

# REBECCA L. CARRIER

Chemical Engineering Department  
Northeastern University  
313 Snell Engineering Center, Boston, MA 02115-5000  
phone: 617-373-7126 fax: 617-373-2209 email: [r.carrier@neu.edu](mailto:r.carrier@neu.edu)  
<http://www1.coe.neu.edu/~rebecca/>

**GOAL :** To benefit human health and wellbeing by 1) advancing fundamental understanding of interactions between materials and biological systems, with specific applications in drug delivery and tissue engineering, and 2) engaging young scholars in the chemical sciences through synergistic practice oriented education.

## EDUCATION

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1995-2000 Massachusetts Institute of Technology Cambridge, MA  
Ph.D., Chemical Engineering

Thesis: "Cardiac Tissue Engineering: Bioreactor Cultivation Parameters." Studied the influence of chemical and hydrodynamic factors in the bioreactor environment on the structural, biochemical, and molecular properties of cell-polymer constructs. Thesis Advisor: Dr. Robert Langer

1991-1995 Rensselaer Polytechnic Institute Troy, NY  
B.S., Chemical Engineering (Minor in Studio Arts), GPA: 4.0/4.0

## EMPLOYMENT HISTORY

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2003-present Chemical Engineering Dept., Northeastern University Boston, MA  
*Associate Chair for Research (2014-present), Professor (2017-present), Associate Professor (2011-2017), Assistant Professor (2003-2011)*

- Pioneered a research program in 1. Mechanistic studies and modeling of drug delivery, with a focus on transport in the intestine and at mucosal surfaces, and 2. Tissue engineering approaches for intestine and retina.
- Developed and taught courses in Drug Delivery: Engineering Analysis, Quantitative Aspects of Cell and Tissue Engineering, Transport Phenomena, Unit Operations, Graduate Chemical Engineering Mathematics, and Chemical Engineering Thermodynamics.
- Supervised thesis work of 20 graduate students (4 current (3 PhD, 1 Master's), 16 graduated (11 PhD, 5 Master's)), 52 undergraduate and 6 graduate non-thesis research projects, and 20 Directed/Independent Studies (5 undergraduate, 15 graduate).

2000-2003 Pfizer, Inc. Groton, CT  
*Research Scientist – Controlled Release Formulations*

- Designed formulations and manufacturing processes for two novel osmotic drug delivery technologies for Phase I clinical studies. Assessed *in vitro* and *in vivo* release kinetics, stability, and performance sensitivity to manufacturing variability.
- Scaled up and supervised manufacturing process (blending, granulation, milling, tableting,

- coating) to produce 100,000 osmotic tablets for Phase II clinical trials.
- Organized drug delivery imaging research (NIR, IR, Raman, x-ray tomography).
  - Supervised lab work, research, and professional development of team of scientists.

## **PUBLICATIONS**

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### **Refereed Articles :**

Carlson T. L., Yildiz, H., Dar, Z., Lock, J. Y., Carrier, R. L.. 2018. Lipids alter microbial transport through intestinal mucus. PLoS One Dec 21;13(12):e0209151. doi: 10.1371/journal.pone.0209151.

Yeap, Y. Y., Lock, J., Lerkvikarn, S., Semin, T., Nguyen, N., Carrier, R. L. 2018. Intestinal mucus is capable of stabilizing supersaturation of poorly water-soluble drugs. J Control Release. S0168-3659(18)30684-9. doi: 10.1016/j.jconrel.2018.11.023.

Lock, J. Y., Carlson, T. L., Wang, C. M., Chen, A., **Carrier, R. L.** 2018. Acute Exposure to Commonly Ingested Emulsifiers Alters Intestinal Mucus Structure and Transport Properties. Scientific Reports, 8(1):10008.

Carlson, T. L., Lock, J. Y., **Carrier R. L.** 2018. Engineering the Mucus Barrier. Annual Reviews in Biomedical Engineering, 20:197-220.

Edington, C. D., Chen, W. L. K., Geishecker, E., Kassis, T., Soenksen, L. R., Bhushan, B. M., Freake, D., Kirschner, J., Maass, C., Tsamandouras, N., Valdez, J., Cook, C. D., Parent, T., Snyder, S., Yu, J., Suter, E., Shockley, M., Velazquez, J., Velazquez, J. J., Stockdale, L., Papps, J. P., Lee, I., Vann, N., Gamboa, M., LaBarge, M. E., Zhong, Z., Wang, X., Boyer, L. A., Lauffenburger, D. A., **Carrier, R. L.**, Communal, C., Tannenbaum, S. R., Stokes, C. L., Hughes, D. J., Rohatgi, G., Trumper, D. L., Cirit, M., Griffith, L. G. 2018. Interconnected Microphysiological Systems for Quantitative Biology and Pharmacology Studies. Scientific Reports, 8(1):4530.

Walsh, D. I. 3rd, Dydek, E. V., Lock, J. Y., Carlson, T. L., **Carrier, R. L.**, Kong, D. S., Cabrera, C. R., Thorsen, T. 2018. Emulation of Colonic Oxygen Gradients in a Microdevice. SLAS Technology, 23(2):164-171.

Lock J. Y., Carlson, T. L., **Carrier, R. L.** 2018. Mucus models to evaluate the diffusion of drugs and particles. Advanced Drug Delivery Reviews, 124:34-49.

Chen, W. L. K., Edington, C., Suter, E., Yu, J., Velazquez, J. J., Velazquez, J. G., Shockley, M., Large, E. M., Venkataramanan, R., Hughes, D. J., Stokes, C. L., Trumper, D. L., **Carrier, R. L.**, Cirit, M., Griffith, L. G., Lauffenburger, D. A. 2017. Integrated gut/liver microphysiological systems elucidates inflammatory inter-tissue crosstalk. Biotechnology and Bioengineering, 114(11):2648-2659

Rezhdo, O., DiMaio, S., Le, P., Littrell, K. C., **Carrier, R. L.** 2017. Characterization of colloidal structures during intestinal lipolysis using Small-Angle Neutron Scattering. Journal of Colloid and Interface Science, 499: 189-201.

Kundu, J., Michaelson, A., Baranov, P., Chiumiento, M. Nigl, T., Young, M. J., **Carrier, R. L.**

2018. Interphotoreceptor matrix based biomaterial: impact on human retinal progenitor cell attachment and differentiation. *Journal of Biomedical Materials Research B Applied Biomaterials*. 106(2):891-899.
- Rezhdo, O., Speciner, L., **Carrier, R. L.** 2016. Lipid-associated oral delivery: Mechanisms and analysis of oral absorption. *Journal of Controlled Release*, 240: 544-560.
- Koppes, A. N., Kamath, M., Pfluger, C. A., Burkey, D. D., Dokmeci, M., Wang, L., **Carrier, R. L.** 2016. Complex, multi-scale small intestinal topography replicated in cellular growth substrates fabricated via chemical vapor deposition of Parylene C. *Biofabrication*, 8(3): 035011.
- Kundu, J., Michaelson, A., Talbot, K., Baranov, P., Young, M. J., **Carrier, R. L.** 2016. Decellularized retinal matrix: Natural platforms for human retinal progenitor cell culture. *Acta Biomaterialia*, 31: 61-70.
- Yildiz, H. M., McKelvey, C. A., Marsac, P. J., and **Carrier, R. L.** 2015. Size selectivity of intestinal mucus to diffusing particulates is dependent on surface chemistry and exposure to lipids. *Journal of Drug Targeting*, 3(7-8): 768-774.
- Yildiz, H. M., Carlson, T. L., Goldstein, A. M., **Carrier R. L.** 2015. Mucus barriers to microparticles and microbes are altered in Hirschsprung's Disease. *Macromolecular Bioscience*, 15(5): 712-718.
- Yildiz, H. M., Speciner, L., Ozdemir, C., Cohen, D. E., **Carrier, R. L.** 2015. Food-associated stimuli enhance barrier properties of gastrointestinal mucus. *Biomaterials*, 54: 1-8.
- Wang, L., Pal, A. K., Isaacs, J. A., Bello, D., **Carrier, R. L.** 2014. Nanomaterial induction of oxidative stress in lung epithelial cells and macrophages. *Journal of Nanoparticle Research*, 16: 2591.
- Baranov, P., Michaelson A., Kundu J., **Carrier R. L.** Young M., 2014. Interphotoreceptor matrix-poly(caprolactone) composite scaffolds for human photoreceptor differentiation. *Journal of Tissue Engineering*, 5: 2041731414554139.
- Yu J., **Carrier R. L.**, March J. C., Griffith L. G. 2014. Three dimensional human small intestine models for ADME-Tox studies. *Drug Discovery Today*, 19(10): 1587-1594.
- Kundu J., Michaelson A., Baranov P., Young M. J., **Carrier R. L.** 2014. Approaches to cell delivery: substrates and scaffolds for cell therapy, *Developmental Ophthalmology*, 53: 143-54.
- Thiagarajah, J. R., Yildiz, H., Carlson, T., Thomas, A. R., Steiger, C., Pieretti, A., Zukerberg, L. R., **Carrier, R. L.**, Goldstein, A. M. 2014. Altered goblet cell differentiation and surface mucus properties in Hirschsprung disease, *PLoS One*, Jun 19; 9(6): e99944.
- McMahon, B. J., Pfluger, C. A., Sun, B., Ziemer K. S., Burkey D. D., **Carrier R. L.** 2014. Photoinitiated chemical vapor deposition of cytocompatible poly(2-hydroxyethyl methacrylate) films. *Journal of Biomedical Materials Research Part A*, 102(7): 2375-2382.
- Buyukozturk, F., Di Maio, S., Budil, D. E., **Carrier, R. L.** 2013. Effect of ingested lipids on drug dissolution and release with concurrent digestion: a modeling approach. *Pharmaceutical*

Research, 30(12): 3131-3144.

Wang, L., Acosta, M. A., Leach, J. B., **Carrier, R. L.** 2013. Spatially monitoring oxygen level in 3D microfabricated cell culture systems using optical oxygen sensing beads. *Lab on a Chip*, 13(8): 1586-1592.

Pfluger, C. A., McMahon, B. J., **Carrier, R. L.**, and Burkey, D. D. 2013. Precise, biomimetic replication of the multiscale structure of intestinal basement membrane using chemical vapor deposition, *Tissue Engineering*, 19(5-6): 649-656.

Gamsiz, D. E., Thombre, A. G., Ahmed, I., **Carrier, R. L.** 2013. Modeling the influence of complexation with cyclodextrins on oral absorption. *Biotechnology and Bioengineering*, 110(9): 2536-2547.

Chernenko, T., Buyukozturk, F., Miljkovic, M., **Carrier, R.**, Diem, M., Amiji, M. 2013. Label-free Raman microspectral analysis for comparison of cellular uptake and distribution between non-targeted and EGFR-targeted biodegradable polymeric nanoparticles. *Drug Delivery and Translational Research*, 3(6): 575.

Gu, M., Yildiz, H., **Carrier, R.**, Belfort, G. 2013. Discovery of low mucus adhesion surfaces. *Acta Biomaterialia*, 9(2): 5201-5207.

das Neves, J., Rocha, C. M., Gonçalves, M. P., **Carrier, R. L.**, Amiji, M., Bahia, M. F., Sarmiento B. 2012. Interactions of microbicide nanoparticles with a simulated vaginal fluid. *Molecular Pharmaceutics*, 9(11): 3347-3356.

diMaio, S., **Carrier, R. L.** 2011. Gastrointestinal contents post-lipid ingestion: In vivo measurements and in vitro models for studying oral drug delivery. *Journal of Controlled Release*, 151(2): 110-122.

Sadasivan, V. D., Narpala, S., Budil, D. E., Sacco, A. Jr., **Carrier, R. L.** 2011. Modeling the human intestinal mucin (MUC2) C-terminal cystine knot dimer. *Journal of Molecular Modeling*, 17(11): 2953-2963.

Gamsiz, D. E., Thombre, A. G., Ahmed, I., **Carrier, R. L.** 2011. Drug salts and solubilization: modeling the influence of cyclodextrins on oral absorption. *Annals of Biomedical Engineering*, 39(1): 455-468.

Crater, J., **Carrier, R. L.** 2010. Barrier properties of gastrointestinal mucus to nanoparticle transport. *Macromolecular Bioscience*, 10(12): 1473-1483.

Gamsiz, D.E., Ashtikar, M., Crison, J., Woltoz, W., Bolger, M.B., **Carrier, R.L.** 2010. Predicting the effect of fed state intestinal contents on drug dissolution. *Pharmaceutical Research*, 27(12): 2646-2656.

Wang, L., Murthy, S. K., Barabino, G. A., **Carrier, R. L.** 2010. Synergic effects of crypt-like topography and ECM proteins on intestinal cell behavior in collagen based membranes. *Biomaterials*, 31(29): 7586-7598.

Pfluger, C. A., Burkey, D. D., Wang, L., Sun, B., Ziemer, K. S., **Carrier, R. L.** 2010.

Biocompatibility of plasma enhanced chemical vapor deposited poly(2-hydroxyethyl methacrylate) films for biomimetic replication of the intestinal basement membrane. *Biomacromolecules*, 11: 1579–1584.

Gamsiz, D. E., Miller, L. A., Thombre, A. G., Ahmed, I., and **Carrier, R. L.** 2010. Modeling the influence of cyclodextrins on oral absorption of low solubility drugs: 1. Model development. *Biotechnology and Bioengineering*, 105(2): 409-420.

Gamsiz, D. E., Miller, L. A., Thombre, A. G., Ahmed, I., and **Carrier, R. L.** 2010. Modeling the influence of cyclodextrins on oral absorption of low solubility drugs: 2. Experimental validation. *Biotechnology and Bioengineering*, 105(2): 421-430.

Buyukozturk, F., Benneyan, J. C., **Carrier, R. L.** 2010. Impact of emulsion-based drug delivery systems on intestinal permeability and drug release kinetics. *Journal of Controlled Release*, 142(1): 22-30.

Wang, L., Sun, B., Barabino, G., Ziemer, K., and **Carrier, R. L.** 2010. Chemical and physical modifications to polydimethylsiloxane (PDMS) surfaces affect adhesion of Caco-2 cells. *Journal of Biomedical Materials Research Part A*, 93(4): 1260-1271.

Wang, L., Murthy, S. K., Fowle, W., Barabino, G., and **Carrier, R. L.** 2009. Influence of micro-well biomimetic topography on intestinal epithelial Caco-2 cell phenotype. *Biomaterials*, 30(36): 6825-6834.

Pfluger, C. L., **Carrier, R. L.**, Sun, B., Ziemer, K., Burkey, D. D. 2009. Cross-linking and degradation properties of plasma enhanced chemical vapor deposited poly(2-hydroxyethyl methacrylate). *Macromolecular Rapid Communications*, 30(2): 126-132.

Wang, L., Nagesha, D. K., Selvarasah, S., Dokmeci, M. R., **Carrier, R. L.**, 2008. Toxicity of CdSe nanoparticles in Caco-2 cell cultures. *Journal of Nanobiotechnology*, 6: 11.

Gamsiz, D. E., Shah, L. K., Devalapally, H., Amiji, M. M., and **Carrier, R. L.**, 2008. A model predicting delivery of saquinavir in nanoparticles to human monocyte/macrophage (Mo/Mac) cells. *Biotechnology and Bioengineering*, 101(5): 1072-1082.

**Carrier, R. L.**, Miller, L. A., Ahmed, I., 2007. The utility of cyclodextrins for enhancing oral bioavailability. *Journal of Controlled Release*, 123: 78–99.

Miller, L. A., **Carrier, R. L.**, and Ahmed, I., 2007. Practical considerations in development of solid dosage forms that contain cyclodextrin. *Journal of Pharmaceutical Sciences*, 96(7): 1691-1707.

Bueno, E. M., Bilgen, B., **Carrier, R. L.**, Barabino, G. A., 2004. Increased rate of chondrocyte aggregation in a wavy-walled bioreactor. *Biotechnology and Bioengineering*, 88(6): 767-777.

Waterman, K. D., Adami, R. C., Alsante, K. M., Antipas, A. S., Arenson, D. R., **Carrier, R.**, Hong, J., Landis, M. S., Lombardo, F., Shah, J. C., Shalaev, E., Smith, S. W., Wang, H., 2002. Hydrolysis in pharmaceutical formulations. *Pharmaceutical Development and Technology*, 7(2): 113-146.

**Carrier, R. L.**, Rupnick, M., Langer, R., Schoen, F. J., Freed, L. E., Vunjak-Novakovic, G., 2002. Effects of oxygen on engineered cardiac muscle. *Biotechnology and Bioengineering*, 78(6): 616-624.

**Carrier, R. L.**, Rupnick, M., Langer, R., Schoen, F. J., Freed, L. E., Vunjak-Novakovic, G., 2002. Perfusion improves architecture of engineered cardiac muscle. *Tissue Engineering*, 8(2): 175-188.

Obradovic, B., **Carrier, R. L.**, Vunjak-Novakovic, G., Freed, L. E., 1999. Gas exchange is essential for bioreactor cultivation of tissue engineered cartilage. *Biotechnology and Bioengineering*, 63: 197-205.

Bursac, N., Papadaki, M., Cohen, R. J., Schoen, F. J., Eisenberg, S. R., **Carrier, R. L.**, Vunjak-Novakovic, G., Freed, L. E., 1999. Cardiac muscle tissue engineering: towards an in vitro model for electrophysiological studies. *American Journal of Physiology*, 277(2, Pt 2): H433-H444.

**Carrier, R. L.**, Papadaki, M., Rupnick, M., Schoen, F. J., Bursac, N., Langer, R., Freed, L. E., Vunjak-Novakovic, G., 1999. Cardiac tissue engineering: cell seeding, cultivation parameters, and tissue construct characterization. *Biotechnology and Bioengineering*, 64: 580-589.

#### **Book Chapters:**

Hernandez-Gordillo, V., Koppes, A. N., Griffith, L. G., Breault, D. T., **Carrier, R. L.** Engineering the Niche for Intestinal Regeneration, in "Biology and Engineering of Stem Cell Niches," edited Vishwakarma, A., Karp, J., Elsevier, 2016.

Wang, L., **Carrier, R. L.** Biomimetic topography: Bioinspired cell culture substrates and scaffolds, in "Advances in Biomimetics," edited George, A., INTECH, 2011.

**Carrier, R. L.**, Waterman, K. Utility of biodegradable polymers in oral drug delivery, pp. 34-56 in "Handbook of Biodegradable Polymers," edited Mallapragada, S. K., Narasimhan, B., American Scientific Publishers, 2006.

#### **Patent:**

Billote, A. M., **Carrier, R. L.**, Fergione, M. B., Miller, L. A., Roy, M. C., Shamblin, S. L., Waterman, K. C., MacDonald, B. C., Friesen, D. T. Osmotic pharmaceutical delivery system. PCT Int. Appl. (2003), 57 pp. WO 2003063823 A2.

#### **Patent Applications Filed:**

Nguyen, T. V., Edington, C. D. J., Suter, E. C., Carrier, R. L., Trumper, D. L., Griffith, L. G. Device for Controlled Apical Flow in Cell Culture Inserts. (2017) U.S. Patent Applications No.: 15/399496.

Carrier, R. L., Yildiz, H. M. Mucus strengthening formulations to alter mucus barrier properties. (2016) U.S. Patent Applications No.: 14/787,550.

Carrier, R. L., Kundu, J. Retina extracellular matrix based biomaterial. (2016) U.S. Patent

Applications No.: 14/787,359.

## CONFERENCE PRESENTATIONS

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*Please Note: Invited Talks Listed in Separate Section Below*

### **Presentations, International:**

Rezhdo, O., Di Maio, S., Le, P., Littrell, K., Chen, S. H., **Carrier, R.** "SANS analysis of micellar structures in the GI tract during food digestion," presented at the Controlled Release Society, Edinburgh, Scotland, July 2015.

Pfluger, C., **Carrier, R. L.**, Burkey D. D. "Using plasma enhanced chemical vapor deposition of poly (2-hydroxyethyl methacrylate) for replication of intestinal basement membrane for use as a tissue culture substrate," presented at the JCF Frühjahrssymposium, Essen, Germany, March 2009.

Pfluger, C. A., **Carrier, R. L.**, Burkey, D. D. "Biomimetic replication of intestinal basement membrane using chemical vapor deposition," presented at the International Conference on Bioengineering and Nanotechnology, Dublin, Ireland, July 2008.

Wang, L., Dokmeci, M. R., Barabino, G. and **Carrier, R. L.** "Chemical and microstructural design of poly(dimethylsiloxane) substrate for tissue engineered intestine," poster presentation at 2nd International Conference on Tissue Engineering, Crete, Greece, May 2005.

Papadaki, M., Bursac, N., **Carrier, R.**, Langer, R., Schoen, F. J., Vunjak-Novakovic, G., Freed, L. E. "In vitro reconstitution of three-dimensional cardiac muscle: composition and functional evaluation," presented at the North Sea Biomaterials Meeting, The Hague, The Netherlands, 1998.

### **Presentations, National:**

Rezhdo, O., Zhu, D., Speciner, L. J., **Carrier, R. L.** "Mechanistic Model Predicting the Impact of Food on Oral Drug Absorption", presented at the Controlled Release Society Annual Meeting, New York, NY, July 2018.

Kundu, J., Baranov, P., Monaghan, J., Young, M., **Carrier, R. L.** "Understanding Regeneration-Permissive Cues in Lower Vertebrate Retina to Develop Therapeutics for Retinal Degeneration," presented at the AIChE Society for Biological Engineering 3rd Bioengineering and Translational Medicine Conference, Boston, MA, September 2018.

Lock, J. Y., Carlson, T. Y., Yu, Y., Lu, J., Claud, E. C. and **Carrier, R. L.** "The Intestinal Mucosal Barrier as a Therapeutic Target for Necrotizing Enterocolitis," presented at the AIChE Society for Biological Engineering 3rd Bioengineering and Translational Medicine Conference, Boston, MA, September 2018.

**Carrier, R. L.** "Engineering the Intestinal Environment," poster presentation at Bob Langer's 70<sup>th</sup> Birthday Celebration, Boston, MA, September 2018.

Lock J. Y., Carlson T., **Carrier R. L.** “Ingested Emulsifiers Inhibit Diffusion of Model Drug Carriers Through Intestinal Mucus,” presented at Controlled Release Society Annual Meeting, Boston, MA, July 2017.

Rezhdo, O., Zhu, D., Khanmohammed, A., Tse, M., **Carrier, R. L.** “Mechanistic model predicting the role of ingested lipids in oral drug absorption”, presented at the Controlled Release Society Annual Meeting, Boston, MA, July 2017.

Rezhdo, O., Zhu, D., Khanmohammed, A., Tse, M., **Carrier, R. L.** “Mechanistic model predicting the role of ingested lipids in oral drug absorption”, presented at the Gordon Research Seminar in Preclinical Form & Formulation for Drug Discovery, Stowe, VT, June 2017.

Lock, JY., Carlson, T., Evans, C, **Carrier, R. L.** “Dextran sodium sulfate exposure affects the intestinal mucus integrity,” presented at the American Institute of Chemical Engineers Annual Meeting, San Francisco, CA, November 2016.

Lock, JY., Carlson, T., Chen, A., **Carrier, R. L.** “Do Ingested Emulsifiers Disrupt the Intestinal Mucus Barrier?” presented at the Biomedical Engineering Society Annual Meeting, Minneapolis, MN, October 2016.

Kundu, J., Baranov, P., Monaghan, J., Young, M, J., **Carrier, R, L.** “Regeneration permissive cues in lower vertebrate retina to inform retinal regenerative medicine,” presented at the TERMIS-Americas Conference, San Diego, CA, December 2016.

Kundu, J., Blanton, D., Baranov, P., Oudin, M., Young, M., Miller, M., Lauffenburger, D., **Carrier, R, L.** “Migration of human retinal progenitor cells in 3D collagen gels,” presented at Translational Medicine and Bioengineering Conference, San Francisco, CA, November 2016.

Phillips, A., Kundu, J., **Carrier, R, L.** “Axolotl retinal ECM promotes down-regulation of ERK 1/2 expression in human retinal progenitor cells,” poster presentation at the 2016 Biomedical Engineering Society Annual Meeting, Minneapolis, MN, October 2016.

Rezhdo, O., Khanmohammed, A., Tse, M., **Carrier, R.** “Mechanistic model predicting the role of ingested lipids in oral drug dissolution”, presented at the American Association of Pharmaceutical Sciences, Denver, CO, November 2016.

Carlson, T., Lock, J., **Carrier, R.** “Impact of Lactoferrin and Lysozyme on Microbe Transport in Mucus” poster presentation at the Biomedical Engineering Society Annual Meeting 2016 Annual Meeting, Minneapolis, MN, October 2016.

Kundu, J., Baranov, P., Young, M, J., **Carrier, R, L.** “Decellularized retina matrices controlling retinal progenitor cell response,” poster presentation at the 4th TERMIS World Congress, Boston, MA, September 2015.



Scaralia, J., **Carrier, R. L.**, Kundu, J., Koppes, A. “Development of native retinal ECM hydrogels for increased cell viability during transplantation,” poster presentation at the Biomedical Engineering Society Annual Meeting, Tampa, FL, October 2015.

Rezhdo, O., Wiinberg, L., **Carrier, R.** “Mechanistic model predicting the effect of lipids on the bioavailability of lapatinib,” poster presentation at the American Association of Pharmaceutical Scientists, Orlando, FL, October 2015.

Lock, JY., Carlson, T., **Carrier, R.** "Dietary lipids and emulsifiers affect particle transport in intestinal mucus," presented at the Biomedical Engineering Society Annual Meeting 2015 Annual Meeting, Tampa, FL, October 2015.

Carlson, T., Lock, JY., **Carrier, R.** "Effect of lactoferrin and lysozyme on mucus barrier properties," presented at the Biomedical Engineering Society Annual Meeting 2015 Annual Meeting, Tampa, FL, October 2015.

Carlson, T., Yildiz, H., Claud, E., **Carrier, R. L.** “Impact of necrotizing enterocolitis on the barrier properties of intestinal mucus,” presented at the American Institute of Chemical Engineers Annual Meeting, Atlanta, GA, November 2014.

Carlson, T., Yildiz, H., Goldstein, A., **Carrier, R. L.** “Impact of Hirschsprung's Disease on the barrier properties of colonic mucus,” poster presentation at the Biomedical Engineering Society Annual Meeting, , October 2014.

Rezhdo, O., Di Maio, S., Budil, D., **Carrier, R. L.** “A thorough characterization of the food effect on oral drug dissolution in the stomach,” poster presentation at the Annual Meeting of the Controlled Release Society, Chicago, IL, July 2014.

Rezhdo, O., Budil, D., **Carrier, R. L.** “Monitoring partitioning of poorly water soluble oral drugs in the presence of in vitro food digestion by Electron Paramagnetic Resonance,” presented at the American Institute of Chemical Engineers Annual Meeting, Atlanta, GA, November 2014.

Kundu, J., Michaelson, A., Baranov, P., Young, M. J., **Carrier, R. L.** “Decellularized Retinal Matrix based biomaterials as novel cell delivery platforms,” presented at the Society for Biomaterials Annual Conference, Denver, CO, April 2014.

Kundu, J., Michaelson, A., Baranov, P., Young, M. J., **Carrier, R. L.** “Decellularized Retinal Matrix: natural platforms for human retinal progenitor cells,” poster presentation at the Annual Meeting & Alumni Reunion, Department of Ophthalmology, Harvard Medical School, Boston MA, June 2014.

Kundu, J., Michaelson, A., Baranov, P., Young, M. J., **Carrier, R. L.** “Decellularized Retinal Matrix: biomimetic substrate for human retinal progenitor cells,” presented at the TERMIS-Americas Conference, Washington DC, December 2014.

Yeap, Y. Y., **Carrier, R. L.** “Modeling the effect of oleic acid absorption on bioavailable griseofulvin concentration,” poster presentation at the Biomedical Engineering Society Annual

Meeting, San Antonio, TX, October 2014.

Yeap, Y. Y., Diem, M., **Carrier, R. L.** "Computational modeling of the impact of dietary fatty acid absorption on the absorption of poorly water-soluble drugs," poster presentation at the American Association of Pharmaceutical Sciences Annual Meeting, San Diego, CA, November 2014.

Yeap, Y. Y., Diem, M., **Carrier, R. L.** "Visualization of the intracellular localization and metabolism of exogenous fatty acid in Caco-2 Cells via Confocal Raman Microspectral Imaging (CRMI)," poster presentation at the American Association of Pharmaceutical Sciences Annual Meeting, San Diego, CA, November 2014.

Koppes, A., **Carrier, R. L.** Baranov, P., Young, M., Oudin, M., Gertler, F., Miller, M., and Lauffenburger, D., "High-throughput screening for directed chemotaxis of retinal progenitor cells in 3D hydrogels," poster presentation at the Northeast Bioengineering Conference (NEBEC), 2014 40th Annual, IEEE, 2014, pp. 1-2.

Koppes, A., Montgomery B., Kamath, M., Breault, D., **Carrier, R. L.** "Biomimetic Topographical replicas of small intestine for regenerative medicine and drug delivery platforms," poster presentation at the American Institute of Chemical Engineers Annual Fall Conference (AIChE), 2014.

Kamath, M., Koppes, A., **Carrier, R. L.** "Hydrogels Containing Biomimetic topographical features for small intestinal model systems," poster presentation at the Materials Research Society Annual Fall Conference (MRS), 2014.

Buyukozturk, F., Budil, D. E., **Carrier, R. L.** "Mechanistic Modeling of Lipid Based Drug Delivery Systems for Enabling Oral Delivery of Hydrophobic Drugs", presented at the 2013 ASME Global Congress on Nano Engineering for Medicine and Biology, Boston, MA, February, 2013.

Di Maio, S., Budil, D. E., **Carrier, R. L.** "Modeling impact of ingested lipids on orally delivered drug dissolution" poster presentation at the 2012 American Institute of Chemical Engineers Annual Meeting, Pittsburgh, PA, October, 2012.

Di Maio, S., Budil, D. E., **Carrier, R. L.** "Monitoring of partitioning of poorly water-soluble drugs during in vitro lipolysis by Electron Paramagnetic Resonance" presented at 6th International Conference on Bioengineering and Nanotechnology, UC Berkeley, Berkeley, CA, June, 2012.

Yildiz, H. M., **Carrier, R. L.** "Examining the impact of food-associated stimuli on particle penetration through gastrointestinal mucus barrier" poster presentation at the SBE's 6th International Conference on Bioengineering and Nanotechnology, San Francisco, CA, June 2012.

Yildiz, H. M., **Carrier, R. L.** "Impact of Food-associated Stimuli on Nanoparticle Penetration through Gastrointestinal Mucus" poster presentation at the Biomedical Engineering Society, Atlanta, GA, October 2012.

Yildiz, H. M., **Carrier, R. L.** "Food-associated Stimuli Impact on Particle Penetration

through Gastrointestinal Mucus Barrier” presented at the American Institute of Chemical Engineers 2012 National Meeting, Pittsburgh, PA, November 2012.

Buyukozturk, F., Budil, D. E., **Carrier R. L.** “Monitoring drug release from self-emulsifying drug delivery systems real time during in vitro formulation digestion: A modeling approach” poster presentation at the Controlled Release Society Annual Meeting and Exposition, Quebec City, QC, Canada, July 2012.

Buyukozturk, F., Budil, D. E., **Carrier R. L.** “Modeling of drug release from self-emulsifying drug delivery systems during in vitro formulation digestion” poster presentation at the American Association for Pharmaceutical Scientists Northeast Regional Discussion Group (NERDG) Meeting, Rocky Hill, CT, April 2012.

Kevlahan, S. H., **Carrier, R. L.**, Murthy, S. K. "Label-free microfluidic isolation of intestinal stem and progenitor cells from native rat tissue," presented at the Tissue Engineering and Regenerative Medicine International Society-North America (TERMIS-NA) 2011 Annual Conference and Exposition, Houston, TX, December 2011.

Kevlahan, S. H., **Carrier R.L.**, Murthy, S. K. “Selective capture and release of intestinal progenitor cells from digested rat tissue,” poster presentation at Biomedical Engineering Society (BMES) 2011 Annual Meeting, Hartford, CT, October 2011.

Kevlahan, S. H., **Carrier, R.L.**, Murthy, S. K. “Label-free isolation of intestinal progenitor cells from native rat tissue using microfluidic devices,” poster presentation at Miniaturized Systems for Chemistry and Life Sciences (MicroTAS) 2011 Annual Meeting, Seattle, WA, October 2011.

Buyukozturk, F., **Carrier, R. L.**, Benneyan, J. "Mechanistic studies of self- emulsifying drug delivery systems for the oral delivery of lipophilic drugs," presented at the Annual Meeting of American Institute of Chemical Engineers, Minneapolis, MN, October 2011.

Di Maio, S., **Carrier R. L.** "Effects of lipids on dissolution of poorly water-soluble drugs," poster presentation at the Bioengineering Conference (NEBEC) 2011 IEEE 37th Annual Northeast, Troy, NY, March 2011.

Di Maio, S., **Carrier R. L.** "Effects of lipids on absorption of poorly water-soluble drugs," presented at the 38th Annual Meeting and Exposition of the Controlled Release Society 2011 Conference Proceedings, National Harbor, MD, July 2011.

Di Maio, S., **Carrier, R.L.** "Monitoring of dissolution of poorly water-soluble drugs during in vitro lipolysis by electron resonance spectroscopy," presented at the AIChE Annual Meeting 2011 Conference Proceedings, Minneapolis, MN, October 2011.

Di Maio, S., **Carrier, R. L.** “Studies of dynamic nanoscale structures during in vitro lipid digestion,” presented at the American Institute of Chemical Engineers 2010 National Meeting, Salt Lake City, UT, November 2010.

Pfluger, C., **Carrier, R. L.** “Replicating the topography of intestinal basement membrane,” presented at the Biomedical Engineering Society Annual Meeting, Austin, TX, October 2010.

**Carrier, R. L.** “Impact of food on the function of oral drug delivery systems,” presented at

the American Chemical Society 240th National Meeting (Invited Speaker), Boston, MA, August 2010.

Buyukozturk, F., Benneyan, J., **Carrier, R. L.** "Mechanistic studies of emulsion-based drug delivery system function in the biological environment," poster presentation at the Controlled Release Society Annual Meeting and Exposition, Portland, OR, July 2010.

Bolger, M. B., Fraczkiewicz, R., Waldman, M., Woltosz, W. S., Gamsiz, E., Ashtikar, M. and **Carrier, R. L.** "In silico models of solubility in simulated gastrointestinal fluids (FaSSIF, FeSSIF, and FaSSGF) for a diverse set of 160 molecules," presented at the 14th International Workshop on QSARs in Environmental and Health Sciences, Montreal, Canada, May 2010.

Wang, L., Murthy, S. K., Barabino, G. A., **Carrier, R. L.** "Caco-2 intestinal epithelial model utilizing collagen based substrates patterned with crypt-like topography," poster presentation at Society for Biomaterials Annual Meeting, Seattle, WA, April 2010.

Pfluger, C., Burkey D. D., **Carrier, R. L.** "Replicating the topography of the intestinal basement membrane," presented at the American Institute of Chemical Engineers 2009 National Meeting, Nashville, TN, November 2009.

Buyukozturk, F., Long, H., **Carrier, R. L.** "Emulsion function in a simulated gastric environment: a quantitative study of drug release, permeability enhancement and digestion kinetics," presented at the American Institute of Chemical Engineers 2008 National Meeting, Philadelphia, PA, November 2008.

McMahon, B. J., **Carrier, R. L.**, Burkey D. D. "Replication of intestinal basement membrane via chemical vapor deposited silica thin films," poster presentation at the American Institute of Chemical Engineers 2008 National Meeting, Philadelphia, PA, November 2008.

Pfluger, C., **Carrier, R. L.**, Burkey D. D. "Plasma enhanced chemical vapor deposited poly(2-hydroxyethyl methacrylate) films for fabricating a degradable, biocompatible intestinal tissue culture substrate," presented at the American Institute of Chemical Engineers 2008 National Meeting, Philadelphia, PA, November 2008.

Buyukozturk, F., **Carrier, R. L.** "Function of micro- and nano- emulsion based drug delivery systems in the intestinal environment: permeability enhancement, digestion kinetics and drug release," poster presentation at the Controlled Release Society Annual Meeting and Exposition, New York, NY, July 2008.

Gamsiz, D. E, Miller, L. Thombre, A., **Carrier, R. L.** "Development of a computer program predicting the influence of cyclodextrins on oral bioavailability of insoluble drugs: From modeling to in vivo comparison," presented at the American Institute of Chemical Engineers 2007 National Meeting, Salt Lake City, UT, November 2007.

Pfluger, C., **Carrier, R. L.**, Burkey D. D. "Nano and micro scale replication of the intestinal basement membrane using chemical vapor deposition," presented at the American Institute of Chemical Engineers 2007 National Meeting, Salt Lake City, UT, November 2007.

Gamsiz, D. E., Miller, L. Thombre, A., **Carrier, R. L.** "Model prediction of the influence of cyclodextrins on oral bioavailability of insoluble drugs" presented at International Society for

Pharmaceutical Engineering (ISPE) Annual Meeting, Las Vegas, NV, November 2007.

Wang, L., Murthy, S. K., **Carrier, R. L.** “Intestinal epithelial cell response to crypt-like substrate topography,” presented at American Chemical Society 234th National Meeting, Boston, MA, August 2007.

Gamsiz, D. E., Shah, L., Amiji, M., **Carrier, R. L.** “A model predicting delivery of saquinavir in nanoparticles to human monocyte/macrophage (Mo/Mac) cells” presented at American Chemistry Society, 234th National Meeting, Boston, MA, August 2007.

Wang, L., Murthy, S., **Carrier, R. L.** “Effect of cell culture substrate topology on Caco-2 cell growth and attachment,” poster presentation at the 1st Annual Methods in Bioengineering Conference, Cambridge, MA, July 2006.

Gamsiz, D. E., Miller, L. A., Thombre, A., **Carrier, R.** “Modeling the influence of cyclodextrins on oral absorption of neutral and saltform drugs delivered as a pre-formed complex,” poster presentation at the 2006 AAPS National Biotechnology Conference, Boston, MA, June 2006.

Sadasivan, V., Budil, D., Sacco, A. Jr., **Carrier, R.** “Structural prediction of the carbon terminal end of human intestinal mucin (MUC2) using molecular modeling,” presented at the 2006 NSTI Nanotechnology Conference and Trade Show, Boston, MA, May 2006.

Sadasivan, V., Budil, D., Sacco, A. Jr., **Carrier, R.** “Molecular modeling of the C-terminal end of human intestinal mucin (MUC2) predicts a cysteine-knot tertiary structure,” presented at the 231st ACS National Meeting, Atlanta, GA, March 2006.

Gamsiz, D. E., Thombre, A. G., Miller, L. A., **Carrier, R. L.** “Modeling the influence of cyclodextrins on oral absorption of saltform drug in immediate and controlled release delivery,” presented at the American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, November 2005.

Gamsiz, D. E., Miller, L. A., Thombre, A. G., **Carrier, R. L.** “Predicting the ability of cyclodextrin to enhance intestinal absorption in controlled release delivery: Comparison with immediate release,” presented at the Controlled Release Society Annual Meeting, Miami, FL, June 2005.

Gamsiz, D. E., Miller, L. A., Ahmed, I., Thombre, A. G., **Carrier, R. L.** “Mathematical model for enhanced drug transport across intestinal mucosa using cyclodextrins,” presented at the American Institute of Chemical Engineers Annual Meeting, Austin, TX, November 2004.

**Carrier, R. L.**, Freed, L. E., Schoen, F. J., Rupnick, M., Langer, R., and Vunjak-Novakovic, G. “Control of the structure and metabolism of engineered cardiac muscle by direct perfusion of culture medium,” presented at the American Chemical Society Meeting, San Francisco, CA, March 2000.

**Carrier, R. L.**, Freed, L. E., Schoen, F. J., Rupnick, M., Langer, R., and Vunjak-Novakovic, G. “Oxygen and hydrodynamics influence protein expression and metabolism in engineered cardiac muscle,” poster presentation at the International Society for Applied Cardiovascular

Biology Meeting, Tucson, AZ, March 2000.

**Carrier, R. L.**, Bursac, N., Papadaki, M., Langer, R., Vunjak-Novakovic, G., and Freed, L. E. "Bioreactor design affects the structural, biochemical, and metabolic properties of engineered cardiac tissue," poster presentation at the American Institute of Chemical Engineers Meeting, Miami, FL, November 1998.

**Carrier, R. L.**, Bursac, N., Vunjak-Novakovic, G., Langer, R., Rupnick, M. A., and Freed, L. E. "Development of a model culture system for cardiac tissue engineering: Investigation of key parameters," presented at the American Institute of Chemical Engineers Meeting, Los Angeles, CA, November 1997.

**Carrier, R. L.**, Bursac, N., Vunjak-Novakovic, G., Langer, R., Rupnick, M., Freed, L. E. "Cardiac tissue engineering: influence of cell source and bioreactor conditions," poster presentation at the XIth World Congress of the International Society for Artificial Organs, Providence, RI, June 1997.

Papadaki, M., Bursac, N., Langer, R., Schoen, F. J., **Carrier, R.**, Vunjak-Novakovic, G., Freed, L. E. "Engineered three-dimensional cardiac muscle: structural, biochemical, and functional assessment," presented at the American Institute of Chemical Engineers Meeting, Miami, FL, November 1998.

Bursac, N., Papadaki, M., Cohen, R. J., Schoen, F. J., Eisenberg, S. R., **Carrier, R.**, Vunjak-Novakovic, G., Freed, L. E. "Cardiac muscle tissue engineering: an electrophysiological study," presented at the Biomedical Engineering Society meeting, Cleveland, OH, October 1998.

Freed, L. E., Bursac, N., **Carrier, R.**, Martin, I., Papadaki, M., Vunjak-Novakovic, G. "Three-dimensional cultures of skeletal and cardiac-like tissues," presented at the Annual Meeting of the American Society for Cell Biology, Washington, D. C., December 1997.

#### **Presentations, Local:**

Di Maio, S., Budil, D. E., **Carrier, R. L.** "Modeling impact of ingested lipids on orally delivered drug dissolution", poster presentation at Drug Discovery and Development in the 21st Century, Northeastern University, Boston, MA. November, 2012.

Buyukozturk, F., **Carrier, R. L.** "Impact of emulsion-based drug delivery systems on intestinal permeability and drug release kinetics," poster presentation at the Regional International Society of Pharmaceutical Engineering Poster Contest, Boston, MA, May 2010.

Wang, L., Murthy, S. K., Barabino, G. A., **Carrier, R. L.** "Caco-2 intestinal epithelial model utilizing collagen based substrates patterned with crypt-like topography," poster presentation at the Regional International Society of Pharmaceutical Engineering Poster Contest, Boston, MA, May 2010.

Buyukozturk, F., Benneyan, J., **Carrier, R. L.** "Impact of emulsion-based drug delivery systems on intestinal permeability and drug release kinetics," poster presentation at the Regional International Society of Pharmaceutical Engineering Poster Contest, Boston, MA, May 2009.

Pfluger, C., Burkey D. D., **Carrier, R. L.** "Replication of intestinal basement membrane using chemical vapor deposition of poly (2-hydroxyethyl methacrylate): Film degradation and biocompatibility," poster presentation at the 35th Annual Northeast Bioengineering Conference, Boston, MA, April 2009.

Wang, L., Murthy, S. K., Barabino, G. A., **Carrier, R. L.** "Intestinal epithelial cell behavior on collagen substrates with biomimetic micro-topography," poster presentation at the 35th Annual Northeast Bioengineering Conference, Boston, MA, April 2009.

Buyukozturk, F., Benneyan, J., **Carrier, R. L.** "Effect of emulsion based drug delivery systems on rate of drug release and intestinal permeability enhancement," presented at the Northeast Bioengineering Conference, Boston, MA. April 2009.

Pfluger, C., **Carrier, R. L.**, Burkey D. D. "Nano and micro scale replication of the intestinal basement membrane using chemical vapor deposition," poster presentation at the Northeast Regional International Society for Pharmaceutical Engineering (ISPE) Poster Contest, Boston, MA, April 2008.

Pfluger, C., **Carrier, R. L.**, Burkey D. D. "Nano and micro scale replication of the intestinal basement membrane using chemical vapor deposition," poster presentation at the Research & Scholarship Expo at Northeastern University, Boston, MA, March 2008.

Pfluger, C., **Carrier, R. L.**, Burkey D. D. "Nano and micro scale replication of the intestinal basement membrane using chemical vapor deposition," presented at the Graduate Materials Links (GML) Symposium on Interdisciplinary Graduate Research, Boston, MA, February 2008.

Gamsiz, D. E, Miller, L. Thombre, A., **Carrier, R. L.** "Model Prediction of the Influence of Cyclodextrins on Oral Bioavailability of Insoluble Drugs" presented at AAPS Northeast Regional Discussion Group meeting, Rocky Hill, CT, April 2007.

Wang, L., Murthy, S. K., **Carrier, R. L.** "Effect of cell culture substrate topology on Caco-2 cell growth and attachment," poster presentation at the 2007 northeast regional ISPE poster contest, Boston, MA, June 2007.

Wang, L., Selvarasah, S., Dokmeci, M. R, **Carrier, R. L.** "Nano-toxicity and biocompatibility of CdSe quantum dots on small intestinal epithelial cell-like Caco-2 cell line," presented at Northeastern University's NSF Nanoscale Science and Engineering Center for High-Rate Nanomanufacturing (CHN) Host Industry Day Showcase, Boston, MA, January 2007.

Gamsiz, D., Bhardwaj, S., Miller, L. A., Thombre, A. G., and **Carrier, R. L.** "Computational modeling to predict the influence of complexation solubilization on drug absorption," Celebrating Thirty Years of Robert Langer's Science, Cambridge, MA, July 2006.

Wang, L., Murthy, S., Dokmeci, M. R., **Carrier, R. L.** "Biomimesis of intestinal crypt-villus micro-topography for enterocyte culture," Celebrating Thirty Years of Robert Langer's Science, Cambridge, MA, July 2006.

Bhardwaj, S., **Carrier, R. L.** "Physiological modeling of gastrointestinal tract for predicting the effect of cyclodextrin on oral drug delivery of neutral compounds," poster presentation at

Women in Science and Engineering Expo, Northeastern University, Boston, MA, April 2006.

Bhardwaj, S., **Carrier, R. L.** “Predicting the effect of cyclodextrin on neutral compound absorption using physiological modeling of gastrointestinal tract,” poster presentation at the 9th Annual AAPS Northeast Regional Discussion Group, Rocky Hill, CT, April 2006.

Wang, L., **Carrier, R.** “Improvement of small intestinal cell culture model: optimizing cell attachment properties on surfaces of poly(dimethylsiloxane),” poster presentation at the Women in Science and Engineering Expo, Northeastern University, Boston, MA, April 2006.

Wang, L., Murthy, S., **Carrier, R.** “A tissue engineering approach to improve Caco-2 intestinal epithelial model,” poster presentation at the 9th Annual AAPS Northeast Regional Discussion Group, Rocky Hill, CT, April 2006.

Sadasivan, V., Sacco, A. Jr., Budil, D., Gulla, S., **Carrier, R.** “Molecular modeling of the human intestinal mucus,” poster presentation at the Women in Science and Engineering Expo, Northeastern University, Boston, MA, April 2006.

Sadasivan, V., Sacco, A. Jr., Budil, D., Gulla, S., **Carrier, R.** “Molecular modeling of the human intestinal mucus,” poster presentation at the 9th Annual AAPS Northeast Regional Discussion Group, Rocky Hill, CT, April 2006.

Wang, L., Dokmeci, M., **Carrier, R.** “Improvement of small intestinal cell culture model: optimizing physical and chemical properties of cell culture substrate,” poster presentation at Northeastern University Research and Scholarship Expo 2005, Northeastern University, Boston, MA, March 2005.

Gamsiz, D. E., Miller, L. A., Thombre, A. G., **Carrier, R. L.** “Predicting the influence of cyclodextrins on oral absorption of insoluble drugs,” poster presentation at Northeastern University Research and Scholarship Expo 2005, Northeastern University, Boston MA, March 2005.

Gamsiz, D. E., Miller, L. A., Thombre, A. G., **Carrier, R. L.** “Predicting the ability of drug delivery technology to enhance intestinal absorption : Effect of cyclodextrin on precipitation,” poster presentation at the International Society of Pharmaceutical Engineers (ISPE) Poster Competition, Northeastern University, Boston, MA, March 2005.

Miller, L. A., Gamsiz-Sen, D. E., Thombre, A. G., **Carrier, R. L.** “Mathematical model for predicting enhanced drug transport across intestinal mucosa using cyclodextrins,” poster presentation at the Northeast Regional Discussion Group (NERDG) meeting of the American Association of Pharmaceutical Scientists (AAPS), Rocky Hill, CT, April 2005.

## RESEARCH SUPPORT

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### 19.1 M in External Funding since joining Northeastern University

#### EXTERNAL Active

Project Title: “Impact of lipids and food on oral compound absorption: mechanistic studies and modeling”



Amount: \$1.6 M  
Principal Investigator: Rebecca L. Carrier  
Agency: NIH (NIGMS)  
Period: September 1, 2018 – August 30, 2022  
Role: PI

Project Title: “Collaborative Research: Engineering Architecture for Tissue Models”  
Amount: \$162,225 (Northeastern University total budget)  
Principal Investigator: Erin Lavik  
Agency: NSF  
Period: August 1, 2018 – July 31, 2021  
Role: Co-PI

Project/Proposal Title: “Artificial Gut – The Gut-Brain Axis: A Model Platform for Probing the Link Between the Gut Microbiome and Neural Health”  
Amount: \$23,825  
Principal Investigator: Todd Thorsen  
Agency: Lincoln Labs  
Period: 10/01/2017-09/30/2018  
Role: Co-Investigator

Project/Proposal Title: “GuMI: New In Vitro Platforms to Parse the Human Gut Epithelial-Microbiome-Immune Axis”  
Amount: \$5,003,552 (\$4,425,498 direct, \$1,000,710 annual budget)  
Principal Investigator: Rebecca L. Carrier, Ph.D. (Co-PI Linda Griffith, MIT)  
Agency: NIH (NIBIB)  
Period: August 1, 2016 – April 30, 2021  
Role: PI  
Roles of Participants: Carrier: Direct project and develop primary gut model with integrated microbiome; Koppes: Integrate neural and fibroblast cells into gut model; Griffith (MIT): Direct MIT portion of project and chemostat modeling of microbe cultures, aid in hardware development; Trumper (MIT): Direct hardware development; Alm (MIT): Direct development of model microbiome cultures  
% Effort: 85%

Project/Proposal Title: “Uncovering Regeneration-Permissive Cues in Lower Vertebrate Retina to Inform Retinal Regenerative Medicine”  
Amount: \$449,994 (\$291,258 direct, \$149,998 annual budget)  
Principal Investigator: Rebecca L. Carrier, Ph.D.  
Agency: NSF  
Period: September 1, 2016 – August 30, 2019  
Role: PI  
Roles of Participants: Carrier: Direct investigation of regeneration permissive cues in axolotl matrix; Kundu: Investigate cell responses to lower vertebrate relative to mammalian matrix; Monaghan: Investigate proteomics of lower vertebrate relative to mammalian matrix

% Effort: 60%

**Completed**

Project/Proposal Title: "Investigation of the impact of polymers on mucus barrier properties"

Amount: \$23,285

Principal Investigator: Rebecca L. Carrier

Agency: Glyscend, Inc.

Period: 11/21/2017-05/31/2018

Role: PI

Project/Proposal Title: "Intestinal Mucus Barrier: Role in Necrotizing Enterocolitis (NEC) and Prophylactic "Mucus-strengthening" Treatment to Prevent NEC"

Amount: \$400,000 (\$351,697 direct, \$133,333 annual budget)

Principal Investigator: Rebecca L. Carrier, Ph.D.

Agency: March of Dimes

Period: July 1, 2014 – June 30, 2017

Role: PI

Roles of Participants: Carrier: Conduct analysis of mucus barrier properties associated with risk factors for NEC; Claud (U Chicago): Provide animal tissue for analysis of mucus barriers

% Effort: 100%

Project/Proposal Title: "Impact of Lipids on Compound Absorption: Mechanistic Studies and Modeling"

Amount: \$1,784,453 (\$290,635 yearly Carrier portion)

Principal Investigator: Rebecca L. Carrier, Ph.D.

Agency: NIH (NIGMS)

Period: July 1, 2012 – March 31, 2017

Role: PI

Roles of Participants: Carrier: Direct research program and conduct in vitro mechanistic studies and modeling of the impact of lipids on oral absorption; Budil: Direct electron paramagnetic resonance analysis of drug distribution between lipid-based nanostructures; Amiji: Direct in vivo analysis of the impact of lipids on oral absorption; Chen (MIT): Direct small angle x-ray studies of structure of lipid colloidal species

% Effort: 85%

Project/Proposal Title: "Impact of Lipids on Intestinal Mucus Transport and Structural Properties"

Amount: \$428,968 (\$85,551 Carrier portion)

Principal Investigator: Rebecca L. Carrier, Ph.D.

Agency: NIH (NIBIB)

Period: August 1, 2012 – July 31, 2016

Role: PI

Roles of Participants: Carrier: Direct research program and conduct all mucus transport experiments; Budil: Direct electron paramagnetic resonance analysis of transport in mucus;

Ruberti: Direct quick freeze deep etch microscopy analysis of changes in mucus structure  
% Effort: 80%

Project/Proposal Title: “Investigation of Nanoparticle and Micelle Transport across Intestinal Mucus”

Amount: \$56,193 (\$56,193 yearly Carrier portion)

Principal Investigator: Rebecca L. Carrier, Ph.D.

Agency: Merck, Inc.

Period: September 1, 2011 – August 31, 2013

Role: PI

Roles of Participants: Carrier: Direct research program and conduct all mucus transport experiments

% Effort: 100%

Project/Proposal Title: “Interphotoreceptor Matrix Based Cell Delivery Vehicle for Retinal Regeneration”

Amount: \$447,373 (\$112,055 yearly Carrier portion)

Principal Investigator: Rebecca L. Carrier, Ph.D.

Agency: NIH

Period: February 1, 2011 – January 31, 2014

Role: PI

Roles of Participants: Carrier: Direct research program, develop biomaterials; Young, Tucker (Schepens Eye Institute): Conduct cell culture experiments and surgical implantations

% Effort: 100%

Project/Proposal Title: “Combinatorial-designed Nano-platforms to Overcome Tumor Drug Resistance”

Amount: \$3,038,942 (\$1,430,588 direct, \$629,148 annual budget, \$208,245 Carrier portion)

Principal Investigator: Mansoor Amiji, PhD

Agency: NIH

Period: September 1, 2010 – August 31, 2015

Role: co-Investigator

Roles of Participants: Amiji: Direct research program and design of nano-delivery vehicles; Carrier, Radisic, Melero-Martin, and Nahmias: Coordinate isolation and separation of intestinal, cardiac, vascular, and skin stem/progenitor cells

% Effort: 15%

Project/Proposal Title: “Microfluidic Cell Separation for Tissue Engineering and Regenerative Medicine”

Amount: \$1,887,443 (\$1,430,588 direct, \$629,148 annual budget, \$208,245 Carrier portion)

Principal Investigator: Shashi K. Murthy, PhD

Agency: NIH (R01)

Period: May 1, 2010 – April 30, 2013

Role: co-Investigator

Roles of Participants: Murthy: Direct research program and microfluidic system design;

Carrier, Radisic, Melero-Martin, and Nahmias: Coordinate isolation and separation of intestinal, cardiac, vascular, and skin stem/progenitor cells

% Effort: 15%

Project/Proposal Title: “CAREER: Mechanistic Studies and Modeling of Self-Emulsifying Drug Delivery Systems”

Amount: \$400,000 (\$266,759 direct, \$80,000 annual budget, \$400,000 Carrier portion)

Principal Investigator: Rebecca L. Carrier, PhD

Agency: NSF

Period: February 15, 2008 – January 31, 2013

Role: Principal Investigator

Roles of Participants: Carrier: Direct research program, plan and coordinate experiments to probe mechanistic function of lipid-based drug delivery systems, develop models predicting bioavailability enhancement

% Effort: 100%

Project/Proposal Title: “A Multi-tiered High Throughput Screening Approach for Evaluating the Toxicity of Engineered Nanomaterials”

Amount: \$171,493 (\$109,932 direct, \$171,493 annual budget, \$58,373 Carrier portion)

Principal Investigator: Jacqueline Isaacs, Ph.D.

Agency: NSF

Period: July 1, 2010 – June 30, 2012

Role: co-PI

Roles of Participants: Isaacs: Direct research program; Carrier, Gu: Conduct eukaryotic and prokaryotic cellular assays, respectively, to correlate with acellular nanotoxicity results; Bello (UMass Lowell): Conduct and develop acellular nanotoxicity assays; Benneyan: Statistically correlate results between different cellular and acellular assays.

% Effort: 10%

Project/Proposal Title: “Multifunctional Nanoemulsions for Modulation of BBB Transport”

Amount: \$428,323 total (\$275,000 direct, \$214,500 annual budget, \$21,852 Carrier portion)

Principal Investigator: Mansoor Amiji, Ph.D.

Agency: NIH (R21)

Period: July 1, 2010 – June 30, 2012

Role: co-Investigator

Roles of Participants: Amiji: Direct the research program and oversee experimental design protocols; Carrier: Optimize formulation design and in vitro evaluation in the cell culture model

% Effort: 10%

Project/Proposal Title: “Integrating Experiential Teaching with a Contemporary Chemical Engineering Curriculum”

Amount: \$150,000 (\$104,618 direct, \$50,000 annual budget, \$0 Carrier portion, as this is a programmatic reform proposal)

Principal Investigator: Kate Ziemer, PhD

Agency: NSF

Period: May 1, 2008 – April 31, 2011

Role: co-Investigator

Roles of Participants: Ziemer: Direct research program, develop novel Transport class with integrated lab component; Carrier, Sacco, Podlaha-Murphy: Develop experimental modules to complement classroom learning for Transport Phenomena courses, aid in interpretation of student response

% Effort: 5%

Project/Proposal Title: “Solubility in Simulated Gastric Fluid and Simulated Intestinal Fluid”

Amount: \$113,000 (\$71,694 direct, \$37,667 annual budget)

Principal Investigator: Rebecca L. Carrier, PhD

Agency: Simulations Plus, Inc.

Period: April 1, 2008 – August 1, 2011

Role: Principal Investigator

Roles of Participants: Carrier: Direct studies of the influence of endogenous intestinal lipids on drug compound solubility

% Effort: 100%

Project/Proposal Title: “Mucus Transport Studies: Colonic Absorption Initiative”

Amount: \$30,000 (\$19,231 direct, \$30,000 annual budget, \$30,000 Carrier portion)

Principal Investigator: Rebecca L. Carrier, PhD

Agency: Pfizer, Inc.

Period: December 1, 2007 – June 30, 2008

Role: Principal Investigator

Roles of Participants: Carrier: Plan and coordinate experiments to determine potential permeability differences between upper and lower gastrointestinal tract mucus

% Effort: 100%

Project/Proposal Title: “Chemical Vapor Deposition Fabrication of Nano- and Micro-scale Biomimetic Surfaces”

Amount: \$150,000 plus \$30,000 supplement awarded in 2009 (\$115,385 direct, \$60,000 annual budget, \$75,000 Carrier portion)

Principal Investigator: Rebecca L. Carrier, PhD

Agency: NSF

Period: September 1, 2007 – August 31, 2011

Role: Principal Investigator (Note: Dr. Daniel Burkey was PI for the first year of the project)

Roles of Participants: Carrier: Guide tissue template preparation and aid in chemical vapor deposition (CVD) process development for CVD fabrication of precisely structurally biomimetic biomaterials.; Burkey: Direct CVD process development for fabrication of precisely structurally biomimetic biomaterials

% Effort: 50%

Project/Proposal Title: “Transport Studies of Drug Compounds through Mucus”

Amount: \$20,000 (\$20,000 direct, \$20,000 annual budget, \$20,000 Carrier portion)

Principal Investigator: Rebecca L. Carrier, PhD

Agency: Pfizer, Inc., Groton, CT

Period: July 1, 2007 – December 31, 2008

Role: Principal Investigator

Roles of Participants: Carrier: Coordinate project aimed at characterizing the significance of the intestinal mucus barrier to transport of small molecules and particulate drug carriers.

% Effort: 100%

Project/Proposal Title: “Development of Biomaterial Microstructure and Surface Chemistry for Tissue Engineering of Intestine”

Amount: \$300,000 (\$190,446 direct, \$100,000 annual budget, \$156,775 Carrier portion)

Principal Investigator: Rebecca L. Carrier, PhD

Agency: NSF

Period: April 1, 2007 – March 31, 2011

Role: Principal Investigator

Roles of Participants: Carrier: Coordinate development and testing of biomaterials with biomimetic topography; Murthy: Aid in microfabrication of templates for biomaterials; Barabino: Interpret experimental results pertaining to cellular response to materials

% Effort: 15%

“Graduate Research Supplement (GRS) to Current ENG Award to Broaden Participation” (separately awarded **three** times, as annual reapplication is necessary)

Amount: \$119,000 (\$95,200 direct, \$39,667 annual budget, \$79,334 Carrier portion)

Principal Investigator: Rebecca L. Carrier, PhD

Agency: NSF

Period: April 1, 2007 – March 31, 2011

Role: Principal Investigator

Roles of Participants: Carrier: Advise graduate student developing biomaterials with biomimetic topography for cell culture and regenerative medicine; Burkey: co-advise graduate student developing topographically biomimetic biomaterials

% Effort: 85%

Project/Proposal Title: “Development of a Computational Model to Predict Colon Absorption of Insoluble Drugs in Controlled Release Delivery”

Amount: \$40,000 (\$24,242 direct, \$20,000 annual budget, \$40,000 Carrier portion)

Principal Investigator: Rebecca L. Carrier, PhD

Agency: Pfizer, Inc., Groton, CT

Period: December 31, 2003 – December 30, 2005

Role: Principal Investigator

Roles of Participants: Carrier: Develop programs to predict the influence of cyclodextrins on orally delivered drug bioavailability

% Effort: 100%

**INTERNAL  
Completed**

Project/Proposal Title: “Exploiting Innate Mucosal Immunity for Acute, Safe, and Facile Response to Biowarfare”

Source of Support: Northeastern University Provost Tier 1 Award

Total Award Amount: \$49,565 (\$49,565 annual budget)

Total Award Period Covered: 07/01/2011 - 06/30/2013

Role: PI

Project/Proposal Title: “Eye of Newt...”: Exploiting Regenerative Capacity of Amphibian Matrix for Retinal Regeneration”

Source of Support: Northeastern University Provost Tier 1 Award

Total Award Amount: \$49,977 (\$49,977 annual budget)

Total Award Period Covered: 07/01/2011 - 06/30/2013

Role: PI

Project/Proposal Title: “Nanotoxicology: A MEMS Bioreactor for Understanding Cellular Interactions between Nanoparticles and Intestinal Epithelial Cells”

Source of Support: Northeastern University NSF CHN

Total Award Amount: \$36,200 (\$36,200 annual budget, \$18,100 Carrier portion)

Total Award Period Covered: 08/01/2005 - 07/30/2006

Role: co-Investigator (PI: Dokmeci)

Project/Proposal Title: “Expansion of Drug Delivery and Tissue Engineering Research to the Molecular Level: Education via Attendance at BioScience 2005”

Source of Support: Northeastern University Provost Office Faculty Development Fund

Total Award Amount: \$3,000 (\$3,000 annual budget, \$3,000 Carrier portion)

Total Award Period Covered: 07/01/2005 - 06/30/2006

Role: Principal Investigator

Project/Proposal Title: “Optimization of Biomaterial Physical and Chemical Properties for Tissue Engineering of Intestine”

Source of Support: Northeastern University Provost Office Research and Development Fund

Award Amount: \$7,500 (\$7,500 annual budget, \$7,500 Carrier portion)

Total Award Period Covered: 07/01/2004– 06/30/2005

Role: Principal Investigator

Project/Proposal Title: “Quantitative Modeling of Nanoparticle Cellular Transport”

Source of Support: Northeastern University Electronic Materials Research Institute (eMRI)

Award Amount: \$6,000 (\$6,000 annual budget, \$6,000 Carrier portion)

Total Award Period Covered: 10/29/2003– 10/28/2004

Role: Principal Investigator

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## TEACHING AND ADVISING

**Courses Taught: (\* = new course developed)**

Spring 2004

CHE U310 Transport Processes and Operations I\* (4 cr) 20 students

Summer I 2005

CHE U934 Independent Study (4 cr) 1 student

Student: Rachel Marullo Project: HPLC System Integration and Development of User's Manual for Operation and Maintenance

Fall 2004

CHE U699 Drug Delivery: Engineering Analysis\* (4 cr) 13 students

Spring 2005

CHE U310 Transport Processes and Operations I (4 cr) 20 students

CHE U934 Independent Study (4 cr) 1 student

Student: Angelo Maginas Project: Investigation of Intestinal Epithelial Cell Sources for Application to Intestinal Tissue Engineering

Fall 2005

CHE G404 Independent Study (4 cr) 1 student

Student: D. Ece Gamsiz Project: Modeling the Influence of Nanoparticles on Cellular Drug Uptake I: Development of Computational Model

Spring 2006

CHE U699 Drug Delivery: Engineering Analysis (4 cr) 22 students

CHE G260 Drug Delivery: Engineering Analysis (4 cr) 2 students

CHE G404 Independent Study (4 cr) 1 student

Student: D. Ece Gamsiz Project: Modeling the Influence of Nanoparticles on Cellular Drug Uptake II: Comparison with Experimental Data

Summer II 2006

CHE U924 Directed Study (4 cr) 1 student

Student: Matt Kankash Project: Development of Collagen Sponge Scaffolds for Intestinal Epithelial Cell Culture

Fall 2006

CHE U310 Transport Processes and Operations I (4 cr) 26 students

CHE G404 Independent Study (4 cr) 1 student

Student: D. Ece Gamsiz Project: Modeling the Influence of Nanoparticles on Cellular Drug Uptake II: Comparison with Experimental Data – Part II

CHEU521 Unit Operations Lab – Biomaterial Biocompatibility Module\* (4 cr) 6 students

Spring 2007

CHE U699 Drug Delivery: Engineering Analysis (4 cr) 22 students

CHE G260 Drug Delivery: Engineering Analysis (4 cr) 7 students

CHE U521 Unit Operations Lab – Fluids module and Biomaterial Biocompatibility Module (4 cr) 22 students



Summer II 2007

CHE U521 Unit Operations Lab – Drug Delivery Module\* (4 cr) 8 students

Fall 2007

CHE U310 Transport Processes and Operations I (4 cr) 16 students

Fall 2007

PSC G412 Pharmaceutical Sciences Directed Study (2 cr) 1 student

Student: Neepa Gaba    Literature Review: Digestion of Nanoemulsion Systems and Lipids in the GI Tract

PSC G411 Pharmaceutical Sciences Directed Study (1 cr) 1 student

Student: Rajiv Panwar    Project: Literature Review: Transport of Drugs and Particulate Drug Carriers across Mucosal Surfaces

PSC G411 Pharmaceutical Sciences Directed Study (1 cr) 1 student

Student: Vishwas Pathak    Project: Literature Review: Physical and Chemical Properties of Self Emulsifying Drug Delivery Systems (SEDDS)

PSC G660 Pharmaceutical Sciences Research (2 cr) 1 student

Student: Neepa Gaba    Project: Development of an Experimental Protocol for Measurement of Emulsion Digestion Kinetics in a Simulated Intestinal Environment

PSC G660 Pharmaceutical Sciences Research (2 cr) 1 student

Student: Rajiv Panwar    Project: Study of Mucus Structure from Different Areas of Intestine using Scanning Electron Microscopy

PSC G660 Pharmaceutical Sciences Research (2 cr) 1 student

Student: Vishwas Pathak    Project: Studies of the Influence of Formulation Parameters on the Size and Zeta Potential of Self Emulsifying Drug Delivery Systems (SEDDS)

Spring 2008

CHE U699 Drug Delivery: Engineering Analysis (4 cr) 26 students

CHE G260 Drug Delivery: Engineering Analysis (4 cr) 1 student

PSC G412 Pharmaceutical Sciences Directed Study (2 cr) 1 student

Student: Vishwas Pathak    Project: Expansion of Literature Review: Physical and Chemical Properties of Self Emulsifying Drug Delivery Systems (SEDDS)

PSC G660 Pharmaceutical Sciences Research (2 cr) 1 student

Student: Neepa Gaba    Project: Testing of an Experimental Protocol for Measurement of Emulsion Digestion Kinetics in a Simulated Intestinal Environment

Summer 2008

CHE U521 Unit Operations Lab – Drug Delivery Module (4 cr) 9 students

Fall 2008

CHE G320 Chemical Engineering Mathematics\* (4 cr) 16 students

PSC G412 Pharmaceutical Sciences Directed Study (2 cr) 1 student

Student: Ankit Mehta    Project: Transport Studies of Nanoparticles across Intestinal Mucus

PSC G412 Pharmaceutical Sciences Directed Study (2 cr) 1 student

Student: Mukul Ashtikar Project: Precipitation Kinetics of Drug Compounds Transiting from Gastric to Intestinal Fluid

CHE G404 Independent Study (4 cr) 1 student

Student: Sandeep Reddy Project: Molecular Modeling of the Dimer Formation of MUC2 Mucin Cystine Knots

Spring 2009

CHE U699 Drug Delivery: Engineering Analysis (4 cr) 11 students

CHE G260 Drug Delivery: Engineering Analysis (4 cr) 6 students

Fall 2009

CHME7320 Graduate Chemical Engineering Mathematics (4 cr) 12 students

Spring 2010

CHME 5160 Drug Delivery: Engineering Analysis (4 cr) 15 undergraduate, 1 graduate student

CHME 4993 Independent Study (4 cr) 2 students

Students: Jason Crater and Sarah Scott Projects: Transport studies of Emulsions through Mucus, and Natural Retinal Matrix Materials for Regenerative Medicine

Fall 2010

CHME 3322 Chemical Engineering Thermodynamics II\* (4 cr) 29 students

Fall 2011

CHME 3322 Chemical Engineering Thermodynamics II (4 cr) 32 students

Spring 2012

CHME 3322 Chemical Engineering Thermodynamics II (4 cr) 40 students

CHME 5699 Quantitative Principles of Cell and Tissue engineering\* (4 cr) 24 students

Fall 2013

CHME 3322 Chemical Engineering Thermodynamics II (4 cr) 34 students

Spring 2016

CHME 3312 Chemical Engineering Transport II\* (4 cr) 21 students

Spring 2017

CHME 3312 Chemical Engineering Transport II (4 cr) 44 students

Spring 2018

CHME 3312 Chemical Engineering Transport II (4 cr) 32 students

CHME 5984 Independent Study (4 cr) 1 student

Student: Stephanie Riofrio Project: Design of Novel Drug Delivery Systems

Fall 2018

CHME 3312 Chemical Engineering Transport II (4 cr) 19 students

### **Advising of Graduate Student Theses:**

- Andy Phung, Doctoral Student, projected completion date: 2021. Thesis: "Advanced Analytical Analysis of Molecular Interactions at the Intestinal Mucosal Interface"
- Cuiying Zhang, Master's Student, projected completion date: 2019. Thesis: "Development of a Mesofluidic Engineered Immune-Competent Gut Tube"
- Joshua Luchan, Doctoral Student, projected completion date: 2021. Thesis: "Engineered Intestinal Model with Microbiome"
- Chia-Ming Wang, Doctoral Student, projected completion date: 2021. Thesis: "Impact of Lumen Stimuli on Intestinal Mucosal Integrity in an Engineered Gut System"
- Di Zhu, Masters Student, projected completion date: 2017. Thesis: "Modeling Impact of Fish Oil on Oral Absorption"
- Douglas Blanton, Masters Student, completion date: December 2017. Thesis: "Uncovering Cues Driving Retinal Progenitor Migration"
- Jaclyn Lock, Doctoral Student, completion date: May 2018. Thesis: "Mucus Barrier Properties in Inflammation"
- Lauren Speciner, Doctoral Student, completion date: May 2018. Thesis: "In vivo Analysis of Compound Absorption in the Presence of Food"
- Taylor Carlson, Doctoral Student, completion date: May 2018. Thesis: "Impact of Lipids on Mucus Barrier Properties"
- Oljora Rezhdo, Doctoral Student, completion date: May 2018. Thesis: "Impact of Food on Oral Compound Absorption: Mechanistic Studies and Modeling"
- Sean Kevlahan, Doctoral Student (co-advised with Prof. Shashi Murthy), completion date: August 2013. Thesis: "Microfluidic Cell Separation for Intestinal Tissue Engineering"
- Hasan Yildiz, Doctoral Student, completion date: January 2014. Thesis: "Characterization of Transport Properties of Intestinal Mucus"
- Selena DiMaio, Doctoral Student, completion date: February 2014. Thesis: "Influence of Lipids in the Gastrointestinal Environment on Compound Absorption"
- Fulden Buyukozturk, Doctoral Student, completion date: August 2012. Thesis: "Investigation of Micro- and Nano-emulsion Cytotoxicity, Permeability Enhancement, Digestion, and Drug Release in a Simulated Intestinal Environment"
- Courtney Pfluger, Doctoral Student, completion date: May 2011. Thesis: "Chemical Vapor Deposition Replication of Intestinal Basement Membrane Topography"
- Brian McMahan, Masters Student, completion date: October 2010. Thesis: "Investigation of the Influence of Chemical Vapor Deposition Operating Parameters on Materials Deposited on Biological Surfaces"
- Lin Wang, Doctoral Student, completion date: October 2010. Thesis: "Biomimesis of Intestinal Crypt-villus Micro-topography for Caco-2 Cell Culture"
- D. Ece Gamsiz, Doctoral Student, completion date: December 2010. Thesis: "Modeling the Influence of Drug Delivery Technologies on Oral Absorption of Insoluble Drugs"
- Saloni Bhardwaj, Masters Student, completion date: December 2007. Thesis: "Physiological Representation of Intestinal Transit and Precipitation Phenomena in Oral Drug Delivery Modeling"
- Vatsala Sadasivan, Masters Student, completion date: September 2006. Thesis: "Molecular Modeling of the Human Intestinal Mucin (MUC2) for Drug Transport Study"

**Advising of Postdoctoral Fellows:**

- Joydip Kundu, Project: "Development of a retina extracellular matrix-based injectable gel" (2012-present)
- Yan Yan Yeap, Project: "Mechanisms of Lipid Impact on Transport across Intestinal Mucosa" (2014-2015)
- Abigail Koppes, Project: "Engineering the Intestinal and Retinal Niches" (2013-2014)

**Advising of Graduate Student non-Thesis Projects:**

- Nikhita Jayachandran, Bioengineering Masters student, Fall 2018. Project: Analysis of Soluble and Insoluble Factors from Lower Vertebrate Retina Impact on Retinal Progenitor Cells
- Megha Kamath, Pharmaceutical Sciences Masters student, Fall 2015-May 2016. Project: Biomaterials for In Vitro Intestinal Models
- Joshua Scalaria, Chemical Engineering Masters student, Fall 2015-May 2016. Project: Physical and Chemical Cues Promoting Retinal Progenitor Cell Survival, Attachment, and Migration in the Context of Retinal Regeneration
- Andrew Michaelson, Bioengineering Masters student, Fall 2011-Fall 2013. Project: Matrix-Based Biomaterials for Retinal Regeneration
- Karthik Boppidi, Masters in Biotechnology Program, Fall 2007-Spring 2008. Project: Culture of IEC-6 Intestinal Epithelial Cells on Biomimetic Substrates
- Rajiv Panwar, Pharmaceutical Sciences Masters student, Spring 2008. Project: Electron Microscopy Structural Studies of Mucus
- Mukul Ashtikar, Pharmaceutical Sciences Masters student, Spring 2008-Fall 2009. HPLC Evaluation of Compound Solubility in Fed State and Fasted State Simulated Intestinal Fluids
- Ankit Mehta, Pharmaceutical Sciences Masters student, Spring 2008-Summer 2008, Spring-Fall 2009. Project: Transport Studies of Nanoparticles across Intestinal Mucus
- Christine Rea, Chemical Engineering Masters student, Fall 2011-Summer 2012. Project: Electrodeposition of Precise Replica of Biological Structure
- Esfandiar Kaikhosrowzadeh, Chemical Engineering Masters student, Spring 2012-Fall 2013. Project: Impact of Particle Size on Nanoparticle Transport across Intestinal Mucus

**Undergraduate and High School Advising Activities:**

- Dennis Callahan, undergraduate Honors Adjunct Project, Fall 2005. Project: Computational Fluid Dynamic Modeling of Flow in the Intestine
- Tsz Yeung Emmet Wong, high school research project (Research Science Institute), Summer 2005. Project: Influence of Cyclodextrins on the Dissolution Kinetics of Naproxen in Simulated Gastric and Intestinal Fluid
- Soumya Nettimi, high school research project (Research Science Institute), Summer 2006. Project: Influence of Cyclodextrins on the Dissolution Kinetics of Naproxen in Simulated Gastric and Intestinal Fluid
- Rebecca Harvey, undergraduate research project, Fall 2006. Project: Dependence of Nano-emulsion Dissolution Kinetics on Lipid and Surfactant Components
- Edward Kogan, high school research project (Research Science Institute), Summer 2007. Project: The Effects of Basement Membrane Topography on Caco-2 cell Morphology
- James Sims, undergraduate research project, Fall 2007-Spring 2009. Projects: Transport

Studies of Drugs through Mucus from Upper and Lower Intestine, Characterization of Drug Precipitation Kinetics  
Rhiannon Quirk, undergraduate research project, Fall 2007. Project: Development of a Protocol for Studying Emulsion Digestion Kinetics  
Hong Long, undergraduate research project, Fall 2007-Fall 2008. Project: Kinetic Studies of Nanoemulsion Digestion and Drug Release  
Janae Miller, undergraduate research project, Summer 2008-Spring 2010. Project: Transport Studies of Drug Compounds and Nanoparticles across Intestinal Mucus  
Dalton Hubble, high school research project (Research Science Institute), Summer 2008. Project: Characterization and Degradation of Biomimetic pHEMA Polymer Fabricated by HFCVD for Scaffolding Applications  
Jason Crater, undergraduate cooperative education researcher, Spring 2009. Project: Multiple Particle Tracking Studies of Nanoparticle Transport in Intestinal Mucus; undergraduate research project, Fall 2008, Spring 2010 Projects: Transport of Emulsions Across Intestinal Mucus, Development of Natural Retinal Matrix Materials for Regenerative Medicine  
Sarah Scott, undergraduate research project, Spring-Summer 2010. Projects: Transport of Emulsions Across Intestinal Mucus, Development of Natural Retinal Matrix Materials for Regenerative Medicine  
Annemarie Uliano, undergraduate research project, Summer 2010. Project: Nanoparticle Toxicity and Transport in Lung Epithelial and Macrophage Cells.  
Adithyavairavan Murali, high school research project (Research Science Institute), Summer 2010. Project: Chemical Processing and Characterization of Retinal Extracellular Matrix Biomaterials for Regenerative Medicine  
Taylor Dickman, undergraduate research project, Summer-Fall 2012. Project: Processing of Retinal Extracellular Matrix  
Dang Phan, undergraduate research project, Fall 2011-Spring 2014. Project: Impact of Lipid Digestion on Drug Dissolution  
Hieu Nyugen, undergraduate research project, Fall 2011-Spring 2012. Project: Digestion Kinetics of Lipids  
Jonathan Wang, undergraduate research project, Fall 2011-Spring 2012. Project: Adhesion of Interphotoreceptor Matrix to Tissue Culture Materials  
Murillo Silva, undergraduate research project, Spring 2012. Project: Impact of Particle Size on Transport through Intestinal Mucus  
Samantha Saggese, undergraduate research project, Spring 2012. Project: Isolation of Interphotoreceptor Matrix  
Thomas Nigl, undergraduate research project, Spring 2012. Project: Gel Formation from Interphotoreceptor Matrix  
Marco Chiumiento, undergraduate research project, Spring 2012. Project: Proteomic Analysis of Interphotoreceptor Matrix  
Noah St. James, undergraduate research project, Fall 2013. Project: Soft Lithograph of Intestinal Epithelial Structure using Intestinal Tissue  
Jennifer Langh, undergraduate research project, Fall 2013. Project: Barrier Properties of Mucus in Necrotizing Enterocolitis  
Natalie Viyaran, undergraduate research project, Fall 2013-Spring 2014. Characterization of

Caco-2/HT29-MTX Cell Cultures

Minh Nguyen, undergraduate research project, Fall 2013-Spring 2014. Co-Cultures Techniques for Cell-Based In Vitro Models

McKensie Collins, undergraduate research project, Fall 2013-Fall 2015. Co-Cultures Techniques for Cell-Based In Vitro Models

Aurora Pando, undergraduate research project, Fall 2013-Fall 2015. Evaluation of Digestion Kinetics in an In-Vitro Gastric Simulation

Joseph Iacona, undergraduate research project, Fall 2013-Spring 2015. Assessing Drug Dissolution During an In Vitro Gastrointestinal Digestion of Milk

Jordan Harris, undergraduate research project, Fall 2013-Spring 2015. Assessing Drug Dissolution During an In Vitro Gastrointestinal Digestion of Milk

Kiernan Halligan, undergraduate research project, Fall 2014-Spring 2015. Maintenance and Expansion of NRW and Caco-2 Cell Culture

Sean Lerkvikarn, undergraduate research project, Fall 2014-Fall 2015. Supersaturation Stabilizing Properties of Intestinal Mucus

Mike Brodin, undergraduate research project, Fall 2013-Fall 2015, In Vivo Pharmacokinetic Studies to Determine the Effect of Lipid Digestion on Drug Absorption

Charles Evans, undergraduate research project, Fall 2013-Fall 2015, Effect of Lysozyme on Particle Transport in Intestinal Mucus

Emily Cady, undergraduate research project, Spring 2015-Fall 2015, Biomaterials for Regenerative Medicine

Albert Chen, undergraduate research project, Fall 2013-Fall 2015, Chemical Analysis of Intestinal Mucus

Rachel Shapiro, undergraduate research project, Spring 2015-Fall 2015, Development of an In Vitro Model of the Small Intestine

Hyojung Yoon, undergraduate research project, Spring 2015-Fall 2015, Lipid Impact on Drug Dissolution

Linda Winberg, undergraduate research project, Spring 2015-Fall 2015, Mechanistic Studies and Modeling of the Impact of Lipid Nanoemulsions on Oral Lapatinib Absorption

Nafsika Gjika, undergraduate research project, Spring 2015-Fall 2015, Retinal Tissue Engineering and Development of Explant Culture Models

Martina Merrill, undergraduate research project, Spring 2015-Fall 2015, Study the effect of lipids on particle transport in intestinal mucus.

William Medeiros, undergraduate research project, Spring 2015-Fall 2015, Lipid Impact on Drug Dissolution

William Cisneros, undergraduate research project, Spring 2015-Fall 2015, Tissue Engineering of Retina

Kevin DiBona, undergraduate research project, Creative Endeavor Award, Summer 2016-Spring 2017. Project: Effect of Microbes on 3D Co-Culture Intestinal Epithelial Model

Nicholas Nguyen, undergraduate research project, Fall 2015-current. Project: Use of Ion Selective Electrodes to Determine Drug Solubility

Albert Chen, undergraduate research project, Fall 2013-current. Project: Chemical Analysis of Intestinal Mucus

Martina Merrill, undergraduate research project, Summer 2015-Fall 2015. Project: Study the Impact of Lipids on Intestinal Mucus Barrier Properties

Charles Evans, undergraduate research project, Fall 2013-Spring 2015. Project: Effect of Lysozyme and Lactoferrin on Mucus Barrier Properties

Zaineb Dar, undergraduate research project, Summer 2016-current. Project: Investigation of Microbe Movement in Mucus

Aanie Philips, undergraduate research project, Spring 2016-Fall 2016, The influence of porcine and axolotl retinal ECM factors on human retinal progenitor cells

Sravani Korupolu, undergraduate research project, Spring 2016-Fall 2016, The influence of inflammation-associated bacteria on immune competent intestinal cultures

Mary Larcom, undergraduate research project, Spring 2015-Fall 2015, Study of the impact of emulsifiers on the intestinal digestion of lipids

Maya Raz, undergraduate research project, Spring 2015-Fall 2015, Study of the impact of emulsifiers on the intestinal digestion of lipids

Maggie Turner, undergraduate research project, Spring 2015-Fall 2015, Study of the impact of emulsifiers on the intestinal digestion of lipids

Asad Khanmohammed, undergraduate research project, Fall 2016-present, Study of the impact of emulsifiers on the intestinal digestion of lipids

Matthew Tse, undergraduate research project, Fall 2016-Spring 2017, Study of the impact of food on oral drug dissolution

Kayla Tannock, undergraduate research project, Fall 2016-Spring 2018, Study of the impact of food on oral drug dissolution

Joshua Lee, undergraduate research project, Spring 2017-Summer 2017, Study of the impact of food on oral drug dissolution

Kyi Thwin, undergraduate research project, Spring 2016-Summer 2017, Study the effect of lipids on microbial transport in intestinal mucus

Timmie Dong, undergraduate research project, Spring 2016-Summer 2017, Study the effect of lipids on microbial transport in intestinal mucus

Jonathon Mooncai, undergraduate research project, Summer 2017, Effect of mucin on drug supersaturation

Jennifer Quaglia, undergraduate research project, Summer 2017, Effect of mucin on drug supersaturation

Nicholas Nguyen, undergraduate research project, Fall 2016-Spring 2017, Use of Ion-Selective Electrodes for studying drug supersaturation in the presence of mucin

Tanner Semin, undergraduate research project, Undergraduate Research and Creative Endeavor Award, Spring 2017-Spring 2018, Effect of mucin on drug supersaturation

Alyssia Kazan, undergraduate research project, Spring 2017-Fall 2017, The application of lower vertebrate extracellular matrix factors to human retinal progenitor cells as a means for treating retinal degeneration (REU D3 (Big Data) student)

Christian Choi, cooperative education project, Summer 2017-Spring 2018, Study the effect of mammalian/microbial co-culture on mammalian barrier function and microbial population growth

Jason Jaroslovsky, cooperative education project, Summer 2017-Fall 2017, Analysis of the

impact of lipid digestion on drug dissolution kinetics.

Dylan Sayasith, cooperative education project, Summer 2017-Fall 2017, Analysis of the impact of lipid digestion on drug dissolution kinetics.

Brandon Ng, cooperative education project, Summer 2018-Fall 2018, Analysis of the impact of lipid digestion on drug dissolution kinetics.

## **SERVICE AND PROFESSIONAL DEVELOPMENT**

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### **Service to Northeastern University:**

#### **Department Service**

- Faculty Search Committee Chair (Drug Delivery Research Focus) (2015-2016)
- Dept of Chemical Engineering Business Manager Search Committee (2015-2016)
- Associate Chair of Research in Chemical Engineering (2014-present)
- Chemical Engineering Graduate Coordinator (2013-2014)
- Faculty Search Committee Chair (Bioengineering Research Focus) (2013-2014)
- Industrial Advisory Board Seminar Series co-Coordinator (with Prof. Shashi Murthy) (2010-2011)
- Faculty Search Committee: Joint senior position in regenerative medicine between Chemical Engineering and Pharmaceutical Sciences (2010-2011)
- Faculty Search Committee: Drug Discovery Cluster Hire (2010-2011)
- Undergraduate Education Committee, NU Department of Chemical Engineering (2009-present, Chair, 2011-2012)
- Academic Advisor, NU Chemical Engineering Undergraduates (2006-present) (joint effort with all Chemical Engineering Faculty)
- Faculty Advisor, Chemical Engineering Graduate Student Council (2006-2008)
- Faculty Search Committee (2006-2007)
- Graduate Program Committee, NU Department of Chemical Engineering (2003-2009)

#### **College Service**

- Research Associated Priorities (RAP) Committee (2014-present)
- Graduate Directors Committee, Member (2013-2014)
- Undergraduate Affairs Committee (2011-2012)
- Awards Committee (2011-2012)
- College of Engineering Bioengineering Program- Biochemical Engineering Track Chair (2010-2015)
- Bioengineering Program Committee, Biochemical Engineering Track Chair, NU College of Engineering (2008-present)
- Building Bridges (High School program to interest students in Engineering) Science Demonstration Presenter (2003-present) and Coordinator for Chemical Engineering (2004-2010)



- Sabbatical Leave Committee (Elected Member), NU College of Engineering (2004-2007)
- Computer Advisory Committee, NU College of Engineering (2003-2010)

### **University Service**

- Senate Faculty Development Committee (2015-2018)
- Faculty Senate, Senator (2013-2015)
- Senate Research Policy Oversight Committee (2013-2014)
- Graduate Materials Links (graduate student group focused on materials science) Faculty Advisor (2007-2008)
- Women In Science and Engineering Exposition Poster Judge, NU (2006)
- co-Faculty Advisor, International Society of Pharmaceutical Engineers student chapter at Northeastern University (2006-present)
- NU National Society of Black Engineers High School Engineering Day Presenter (2005)

### **Service to the Discipline/Profession:**

#### **Scientific Meeting Organization**

- Co-Chair, AIChE Society for Biological Engineering 3<sup>rd</sup> Bioengineering and Translational Medicine Conference (2018)
- Member-At-Large, Society for Biomaterials (2018-2019)
- Program Committee, Society for Biomaterials Meeting (2017-2020)
- Session Chair: “Delivery Technologies in Nutraceuticals, Food, and Oral Products,” Controlled Release Society Meeting, Boston, MA (2017)
- Discussion Leader for the session “Barriers and Carriers for Delivery Across Epithelial, Mucus and Other Extracellular Barriers” at the Gordon Research Conference on Drug Carriers (2016)
- Invited to and participated in NIH National Eye Institute Retinal Challenge Workshop, Bethesda, MD (2016)
- Chair, Society for Biomaterials Meeting, Minneapolis, MN (2017)
- National Academy of Engineering Frontiers of Engineering Education Committee (2015-2016)
- Co-Chair, Northeast Bioengineering Conference (2014)
- BMES Biomaterials Track Chair, BMES Annual Meeting, San Antonio, TX (2014)
- Discussion Leader “Matrix Assembly”, Gordon Research Conference (2014)
- Organized the “Challenges with non-injectable drug delivery designs” Society for Biomaterials Meeting (2014)
- Session co-Chair: “Novel Materials and Self Assembly,” BMES Annual Meeting, Seattle, WA (2013)
- Track Chair: “Drug Delivery,” BMES Annual Meeting, Hartford, CT (2011)
- Track Chair: “Meet the Faculty Candidate,” BMES Annual Meeting, Austin, TX (2010)
- Organizing Committee Member: Northeast Bioengineering Conference, Boston (2009)
- Workshop Leader, “Solubilization Technologies for Oral Drug Delivery,” 3<sup>rd</sup> Annual Improving Solubility Conference, Boston, MA (2009)

- Chair: Annual Meeting of the Northeast Regional Discussion Group of the American Association of Pharmaceutical Scientists (AAPS-NERDG), Rocky Hill, CT (2008)
- Session Vice-Chair: “Protein Drug Formulation and Delivery,” AIChE Annual Meeting, Salt Lake City, UT (2007)
- Vice-Chair: Annual Meeting of the Northeast Regional Discussion Group of the American Association of Pharmaceutical Scientists (AAPS-NERDG), Rocky Hill, CT (2007)
- Session Chair: “Biomaterials for Drug Delivery I,” AIChE Annual Meeting, San Francisco, CA (2006)
- Session Vice-Chair: “Agglomeration, Granulation and Particle Formation Processes,” AIChE Annual Meeting, San Francisco, CA (2006)
- Session Vice-Chair: “Agglomeration, Granulation and Particle Formation Processes,” AIChE Annual Meeting, Cincinnati, OH (2005)
- Session Chair: “Biomaterials for Gene Therapy and Drug Delivery,” AIChE Annual Meeting, Austin, TX (2004)
- Session Vice-Chair: “Advances in Drug Delivery: Focus on Biomaterials, I and II,” AIChE Annual Meeting, Austin, TX (2004)
- Session Vice-Chair: “Novel Carriers for Drug & Cell Delivery,” AIChE Annual Meeting, Austin, TX (2004)
- Session Vice-Chair: “Agglomeration, Granulation, and Novel Fluidized Bed Applications,” AIChE Annual Meeting, San Francisco, CA (2003)
- Session Vice-Chair: “Biomimetic Approaches to Material Design,” AIChE Annual Meeting, Indianapolis, IN (2002)
- Session Vice-Chair: “Modeling and Drug Delivery Systems,” AIChE Annual Meeting, Indianapolis, IN (2002)
- Meeting Organizer, Pfizer Global Controlled Release Meeting, Boston, MA, (2001)

### **Invited Lectures**

**XTalks Webinar Sponsored by Catalent and BASF Corp.**, “Using Lipid-Based Drug Delivery for Fast and Efficient Early Phase Development” (October, 2018)

**Catalent-BASF workshop on Lipid-Based Drug Delivery Systems**, Boston, MA, “Mechanistic Studies and Modeling to Predict the Impact of Lipids on Oral Absorption” (September, 2018)

**Northwestern University Department of Biomedical Engineering**, Evanston, IL, “Engineering the Intestinal Mucosal Barrier” (May, 2018)

**Boston University Department of Biomedical Engineering**, Boston, MA, “Biomaterials to Promote Retinal Regeneration” (April, 2018)

**6th Pharmaceutical Sciences World Congress**, Stockholm, Sweden, “Lipid Nanoemulsions Impact Transport Across Mucosal Surfaces” (May, 2017)

**Workshop on Micro- and Nanotechnologies for Medicine**, Cambridge, MA, “Approaches to Control the Retinal Microenvironment” (July 2017)

**National Eye Institute Workshop: Stem Cells and Organoids as Models of Tissue Differentiation and Eye Diseases**, Baltimore, MD, “Generation of Retinal Tissue and Function: Development of a 3D Retinal Microenvironment” (May, 2017)

**Acta Biomaterialia Gold and Silver Medal Session, Society for Biomaterials Annual Meeting**, Minneapolis, MN, “Nanomedicine at the Intestinal Mucosal Interface” (April, 2017)

**Barabasi Lab, Northeastern University Department of Physics**, Boston, MA, “Engineering the Intestinal Environment” (November, 2017)

**Lehigh University Department of Chemical Engineering**, Lehigh, PA, “Engineering Analysis and Control of Transport across the Intestinal Mucosal Barrier” (November, 2017)

**Tufts University Department of Chemical Engineering**, Medford, MA, “Engineering Analysis and Control of Transport across the Intestinal Mucosal Barrier” (October, 2017)

**University of Massachusetts Lowell**, Lowell, MA, “Engineering the Intestinal Mucosal Barrier” (September, 2017)

**AIChE Annual Meeting "Bionanotechnology" Session Invited Platform Presentation**, San Francisco, CA, “Lipid Nanoemulsions Impact Transport Across Mucosal Surfaces” (November, 2016)

**AIChE Annual Meeting "Cells, Organs, Labs-on-a-chip" Session Invited Platform Presentation**, San Francisco, CA, “Multi-organ on chip models to advance drug development and model disease” (November, 2016)

**Northeastern University Center for Interdisciplinary Research on Complex Systems (CIRCS)**, Boston, MA, “Engineering Materials for Controlling Retinal Progenitor Cell Behavior” (November, 2016)

**4th Workshop in Micro- and Nanotechnologies for Medicine**, “Engineering Materials for Controlling Retinal Progenitor Cell Behavior,” (July, 2016)

**Merck, Inc.**, West Point, PA, “Engineering analysis and control of transport across the intestinal mucosal barrier” (January, 2016)

**University of Virginia Department of Chemical Engineering**, Charlottesville, VA, “Engineering the Gut Mucosal Barrier” (September, 2016)

**ACS Colloids Symposium**, Boston, MA, “Interactions of Intestinal Lumen Contents with the Mucosa: Implications for Molecular, Particulate, and Microbe Transport to Underlying Tissues” (May, 2016)

**Signal Transduction by Engineered Extracellular Matrix 2016 Gordon Research Conference**, Biddeford, ME, “Engineering the gut mucosal barrier in health and disease” (June, 2016)

**University of Kentucky Department of Pharmaceutical Sciences**, Lexington, KY, “Impact of Lipids on Oral Drug Delivery” (February, 2016)

**Pennsylvania State University**, Philadelphia, PA, “Bioengineering Approaches to Transport Across Mucosal Surfaces” (March, 2015)

**University of Rhode Island Department of Chemical Engineering**, Kingston, RI, “Engineering Analysis and Control of Transport across the Intestinal Mucosal Barrier” (November, 2015)

**Schepens Eye Research Institute**, Boston, MA, “Bioengineering Materials for Manipulating Retinal Progenitor Cell Behavior” (December, 2014)

**Olin College**, Needham, MA, “Biomaterials in Drug Delivery and Tissue Engineering” (September, 2014)

**Needham Community Education Needham Professors Series**, Needham, MA, “Tissue

Engineering: Intestine and Retina” (October, 2014)

**Workshop for Micro- and Nanotechnologies for Medicine: Emerging Frontiers and Applications (Harvard)**, Cambridge, MA, “Biomimetic Biomaterials for Intestinal and Retinal Tissue Engineering” (July, 2014)

**Jeffrey Karp Lab (MIT)**, Cambridge, MA, “Biomimetic Biomaterials for Intestinal and Retinal Tissue Engineering” (January, 2013)

**Boehringer Ingelheim**, Ridgefield, CT, “Enabling Oral Drug Delivery: Overcoming Barrier Through Mechanistic Studies and Modeling” (September, 2013)

**Boston University 57<sup>th</sup> New England Complex Fluids Workshop**, Boston, MA, “Intestinal Mucus: modulation of Hydrogel Structure and Barrier Properties by Mild Physiological Stimuli” (December, 2013)

**Controlled Release Society Connecticut Student Chapter**, New Haven, CT, “The Magic Pill: Enabling Technologies for Oral Drug Delivery” (June, 2012)

**MIT Department of Biological Engineering**, Cambridge, MA, “Enabling Oral Drug Delivery: Overcoming Barriers to Intestinal Absorption” (October, 2012)

**Worcester Polytechnic Institute Department of Biomedical Engineering**, Worcester, MA, “Biomimetic Biomaterials for Intestinal and Retinal Tissue Engineering” (October, 2012)

**Merck, Inc.**, West Point, PA, “Investigation of Nanoparticle and Micelle Transport across Intestinal Mucus” (May, 2012)

**Boehringer Ingelheim**, Ridgefield, CT, “Mechanistic Studies and Modeling to Facilitate Rational Oral Drug Development: Focus on Lipids and Complexing Agents” (May, 2012)

**240th Annual Meeting of the American Chemical Society**, Boston, MA, “Impact of Food on the Function of Oral Drug Delivery Systems” (August 2011)

**Merck, Inc.**, West Point, PA, “Impact of Lipids on Oral Drug Delivery” and “Bioengineering Topics in Oral Drug Delivery” (January, 2011)

**University of Connecticut Department of Chemical Engineering**, Storrs, CT, “Structurally Biomimetic Biomaterials for Intestinal and Retinal Tissue Engineering” (October, 2011)

**Harvard University Wyss Institute for Biologically Inspired Engineering**, Boston, MA, “Biomaterials with Biomimetic Topography for Intestinal Cell Culture and Tissue Engineering,” (March, 2010)

**Rensselaer Polytechnic Institute Department of Chemical Engineering**, Troy, NY, “Material Properties and the Biological Response in Drug Delivery and Regenerative Medicine,” (March, 2010)

**Northwestern University Department of Chemical Engineering**, Evanston, IL, “Bioengineering Topics in Oral Drug Delivery,” (May, 2010)

**University of Texas at Austin Department of Biomedical Engineering**, Austin, TX, “Mechanistic Studies and Modeling of Compound Transport in Oral Drug Delivery,” (March, 2010)

**Johns Hopkins University Department of Chemical Engineering**, Baltimore, MD, “Drug Delivery Studies and Biomaterial Development for Understanding Compound Transport in the Intestinal Environment,” (February, 2009)

**University of Maryland Baltimore County**, Baltimore, MD, “Drug Delivery Studies and Biomaterial Development for Understanding Compound Transport in the Intestinal

Environment,” (February, 2009)

**National Institute of Nanotechnology**, Alberta, Canada, “Structural and Transport Properties of Mucus: a Barrier to Drug Delivery,” (March, 2008)

**IGERT Nanomedicine Program, Northeastern University**, Boston, MA, “Nanomedicine in Oral Drug Delivery and Intestinal Tissue Engineering,” (November, 2007)

**Olin College**, Needham, MA, “Multiscale Studies of Drug Transport in Oral Drug Delivery,” (September, 2007)

**Tufts University**, Medford, MA, “Drug Delivery: Industrial Formulation Development to Academic Research,” (April, 2007)

**International Workshop in Cell and Tissue Engineering**, Belgrade, “Biomimetic Scaffold Development for Intestinal Tissue Engineering,” (Plenary Speaker, July, 2006)

**Graduate Materials Links Symposium on Interdisciplinary Nano, Bio and Materials Research, Northeastern University**, Boston, MA, “Computational and Tissue-Engineered Models of the Drug Delivery Environment,” (January, 2006)

**Nastech** (Seattle, WA), “Tissue Engineering and Computational Approaches to Studying Compound Transport Across the Intestinal Barrier,” (March, 2006)

**Natick Army Laboratories**, Natick, MA, “Computational and Tissue Engineering Approaches to Studying Compound Transport Across the Intestinal Barrier,” (November, 2005)

**Northeastern Pharmaceutical Sciences Colloquium**, Boston, MA, “Computational and Tissue Engineering Approaches to Understanding Oral Drug Delivery,” (February, 2005)

**Harvard Digestive Diseases Center Seminar Series**, Boston, MA, “Computational and Tissue Engineering Approaches to Studying Compound Transport Across the Intestinal Barrier,” (December, 2005)

**Pfizer Pharmaceutical Research and Development Departmental Seminar**, Groton, CT, “Colonic Absorption Enhancement: Cyclodextrin Technology,” (October, 2004)

**MIT’s Academic Careers Panel**, Invited Panel Member, Cambridge, MA, “Surviving Your First Year as an Assistant Professor,” (July, 2004)

**Cornell University Department of Chemical and Biomolecular Engineering**, Ithaca, NY, “Transport phenomena in Drug Delivery and Tissue Engineering,” (April, 2003)

**American Institute of Chemical Engineers**, Kingston, RI, “Application of Chemical Engineering in Tissue Engineering and Drug Delivery,” (March, 2003)

**Pfizer Pharmaceutical Research and Development**, Ann Arbor, MI, “Osmotic Controlled Release Drug Delivery Technologies,” (November, 2002)

**Johns Hopkins University Biomedical Engineering Department**, Baltimore, MD, “Formulation Scientist: A Career in the Pharmaceutical Industry,” (April, 2002)

**Genzyme Tissue Repair**, Cambridge, MA, “Cardiac Tissue Engineering,” (March, 1999)

#### **Journal Referee**

- AAPS Journal
- ABME
- Acta Biomaterialia
- ACS Biomaterials
- ACS Biomaterials Science Engineering
- Advanced Drug Delivery Reviews

- Advanced Healthcare Materials
- Biomacromolecules
- Biomaterials
- Biomaterials Science
- Biochimie
- Biotechnology and Bioengineering
- Biotechnology Journal
- Chemical Engineering Education
- Colloids and Surfaces B: Biointerfaces
- Expert Opinion on Drug Delivery
- In Vitro Cell and Developmental Biology-Animal
- Industrial & Engineering Chemistry Research
- International Journal of Pharmaceutics
- Journal of Biomedical Research
- Journal of Biomedical Materials Research
- Journal of Chemical Technology and Biotechnology
- Journal of Controlled Release
- Journal of Drug Delivery Science and Technology
- Journal of Pharmacy and Pharmacology
- Journal of Pharmaceutical Sciences
- Journal of Theoretical Biology
- Journal of Tissue Engineering
- Lab on a Chip
- Langmuir
- Molecular Pharmaceutics
- NanoLetters
- Nanomedicine
- Nature Translational Medicine
- Plos One
- PNAS
- Proceedings of the Sixth Yugoslav Materials Research Society Conference YUCOMAT 2004, September 13-17, 2004
- RSC Advances
- Scientific Reports
- Stem Cell International
- Stem Cell Research and Therapy
- Stem Cell Reviews and Reports
- Tissue Engineering

#### **Proposal Review**

- National Institutes of Health, Gene and Drug Delivery Panel Standing Member (2013-2017), ad hoc reviewer (2011)
- National Science Foundation (**eleven panels**)
- Center for Integration of Medicine and Innovative Technology (CIMIT) (May, 2007)

- Irish Research Council Postdoctoral Fellowship Review Panel (May, 2006)
- Natural Sciences and Engineering Research Council of Canada (February, 2006)
- Children's Research Center of Michigan Grant Program (April, 2004)

### **Other Service to the Profession**

- Contributed video to video course "Exploring Engineering," offered on BrownX platform and available to global audience at no cost (September, 2018)
- Served on "Academic Careers" panel at the AIChE Women's Initiative Committee meeting (2016)
- Served on Career Panel at the Young Scholars Conference at Brown (2016)
- International Editorial Board for "Biomaterials"
- Northeastern University ADVANCE Workshop Design and Presentation (with Penny Beuning), "Building a Research Program" (2016, 2017, 2018)
- MIT "Path to Professorship" "Doing It All" Panel (2014, 2015, 2016, 2017, 2018)
- Society for Biomaterials Membership Committee (2014-2015)
- Northeastern University ADVANCE Panel, "Increasing Scholarly Productivity in STEM Fields" (2014)
- Research Leadership Development Initiative (ReDI) at NU (2013-2014)
- Northeastern University ADVANCE Future Faculty Workshop, Panel Presentation Leader, "Establishing a Research Program and Managing the Graduate Students" (2012)
- Massachusetts Institute of Technology Independent Activities Period Panel Presentation, "Work Life Balance as a Female Faculty Member" (2010)
- Northeastern University ADVANCE Panel, "Hitting the Ground Running" (2010)
- Northeastern University Student AIChE Chapter presentation, "Advanced Drug Delivery Research Lab" (2010)
- Member, Harvard Digestive Diseases Center (2010-present)
- Northeastern Section Younger Chemists Committee of the American Chemical Society, Panel Presentation, "Overcoming Barriers" (2009)
- Controlled Release Society Capsugel Award Committee (2005)
- Massachusetts Institute of Technology "Forward-to-Professorship" Panel (2005)
- Controlled Release Society 3M Graduate Student Award Committee (2003-2005)

### **Service to the Community/Public:**

- Girl Scout Troop Leader (Troop 82826), with focus on "Think Like an Engineer" Journey (2017-present)
- Taught Adult Continuing Education Class for Needham, MA Community Center: "Tissue Engineering" (2014)
- Presenter to Health Careers Academy Students, "My Career Path" (2009)
- Teaching Assistant Volunteer, Washington County, RI Adult Education Center (2002-2003)
- SMART Volunteer Speaker/Demonstrator, Pfizer (2000-2003)
- Pfizer Fun and Exciting Environment Team (2001-2002)
- A Moveable Feast Meal Delivery Volunteer (2000-2001)

## HONORS

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Society for Biomaterials Member-At-Large (2018)  
Northeastern University Soren Buus Outstanding Research Award (2017)  
National Academy of Engineering Frontiers of Engineering, Selected Attendee (2016)  
International Journal of Nanomedicine Outstanding Scientist Award (2015)  
Northeastern University Faculty Fellow (2014) (awarded to Associate Professors demonstrating outstanding achievement and potential for leadership in the University and in their disciplines)  
National Academy of Engineering Frontiers of Engineering Education, Selected Attendee (2013)  
NIH Gene and Drug Delivery Study Section Member (2013-2017)  
Northeastern University College of Engineering “Outstanding Teacher” Award (2011)  
National Science Foundation CAREER Award (2008)  
Bolton (CT) High School “Hall of Fame” Award, for community service and professional promise (2002)  
International Society for Applied Cardiovascular Biology Young Investigator Award (2000)  
Elected member of Sigma Xi Scientific Research Society (MIT Chapter) (1999-2000)  
AIChE Award for Excellence in Teaching (1998)  
Graduate Student Award, International Society for Artificial Organs (1997)  
Ricketts Prize – Chemical engineer with outstanding promise for professional success (1995)  
Balleisen Prize – RPI senior athlete standing highest academically in the class (1995)  
Phalanx – Rensselaer’s Senior Honorary Society (1995)

## PERSONAL INTERESTS

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Snowboarding, cooking and food, hiking, biking, running, gardening, parenting