

## Curriculum Vitae

**Maureen D. Donovan, Ph.D.**

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**Education:** University of Minnesota College of Pharmacy  
Minneapolis, Minnesota  
Bachelor of Science in Pharmacy, 1983

University of Michigan College of Pharmacy  
Horace H. Rackham School of Graduate Studies  
Ann Arbor, Michigan  
Ph.D. (Pharmaceutics), 1989

### PROFESSIONAL EXPERIENCE

*2013-present*     **Associate Dean for Undergraduate Programs**  
College of Pharmacy  
University of Iowa  
Iowa City, IA

*2008-2013*     **Division Head**  
Division of Pharmaceutics and Translational Therapeutics  
University of Iowa College of Pharmacy  
Iowa City, IA

*2008-present*     **Professor**  
Division of Pharmaceutics and Translational Therapeutics  
University of Iowa College of Pharmacy  
Iowa City, IA

*1996-2008*     **Associate Professor**  
University of Iowa College of Pharmacy  
Division of Pharmaceutics  
Iowa City, IA

*1989-1996*     **Assistant Professor**  
University of Iowa College of Pharmacy  
Division of Pharmaceutics  
Iowa City, IA

*1991*     **Visiting Scholar**  
SmithKline Beecham Pharmaceuticals  
King of Prussia, PA

*1986-88*     **Staff Pharmacist**  
Clark Professional Pharmacy  
Ypsilanti, MI

Exhibit 1052

## ADDITIONAL POSITIONS AND MEMBERSHIPS

- 2011-present Visiting Professor, Tongji School of Pharmacy, Tongji Medical University, Wuhan, China
- 2010-present Member, Environmental Health Sciences Research Center, University of Iowa
- 2009-10 Member, Nanoscience and Nanotechnology Institute at the University of Iowa.

## PUBLICATIONS

### Thesis

Donovan, Maureen D. The Molecular Weight Permeability Dependence of the Absorption of Polyethylene Glycols in the Nasal and Gastrointestinal Mucosa and Its Correlation to Size Dependent Diffusion. Ph.D. Thesis, The University of Michigan, 1989.

### Publications

1. Miller SC and Donovan MD. Effect of Poloxamer Gels on the Miotic Activity of Pilocarpine Nitrate in Rabbits. *Int. J. Pharm.* 12, 147-152, 1982.
2. Donovan MD, Flynn GL, Amidon GL. The Molecular Weight Dependence of Nasal Absorption: The Effect of Absorption Enhancers. *Pharm. Res.* 7, 808-815, 1990.
3. Donovan MD, Flynn GL, Amidon GL. Absorption of Polyethylene Glycols 600 through 2000: The Molecular Weight Dependence of Gastrointestinal and Nasal Absorption. *Pharm. Res.* 7, 863-868, 1990.
4. Donovan MD and Zhou M. Drug Effects on *In Vivo* Nasal Clearance in Rats. *Int. J. Pharm.* 116, 77-86, 1995.
5. Chung FY and Donovan MD. Pre-systemic Bradykinin Metabolism in Rat and Sheep Nasal Homogenates. *J. Pharm. Sci.* 84, 794-798, 1995.
6. Chung FY and Donovan MD. Bradykinin Metabolism in Rat and Sheep Nasal Secretions. *J. Pharm. Sci.* 84, 829-834, 1995.
7. Bhat PG, Flanagan DR, Donovan MD. The Limiting Role of Mucus in Drug Absorption: Drug Permeation through Mucus Solution. *Int. J. Pharm.* 126, 179-187, 1995.
8. Huang Y and Donovan MD. Microsphere Transport Pathways in the Rabbit Nasal Mucosa. *Int. J. Pharm. Adv.* 1, 298-309, 1996.
9. Chung FY and Donovan MD. Nasal Pre-systemic Metabolism of Peptide Drugs: Substance P Metabolism in the Sheep Nasal Cavity. *Int. J. Pharm.* 128, 229-237, 1996.
10. Zhou M and Donovan MD. Recovery of the Nasal Epithelium following Laureth-9 Induced Damage. *Int. J. Pharm.* 130, 93-102, 1996.
11. Bhat PG, Flanagan DR, Donovan MD. Drug Diffusion through Cystic Fibrotic Mucus: Steady-State Permeation, Rheologic Properties, and Glycoprotein Morphology. *J. Pharm. Sci.* 85, 624-630, 1996.
12. Bhat PG, Flanagan DR, Donovan MD. Drug Binding to Gastric Mucus Glycoproteins. *Int. J. Pharm.* 134, 15-25, 1996.

13. Zhou M and Donovan MD. Intranasal Mucociliary Clearance of Bioadhesive Polymer Gels. *Int. J. Pharm.* 135, 115-125, 1996.
14. Nardviriyakul N, Wurster DE, Donovan MD. Determination of Diffusion Coefficients of Sodium p-Aminosalicylate in Sheep Nasal Membranes and Dialysis Membranes by Fourier Transform Infrared Horizontal Attenuated Total Reflectance Spectroscopy. *J. Pharm. Sci.* 86, 19-25, 1997.
15. Chou K-J and Donovan MD. Distribution of Antihistamines into the CSF following Intranasal Delivery. *Biopharm. Drug Disp.* 18, 335-346, 1997.
16. Donovan MD and Huang Y. Large Molecule and Particulate Uptake in the Nasal Cavity: The Effect of Size on Nasal Absorption. *Adv. Drug Deliver. Rev.* 29, 147-155, 1998.
17. Chou K-J and Donovan MD. Distribution of Local Anesthetics into the CNS following Intranasal Administration. *Int. J. Pharm.* 168, 137-145, 1998.
18. Chou K-J and Donovan MD. Lidocaine Distribution into the CNS following Nasal and Arterial Delivery: A Comparison of Local Sampling and Microdialysis Techniques. *Int. J. Pharm.* 171, 53-61, 1998.
19. Khanvilkar K, Donovan MD, Flanagan DR. Drug Transfer through Mucus. *Adv. Drug Deliv. Rev.* 48, 173-193, 2001.
20. Donovan MD Sex and Racial Differences in Pharmacologic Response: Effect of Route of Administration and Drug Delivery System on Pharmacokinetics. *J. Womens Health* 14(1), 30-37, 2005.
21. Kandimalla K. and Donovan M.D. Carrier Mediated Transport of Chlorpheniramine and Chlorcyclizine across Bovine Olfactory Mucosa: Implications on Nose-to-Brain Transport. *J. Pharm. Sci.* 94, 613-624, 2005.
22. Sinn PL, McCray PB, Donovan MD, Shah AJ. Viscoelastic Gel Formulations Enhance Airway Epithelial Gene tTransfer with Viral Vectors. *Am. J. Resp. Cell. Mol. Biol.* 32, 404-410, 2005.
23. Chemuturi NV, Hayden P, Klausner M, and Donovan MD. Comparison of Human Tracheal/bronchial Epithelial Cell Cultures (EpiAirway) and Bovine Nasal Respiratory Explants for Nasal Drug Transport Studies. *J. Pharm. Sci.* 94, 1976-1985, 2005.
24. Kandimalla K. and Donovan M.D. Localization and Differential Activity of P-glycoprotein in the Bovine Olfactory and Nasal Respiratory Mucosae. *Pharm. Res.* 22, 1121-1128, 2005.
25. Kandimalla K. and Donovan M.D. Transport of Hydroxyzine and Triprolidine Across Bovine Olfactory Mucosa: Role of Passive Diffusion in the Direct Nose-to-Brain Uptake of Small Molecules. *Int. J. Pharm.* 302, 133-144, 2005.
26. Chemuturi NV and Donovan MD. Metabolism of Dopamine Hydrochloride by the Nasal Mucosa. *J. Pharm. Sci.* 95, 2507-2515, 2006 (doi:10.1002/jps.20724).
27. Chemuturi NV, Haraldsson JE, Prisinzano TP, and Donovan MD. Role of Dopamine Transporter (DAT) in Dopamine Transport Across the Nasal Mucosa. *Life Sci.* 79, 1391-1398, 2006.

28. Donovan MD. Nose to Brain Drug Delivery: An Optimistic Pessimist's Analysis. In *Respiratory Drug Delivery 2006*. Dalby RN, Byron PR, Peart J, Suman JD, Farr SJ (Eds). Davis Healthcare International Publishers, River Grove IL. 2006, p. 239-248.
29. Shah AJ and Donovan MD. Rheological Characterization of Bioadhesive Polysaccharide Polymers with Reduced Mucociliary Clearance for Intranasal Delivery. *AAPS PharmSciTech*, 8(2):Article 32, 2007. (<http://www.aapspharmscitech.org>) doi: [10.1208/pt0802032](https://doi.org/10.1208/pt0802032)
30. Shah AJ and Donovan MD. Formulating Gels for Decreased Mucociliary Transport Using Rheologic Properties: Polyacrylic Acids. *AAPS PharmSciTech*, Article 33, 2007. (<http://www.aapspharmscitech.org>) doi: [10.1208/pt0802033](https://doi.org/10.1208/pt0802033)
31. Foo M-Y, Cheng Y-S, Su W-C, and Donovan MD. The Influence of Spray Geometry on Intranasal Deposition and Distribution. *J. Aerosol Med.* 20 (4), 495-508, 2007 [doi: 10.1089/jam.2007.0638]
32. Chemuturi NV and Donovan MD. The Role of Organic Cation Transporters in Dopamine Transport Across Olfactory and Nasal Respiratory Tissues. *Mol. Pharmaceutics*, 4(6), 936-942, 2007. [doi:10.1021/mp070032u]
33. Abbas AO, Donovan MD, Salem A. Technical Aspects of Formulating Poly (lactide-co-glycolide). *J. Pharm. Sci.*, 97, 2448-2467, 2008. [doi: 10.1002/jps21215]
34. Zhang H, Schmidt M, Murry DJ, Donovan MD. Permeation and Systemic Absorption of R- and S- Baclofen across the Nasal Mucosa. *J. Pharm. Sci.*, 100. 2717-2723, 2011. [doi:10.1002/jps.22499; PMID 21283988]
35. Zhang H, Prisinzano T, and Donovan MD. Permeation and Metabolism of Cocaine in the Nasal Mucosa. *Eur J Drug Metab Pharmacokinetics* 37(4), 255-262, 2012. [doi:10.1007/s13318-012-0085-x]
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37. Lack WD, Fredricks D, Petersen E, Donovan MD, George M, Nepola J, Smucker J, Fermino JE. The Effect of Low Dose Aspirin on Bone Healing in a Rabbit Ulna Osteotomy Model. *J Bone Joint Surg*, 95(6), 488-96, 2013. [doi: 10.2106/JBJS.L.00462]
38. Al-Ghabeish M, Scheetz T, Assem M, Donovan MD. Microarray Determination of Expression of Drug Transporters in Humans and Animal Species Used in the Investigation of Nasal Absorption. *Mol. Pharm.* 12(8), 2742-2754, 2015.
39. Dhamankar V, Assem M, Donovan MD. Expression and Localization of Major Cytochrome P450 Metabolizing Isoforms in Bovine Nasal Olfactory and Respiratory Mucosa. *Inhal. Tox.* 16, 1-11, 2015. [doi: 10.3109/08959378.2015.1066903]
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41. Dhamankar V and Donovan MD. Metabolic Loss of Melatonin during Nasal Permeation Demonstrates CYP1A2-like Activity in the Nasal Mucosa. *In review*

42. Awasthi R, An Guohua, Donovan MD, Ponto LB. Relating Observed Psychoactive Effects to the Plasma Concentration of  $\Delta^9$ -tetrahydrocannabinol (THC) and Active Metabolite: An Effect-Compartment Modeling Approach. *in revision*
42. Reiland J and Donovan MD. Expression of Drug Transporters in Cultured Human Mammary Epithelial Cells. *in preparation*
43. Reiland J and Donovan MD. Analysis of Peptide Transport in MCF10A Cells by Flow Cytometry. *in preparation*
44. Foo M-Y and Donovan MD. Viscosity and Surface Tension Effects on Nasal Spray Characteristics. *in preparation*
45. Foo M-Y and Donovan MD. A Geometric Model to Predict Nasal Deposition Efficiency. *in preparation.*

#### Other Publications

1. Donovan MD. Rifampin Stability Monograph in *Chemical Stability of Pharmaceuticals. A Handbook for Pharmacists 2<sup>nd</sup> Edition*. Connors KA, Amidon GL, and Stella VJ, John Wiley & Sons, New York, NY 1986.
2. Amidon GL, Sinko PJ, Donovan MD. "Oral Absorption of Peptide and Peptide-Type Drugs: Problems and Prospects." in *Peptides, Theoretical and Practical Approaches to Their Delivery*. Capsugel Symposia Series, Greenwood, SC Capsugel Library, 1992.
3. Donovan MD. Gender Equity in Faculty Hiring and Retention in *The Dean's Compass: Practical Advice for Achieving Excellence*, P. Chase, B. Hayes, V. Yanchik (Eds). AACP 2007.
4. Donovan MD. Graduate Education in Colleges of Pharmacy in *The Dean's Compass: Practical Advice for Achieving Excellence*, P. Chase, B. Hayes, V. Yanchik (Eds). AACP 2007.

#### **BOOK CHAPTERS**

Donovan MD and Flanagan DR. "Bioavailability of Disperse Dosage Forms" in Pharmaceutical Dosage Forms: Disperse Systems Lieberman HA, Rieger MM, and Banker GS (Eds). Marcel Dekker, New York, 1995.

Donovan MD "The Effect of Route of Administration and Distribution on Drug Action" in *Modern Pharmaceutics (5<sup>th</sup> Ed)*. A.T. Florence and J. Siepmann (Eds), CRC Press, Boca Raton, FL, 2009

Donovan MD. "The Feminine World of Drug Delivery. On Female Needs and Delivery of Drugs Vaginally" in *Physical and Biophysical Foundations of Pharmacy Practice. Issues in Drug Delivery*. GL Flynn and MS Roberts. Michigan Publishing, Ann Arbor, MI 2015.

Donovan MD, Foo A, Sawant N. Aerosol Delivery to the Nasal Cavity – A Tortuous Pathway to Efficacy. In: Dhand, R, editor. *Textbook of Aerosol Medicine*. Knoxville(TN): International Society of Aerosols in Medicine; 2015. p.e1-40. Available from: [www.isam.org](http://www.isam.org).

#### **PATENTS**

"Formulation and method for treating neoplasms by inhalation" M.E. Placke, A.R. Imondi, M.J. Brooker, J.E. Frye, P.K. Shah, D.R. Flanagan, M.D. Donovan US 6,348,209.

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