 13, 2017; which is a continuation of U.S. Pat. App. No. 15/360,886, filed November 23, 2016, now U.S. Pat. No. 9,770,457; which is a continuation-in-part of U.S. Pat. App. No. 15/217,773, filed July 22, 2016, now U.S. Pat. No. 9623038; which is a continuation of U.S. Pat. App. No. 14/967,224, filed December 11, 2015, now U.S. Pat. No. 9,408,861; which is a continuation of U.S. Pat. App. No. 14/604,524, filed on January 23, 2015, now U.S. Pat. No. 9,211,257; which is a continuation-in-part of U.S. Pat. App. No. 14/536,526, filed on November 7, 2014, now abandoned; which is a continuation-in-part of U.S. Pat. App. No. 14/446,184, filed on July 29, 2014, now U.S. Pat. No. 9,006,279; which is a divisional of U.S. Pat. App. No. 14/288,716, filed May 28, 2014, now U.S. Pat. No. 8,835,650; which claims the benefit of U.S. Prov. Pat. App. No. 61/933,608, filed January 30, 2014; U.S. Pat. App. No. 14/536,526 is also a continuation-in-part of U.S. Pat. App. No. 14/279,229, filed May 15, 2014, now U.S. Pat. No. 9,034,889; which is a continuation of U.S. Pat. App. No. 14/063,979, filed October 25, 2013, now U.S. Pat. No. 8,802,658; which is a continuation-in-part of U.S. Pat. App. No. 13/894,274, filed May 14, 2013, now abandoned; which claims the benefit of U.S. Prov. Pat. App. Nos. 61/803,721, filed March 20, 2013; 61/767,647, filed February 21, 2013; 61/767,676, filed February 21, 2013; 61/764,563, filed February 14, 2013; 61/762,225, filed February 7, 2013; 61/655,541, filed June 5, 2012; 61/655,527, filed June 5, 2012; 61/654,383, filed June 1, 2012; 61/654,292, filed June 1, 2012; 61/647,478, filed May 15, 2012, and 61/646,538, filed May 14, 2012; and U.S. Pat. App. No. 15/360,886 is also a continuation-in-part of International Pat. App. No. PCT/US2015/032739, filed May 27, 2015; which is a continuation of International Pat. App. No. PCT/US2014/050427, filed August 08, 2014, which is a continuation of U.S. Pat. App. No. 14/279,241, filed May 15, 2014, now abandoned; U.S. Pat. App. No. 15/703,891 is also a continuation-in-part of U.S. Pat. App. No. 15/647,140, filed July 11, 2017, now U.S. Pat. No. 9,820,999; which claims the benefit of U.S. Prov. Pat. App. No. 62/378,140, filed August 22,

2016; any of the above applications, U.S. patents issued from, or U.S. publications of any of the above applications are incorporated by references in their entirety.

The above U.S. Pat. App. No. 15/647,140 also claims the benefit of U.S. Prov. Pat. App. No. 62/431,287, filed December 7, 2016.

REMARKS

In the specification, paragraphs [1] has been amended to add a U.S. provisional patent application No. 62/431,287 in the priority claims. Applicant respectfully requests entry of this amendment under 37 CFR §1.312.

The Commissioner is authorized to charge any fee which may be required in connection with the Amendments to deposit account No. 50-5394.

Respectfully submitted,

Dated: July 3, 2018

/Yuefen Zhou/

Yuefen Zhou, Ph.D.
Registration No. 73398
CUSTOMER NUMBER: 97149

MASCHOFF BRENNAN
20 Pacifica, Suite 1130
Irvine, California 92618
Telephone: 949.202.1899
Facsimile: 949.453.1104
Email: Docket@mabr.com

Electronic Acknowledgement Receipt

EFS ID:	33085403
Application Number:	15820305
International Application Number:	
Confirmation Number:	1046
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Customer Number:	97149
Filer:	Brent Arthur Johnson/Maria Nadal
Filer Authorized By:	Brent Arthur Johnson
Attorney Docket Number:	A3226.10005US49
Receipt Date:	03-JUL-2018
Filing Date:	21-NOV-2017
Time Stamp:	17:24:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		A3226-10005US49_AMENDMENT_AFTER_ALLOWANCE.pdf	55510 243c7a2143fff770935a3d7784e44467426a25f1	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment after Notice of Allowance (Rule 312)	1	1
	Specification	2	3
	Applicant Arguments/Remarks Made in an Amendment	4	4
Warnings:			
Information:			
	Total Files Size (in bytes):	55510	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

CORRECTED ADS FORM

Application Number	15820305
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome

Inventor Information

****If no data is shown, no data has been corrected****

	Data of Record	Updated Data
Order Number		
Name		
Residence Information		
Residency		
City		
State		
Country of Residence		
Mailing Address of Inventor		
Address 1		
Address 2		
City,State/Province, Postal Code		
Country		

Corrected ADS 1.0

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

Application Information

	Data of Record	Updated Data
Title of Invention	Neridronic Acid for Treating Complex Regional Pain Syndrome	
Attorney Docket Number	A3226.10005US49	
Entity Type	Small	

Domestic Benefit/National Stage Information

****If no data is shown, no data has been corrected****

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121,365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S. C. 119(e) or 120, and 37 CFR 1.78(a).

		Data of Record	Updated Data
	Prior Application Status	patented	
	Application Number	15820305	
	Continuity Type	CON	
	Prior Application Number	15703891	
	Filing Date (YYYY-MM-DD)	2017-09-13	
	Patent Number	9931352	
	Issue Date (YYYY-MM-DD)	2018-04-03	

Corrected ADS 1.0

		Data of Record	Updated Data
	Prior Application Status	patented	
	Application Number	15703891	
	Continuity Type	CON	
	Prior Application Number	15360886	
	Filing Date (YYYY-MM-DD)	2016-11-23	
	Patent Number	9770457	
	Issue Date (YYYY-MM-DD)	2017-09-26	

		Data of Record	Updated Data
	Prior Application Status	patented	
	Application Number	14279229	
	Continuity Type	CON	
	Prior Application Number	14063979	
	Filing Date (YYYY-MM-DD)	2013-10-25	
	Patent Number	8802658	
	Issue Date (YYYY-MM-DD)	2014-08-12	

		Data of Record	Updated Data
	Prior Application Status	abandoned	
	Application Number	14063979	
	Continuity Type	CIP	
	Prior Application Number	13894274	
	Filing Date (YYYY-MM-DD)	2013-05-14	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61803721	
	Filing Date (YYYY-MM-DD)	2013-03-20	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61767647	
	Filing Date (YYYY-MM-DD)	2013-02-21	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61767676	
	Filing Date (YYYY-MM-DD)	2013-02-21	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61764563	
	Filing Date (YYYY-MM-DD)	2013-02-14	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61762225	
	Filing Date (YYYY-MM-DD)	2013-02-07	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61655541	
	Filing Date (YYYY-MM-DD)	2012-06-05	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61655527	
	Filing Date (YYYY-MM-DD)	2012-06-05	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61654383	
	Filing Date (YYYY-MM-DD)	2012-06-01	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	patented	
	Application Number	15360886	
	Continuity Type	CIP	
	Prior Application Number	15217773	
	Filing Date (YYYY-MM-DD)	2016-07-22	
	Patent Number	9623038	
	Issue Date (YYYY-MM-DD)	2017-04-18	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61654292	
	Filing Date (YYYY-MM-DD)	2012-06-01	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61647478	
	Filing Date (YYYY-MM-DD)	2012-05-15	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	13894274	
	Continuity Type	PRO	
	Prior Application Number	61646538	
	Filing Date (YYYY-MM-DD)	2012-05-14	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status		
	Application Number	15360886	
	Continuity Type	CIP	
	Prior Application Number	PCT/US2015/032739	
	Filing Date (YYYY-MM-DD)	2015-05-27	
	Patent Number		
	Issue Date (YYYY-MM-DD)		

		Data of Record	Updated Data
	Prior Application Status		
	Application Number	PCT/US2015/032739	
	Continuity Type	CON	
	Prior Application Number	PCT/US2014/050427	
	Filing Date (YYYY-MM-DD)	2014-08-08	
	Patent Number		
	Issue Date (YYYY-MM-DD)		

		Data of Record	Updated Data
	Prior Application Status	abandoned	
	Application Number	PCT/US2014/050427	
	Continuity Type	CON	
	Prior Application Number	14279241	
	Filing Date (YYYY-MM-DD)	2014-05-15	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	patented	
	Application Number	15703891	
	Continuity Type	CIP	
	Prior Application Number	15647140	
	Filing Date (YYYY-MM-DD)	2017-07-11	
	Patent Number	9820999	
	Issue Date (YYYY-MM-DD)	2017-11-21	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	15647140	
	Continuity Type	PRO	
	Prior Application Number	62378140	
	Filing Date (YYYY-MM-DD)	2016-08-22	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status		expired
	Application Number		15/647140
	Continuity Type		PRO
	Prior Application Number		62/431287
	Filing Date (YYYY-MM-DD)		2016-12-07
	Patent Number		
	Issue Date (YYYY-MM-DD)		

		Data of Record	Updated Data
	Prior Application Status	patented	
	Application Number	15217773	
	Continuity Type	CON	
	Prior Application Number	14967224	
	Filing Date (YYYY-MM-DD)	2015-12-11	
	Patent Number	9408861	
	Issue Date (YYYY-MM-DD)	2016-08-09	

		Data of Record	Updated Data
	Prior Application Status	patented	
	Application Number	14967224	
	Continuity Type	CON	
	Prior Application Number	14604524	
	Filing Date (YYYY-MM-DD)	2015-01-23	
	Patent Number	9211257	
	Issue Date (YYYY-MM-DD)	2015-12-15	

		Data of Record	Updated Data
	Prior Application Status	abandoned	
	Application Number	14604524	
	Continuity Type	CIP	
	Prior Application Number	14536526	
	Filing Date (YYYY-MM-DD)	2014-11-07	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	patented	
	Application Number	14536526	
	Continuity Type	CIP	
	Prior Application Number	14446184	
	Filing Date (YYYY-MM-DD)	2014-07-29	
	Patent Number	9006279	
	Issue Date (YYYY-MM-DD)	2015-04-14	

		Data of Record	Updated Data
	Prior Application Status	patented	
	Application Number	14446184	
	Continuity Type	DIV	
	Prior Application Number	14288716	
	Filing Date (YYYY-MM-DD)	2014-05-28	
	Patent Number	8835650	
	Issue Date (YYYY-MM-DD)	2014-09-16	

		Data of Record	Updated Data
	Prior Application Status	pending	
	Application Number	14288716	
	Continuity Type	PRO	
	Prior Application Number	61933608	
	Filing Date (YYYY-MM-DD)	2014-01-30	
	Patent Number		
	Issue Date (YYYY-MM-DD)	0001-01-01	

		Data of Record	Updated Data
	Prior Application Status	patented	
	Application Number	14536526	
	Continuity Type	CIP	
	Prior Application Number	14279229	
	Filing Date (YYYY-MM-DD)	2014-05-15	
	Patent Number	9034889	
	Issue Date (YYYY-MM-DD)	2015-05-19	

Foreign Priority Information

****If no data is shown, no data has been corrected****

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

		Data of Record	Updated Data
	Application Number		
	Country		
	Filing Date		
	Access Code		

Applicant Information

****If no data is shown, no data has been corrected****
Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

	Data of Record	Updated Data
Applicant Type		

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is		
Name of the Deceased or Legally Incapacitated Inventor		
Applicant is an Organization		
Name		
Organization Name		
Address 1		
Address 2		
City,State/Province,Postal Code		
Country		
Phone Number		
Fax Number		
Email Address		

Assignee Information including Non-Applicant Assignee Information

****If no data is shown, no data has been corrected****
Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office

	Data of Record	Updated Data
Order		
Applicant is an Organization		
Name		

Organization Name		

Mailing Address

Address 1		
Address 2		
City,State/Province,Postal Code		
Country		
Phone Number		
Fax Number		
Email Address		

Signature

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Yuefen Zhou/	Registration Number	73398
First Name	Yuefen	Last Name	Zhou

Electronic Acknowledgement Receipt

EFS ID:	33085471
Application Number:	15820305
International Application Number:	
Confirmation Number:	1046
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	
Customer Number:	97149
Filer:	Brent Arthur Johnson/Maria Nadal
Filer Authorized By:	Brent Arthur Johnson
Attorney Docket Number:	A3226.10005US49
Receipt Date:	03-JUL-2018
Filing Date:	21-NOV-2017
Time Stamp:	17:32:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet to update/ correct info	CorrectedADS.pdf	227390 57f922ee7771fe91a05faa366a31c9a139d183d9	no	14

Warnings:

Information:	
Total Files Size (in bytes):	227390

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: IFEE PTOL/85B-EFS

Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
15820305	21-Nov-2017	Herriot Tabuteau	A3226.10005US49	1046

TITLE OF INVENTION :

Neridronic Acid for Treating Complex Regional Pain Syndrome

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Small	Utility under 35 USC 111(a)	1628	108000	REI TSANG SHIAO

Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
$500	$0	$500	06-Aug-2018	$0

1.Change of Correspondence Address and/or Indication Of Fee Address (37 CFR 1.33 & 1.363)

Current Correspondence Address:	Current Indicated Fee Address :
97149 Maschoff Brennan 1389 Center Drive, Suite 300 Park City UT 84098 UNITED STATES 435-252-1360 docket@mabr.com	
☐ Change of correspondence address requested, system generated AIA/122-EFS form attached	☐ Fee Address indication requested, system generated SB/47-EFS form attached

2.Entity Status

Change in Entity Status

○ Applicant certifying micro entity status; system generated Micro Entity certification form attached. See 37 CFR 1.29.
Note: Absent a valid certification of micro entity status, issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. If this box is checked, you will be prompted to choose a micro entity status on the gross income basis (37 CFR 1.29(a)) or the institution of higher education basis (37 CFR 1.29(d)), and make the applicable certification online.

◉ Applicant asserting small entity status. See 37 CFR 1.27.
Note: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

○ Applicant changing to regular undiscounted fee status.
Note: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

Doc Code: IFEE PTOL/85B-EFS

Document Description: Issue Fee Payment (PTO-85B)

3.The Following Fee(s) Are Submitted:

☒ Issue Fee

☐ I authorize USPTO to apply my previously paid issue fee to the current fees due

☐ Publication Fee

☐ The Director is hereby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number _____

☐ Advance Order - # of copies _____

☒ If i**n addition to** the payment of the issue fee amount submitted with this form, there are any discrepancies in any amount(s) due, the Director is authorized to charge any deficiency or credit any overpayment, to Deposit Account Number 505394 . The **issue fee must be submitted** with this form. **If payment of the issue fee does not accompany this form, checking this box and providing a deposit account number will NOT be effective to satisfy full payment of the fee(s) due.**

4.Firm and/or Attorney Names To Be Printed

NOTE: If no name is listed, no name will be printed
For printing on the patent front page, list to be displayed as entered

1. MASCHOFF BRENNAN LAYCOCK GILMORE
2. BRENT A. JOHNSON
3. YUEFEN ZHOU

5.Assignee Name(s) and Residence Data To Be Printed

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

Name	City	State	Country	Category
ANTECIP BIOVENTURES II LLC	NEW YORK	NEW YORK	united states	corporation

6.Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/Brent A. Johnson/	**Date**	07-05-2018
Name	Brent Arthur Johnson	**Registration Number**	51851

WEB IFEE 1.0

Electronic Patent Application Fee Transmittal

Application Number:	15820305
Filing Date:	21-Nov-2017
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Filer:	Brent Arthur Johnson/Maria Nadal
Attorney Docket Number:	A3226.10005US49

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPL ISSUE FEE	2501	1	500	500
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**500**

Electronic Acknowledgement Receipt	
EFS ID:	33086924
Application Number:	15820305
International Application Number:	
Confirmation Number:	1046
Title of Invention:	Neridronic Acid for Treating Complex Regional Pain Syndrome
First Named Inventor/Applicant Name:	Herriot Tabuteau
Customer Number:	97149
Filer:	Brent Arthur Johnson/Maria Nadal
Filer Authorized By:	Brent Arthur Johnson
Attorney Docket Number:	A3226.10005US49
Receipt Date:	05-JUL-2018
Filing Date:	21-NOV-2017
Time Stamp:	12:15:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$500
RAM confirmation Number	070518INTEFSW12154000
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	Web85b.pdf	46344 1543e29480f7cf989ef75063f90a42d700ca35e7	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32252 c897dc5fb02c620c2d7ee306baf678c59f694e6e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	78596		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/820,305	11/21/2017	Herriot Tabuteau	A3226.10005US49

CONFIRMATION NO. 1046

97149
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

IMPROPER CFR REQUEST

Date Mailed: 07/06/2018

RESPONSE TO REQUEST FOR CORRECTED FILING RECEIPT

Continuity, Priority Claims, Petitions, and Non-Publication Requests

In response to your request for a corrected Filing Receipt, the Office is unable to comply with your request because:

- The priority or continuity claim has not been entered because it was not filed during the required time period. Applicant may wish to consider filing a petition to accept an unintentionally delayed claim for priority. See 37 CFR 1.55 or 1.78.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/ggasgedom/

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Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/820,305	11/21/2017	Herriot Tabuteau	A3226.10005US49	1046

97149 7590 07/13/2018

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UTAH 84098
UNITED STATES OF AMERICA

EXAMINER	
SHIAO, REI TSANG	

ART UNIT	PAPER NUMBER
1628	

NOTIFICATION DATE	DELIVERY MODE
07/13/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket@mabr.com
info@mabr.com

UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR/ PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
15/820,305	11/21/2017	Tabuteau, Herriot	A3226.10005US49

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

EXAMINER	
REI TSANG SHIAO	
ART UNIT	PAPER
1628	20180709

DATE MAILED: _____

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

The amendment of specification dated 7/3/2018 has been entered.

/REI TSANG SHIAO/
Primary Examiner, Art Unit 1628

PTO-90C (Rev.04-03)

Amendment to the Specification: /REI TSANG SHIAO/

Please replace paragraph [1] in the Section of "CROSS-REFERENCE TO RELATED APPLICATIONS" with the following amended paragraph:

[1] This application is a continuation of U.S. Pat. App. No. 15/703,891, filed September 13, 2017; which is a continuation of U.S. Pat. App. No. 15/360,886, filed November 23, 2016, now U.S. Pat. No. 9,770,457; which is a continuation-in-part of U.S. Pat. App. No. 15/217,773, filed July 22, 2016, now U.S. Pat. No. 9623038; which is a continuation of U.S. Pat. App. No. 14/967,224, filed December 11, 2015, now U.S. Pat. No. 9,408,861; which is a continuation of U.S. Pat. App. No. 14/604,524, filed on January 23, 2015, now U.S. Pat. No. 9,211,257; which is a continuation-in-part of U.S. Pat. App. No. 14/536,526, filed on November 7, 2014, now abandoned; which is a continuation-in-part of U.S. Pat. App. No. 14/446,184, filed on July 29, 2014, now U.S. Pat. No. 9,006,279; which is a divisional of U.S. Pat. App. No. 14/288,716, filed May 28, 2014, now U.S. Pat. No. 8,835,650; which claims the benefit of U.S. Prov. Pat. App. No. 61/933,608, filed January 30, 2014; U.S. Pat. App. No. 14/536,526 is also a continuation-in-part of U.S. Pat. App. No. 14/279,229, filed May 15, 2014, now U.S. Pat. No. 9,034,889; which is a continuation of U.S. Pat. App. No. 14/063,979, filed October 25, 2013, now U.S. Pat. No. 8,802,658; which is a continuation-in-part of U.S. Pat. App. No. 13/894,274, filed May 14, 2013, now abandoned; which claims the benefit of U.S. Prov. Pat. App. Nos. 61/803,721, filed March 20, 2013; 61/767,647, filed February 21, 2013; 61/767,676, filed February 21, 2013; 61/764,563, filed February 14, 2013; 61/762,225, filed February 7, 2013; 61/655,541, filed June 5, 2012; 61/655,527, filed June 5, 2012; 61/654,383, filed June 1, 2012; 61/654,292, filed June 1, 2012; 61/647,478, filed May 15, 2012, and 61/646,538, filed May 14, 2012; and U.S. Pat. App. No. 15/360,886 is also a continuation-in-part of International Pat. App. No. PCT/US2015/032739, filed May 27, 2015; which is a continuation of International Pat. App. No. PCT/US2014/050427, filed August 08, 2014, which is a continuation of U.S. Pat. App. No. 14/279,241, filed May 15, 2014, now abandoned; U.S. Pat. App. No. 15/703,891 is also a continuation-in-part of U.S. Pat. App. No. 15/647,140, filed July 11, 2017, now U.S. Pat. No. 9,820,999; which claims the benefit of U.S. Prov. Pat. App. No. 62/378,140, filed August 22,

2016; any of the above applications, U.S. patents issued from, or U.S. publications of any of the above applications are incorporated by references in their entirety.

The above U.S. Pat. App. No. 15/647,140 also claims the benefit of U.S. Prov. Pat. App. No. 62/431,287, filed December 7, 2016.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/820,305	08/21/2018	10052338	A3226.10005US49	1046

97149 7590 08/01/2018

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Herriot Tabuteau, New York, NY;
ANTECIP BIOVENTURES II LLC, New York, NY;