## CENTER FOR DRUG EVALUATION AND RESEARCH

**APPLICATION NUMBER:** 

205029Orig1s000

**PHARMACOLOGY REVIEW(S)** 



# DEPARTMENT OF HEALTH AND HUMAN SERVICES PUBLIC HEALTH SERVICE FOOD AND DRUG ADMINISTRATION CENTER FOR DRUG EVALUATION AND RESEARCH

### PHARMACOLOGY/TOXICOLOGY NDA/BLA REVIEW AND EVALUATION

Application number: NDA 205-029

Supporting document/s: 0000

Applicant's letter date: December 4, 2012

CDER stamp date: December 4, 2012

Product: Epinephrine (HCL) Injection

USP, 1:1000 (1mg/mL)

Indication: Treatment of increasing systemic arterial blood

pressure in acute hypotensive states associated with

septic shock

Applicant: Belcher Pharmaceuticals, LLC (Belcher)

Review Division: Cardiovascular and Renal Products

Reviewer: Rama Dwivedi, Ph.D.

Supervisor/Team Leader: Thomas Papoian, Ph.D.

Division Director: Norman Stockbridge, M.D., Ph.D.

Project Manager: Russell Fortney

Template Version: September 1, 2010 (Modified by DCRP: December 12, 2012)

#### **Disclaimer**

Except as specifically identified, all data and information discussed below and necessary for approval of NDA205-029 are owned by Belcher Pharmaceuticals or are data for which Belcher Pharmaceuticals, LLC (Belcher) has obtained a written right of reference. Any information or data necessary for approval of NDA205-029 that Belcher Pharmaceuticals, LLC (Belcher) does not own or have a written right to reference constitutes one of the following: (1) published literature, or (2) a prior FDA finding of safety or effectiveness for a listed drug, as reflected in the drug's approved labeling. Any data or information described or referenced below from reviews or publicly available summaries of a previously approved application is for descriptive purposes only and is not relied upon for approval of NDA205-029



### TABLE OF CONTENTS

1	EX	ECUTIVE SUMMARY	6
	1.1	INTRODUCTION AND CLINICAL RATIONALE	6
	1.2	BRIEF SUMMARY OF NONCLINICAL FINDINGS	
	1.3	RECOMMENDATIONS	
	1.3	.1 Approvability	
		3 Labeling	
2		UG INFORMATION	
4		Drug	
	2.1	RELEVANT NDAS.	
	2.3	Drug Formulation.	
	2.4	COMMENTS ON NOVEL EXCIPIENTS	11
	2.5	COMMENTS ON IMPURITIES/DEGRADANTS OF CONCERN	
	2.6	PROPOSED CLINICAL POPULATION AND DOSING REGIMEN	
	2.7	REGULATORY BACKGROUND	
3	S	STUDIES SUBMITTED	12
	3.1	Studies Reviewed	
	3.2	Studies Not Reviewed	
	3.3	Previous Reviews Referenced	
4	I	PHARMACOLOGY	13
	4.1	PRIMARY PHARMACOLOGY	13
	4.2	PRIMARY PHARMACOLOGY: STUDIES FROM THE LITERATURE	
	4.3.1	SAFETY PHARMACOLOGY	
5	PH	ARMACOKINETICS/ADME/TOXICOKINETICS	35
6	GE	NERALTOXICOLOGY	36
	6.1	SINGLE-DOSE TOXICITY	36
	6.2	REPEAT-DOSE TOXICITY STUDIES	36
7	GE	NETIC TOXICOLOGY	40
8	CA	RCINOGENICITY	40
9	RE	PRODUCTIVE AND DEVELOPMENTAL TOXICOLOGY	41
10	O SP	ECIAL TOXICOLOGY STUDIES	42
	10.1	ASTM HEMOLYSIS-DIRECT CONTACT METHOD (ASTM F 756-08)	42
1	1 IN'	TEGRATED SUMMARY AND SAFETY EVALUATION	
-	11.1	Introduction	
	11.1	PHARMACOLOGY	
	11.3	TOXICOLOGY	
	11.4	GENOTOXICITY	
	11.5	CARCINOGENICITY	48



### NDA# 205029

Reviewer:	Rama	S.	Dwived
-----------	------	----	--------

12	REFERENCES	40
11.7	7 Conclusion	48
11 4	5 DEVELOPMENTAL TOXICOLOGY	40



Reviewer: Rama S. Dwivedi NDA# 205029

### **Table of Tables**

Table 1: Effect of epinephrine on vital organ system	.15
<b>Table 2:</b> Time course of arterial metabolic parameters at baseline and 180 minutes in saline,	
epinephrine, or norepinephrine control groups, and endotoxemic rats treated with or without	
epinephrine or norepinephrine from 90 to 180 minutes (Sponsor's table)	20
<b>Table 3:</b> Course of tissue lactate (nmol/mg wet/weight) and lactate/pyruvate (L/R) ratio at	
baseline and 180 minutes in saline, epinephrine, or norepinephrine control groups, and	
endotoxemic rats treated with or without epinephrine or norepinephrine from 90 to 180 minute	es
(Sponsor's table)	
Table 4: The Median Lethal Dose(s) of Epinephrine (Sponsor's table)	36
Table 5: Survival and Median Body Weights of Rats in the 14-Day In halation Study of	
Epinephrine Hydrochloride (NTP)	. 37
<b>Table 6</b> : Survival and Median Body Weights of Mice in the 14-Day In halation Study of	
r r Janes I i janes I I i jane	. 37
Table 7: Organ Weights for rat in the 13-Week Inhalation Study of Epinephrine Hydrochlorid	le
(a)	. 38
Table 8: Change in Organ weights for mice in the 13-Week Inhalation studies of Epinephrine	
hydrochloride (a)	. 39
Table 9: Nasal Passage Lesions Observed in Mice in the 2-Year Inhalation Studies of	
Epinephrine Hydrochloride	40
<b>Table 10:</b> Effect of epinephrine on early pregnancy of rabbit (Sponsor's table)	
Table 11: Supplies (Sponsor's table)	
Table 12: Standard Hemoglobin Concentration (Sponsor's table)	
Table 13: Preparation of test article and controls (Sponsor's table)	44
Table 14: Color Determinations (Sponsor's table)	45
Table 15: Hemolytic Grades	45



## DOCKET

## Explore Litigation Insights



Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

### **Real-Time Litigation Alerts**



Keep your litigation team up-to-date with **real-time** alerts and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

### **Advanced Docket Research**



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

### **Analytics At Your Fingertips**



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

### API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

#### **LAW FIRMS**

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

#### **FINANCIAL INSTITUTIONS**

Litigation and bankruptcy checks for companies and debtors.

### **E-DISCOVERY AND LEGAL VENDORS**

Sync your system to PACER to automate legal marketing.

