Melissa Maria Stadt

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EDUCATION

University of Waterloo Waterloo, ON, Canada
Ph.D. in Applied Mathematics May 2022–Present

- − Supervisor: Prof. Anita T. Layton

University of Waterloo Waterloo, ON, Canada
M.Math. in Applied Mathematics May 2022

- − Thesis: *Mathematical modeling of kidney function during pregnancy*
- − Supervisor: Prof. Anita T. Layton

University of Washington Seattle, WA, USA
B.Sc. in Mathematics June 2017

PUBLICATIONS

Peer-reviewed articles

11. **M.M. Stadt** and A.T. Layton, "A modeling analysis of whole-body potassium regulation on a high potassium diet: Proximal tubule and tubuloglomerular feedback effects," *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology*, vol. 326, April 2024.

10. **M.M. Stadt** and A.T. Layton, "Mathematical modeling of calcium homeostasis in female rats: An analysis of sex differences and maternal adaptations," *Journal of Theoretical Biology*, vol. 572, Sept. 2023.

9. **M.M. Stadt**, C.A. West, and A.T. Layton, "Effect of pregnancy and hypertension on kidney function in female rats: Modeling and functional implications," *PLoS One*, vol. 18 (5), May 2023.

8. **M.M. Stadt**, J. Leete, S. Devinyak, and A.T. Layton, "A mathematical model of potassium homeostasis: Effect of feedforward and feedback controls," *PLoS Computational Biology*, vol. 18 (12), Dec. 2022.

7. **M.M. Stadt**, S. Abo, and A.T. Layton, "Circadian regulation of electrolyte and water transport in the rat kidney," *SIAM Journal on Applied Mathematics*, vol. 0, Dec. 2022.

6. **M.M. Stadt** and A.T. Layton, "From your kidneys to your eyes: lessons from computational kidney models," *Modeling and Artificial Intelligence in Ophthalmology*, vol. 4, Sept. 2022.

5. **M.M. Stadt** and A.T. Layton, "Sex and species differences in epithelial transport in the rat and mouse kidneys: Modeling and analysis," *Frontiers in Physiology*, vol. 13, Sept. 2022.

4. S. Abo, D. Smith, **M.M. Stadt**, and A.T. Layton, "Modelling female physiology from head to toe: Impact of sex hormones, menstrual cycle, and pregnancy," *Journal of Theoretical Biology*, vol. 540, May 2022.

3. **M.M. Stadt** and A.T. Layton, "Adaptive changes in single-nephron GFR, tubular morphology, and transport in a pregnant rat nephron: Modeling and analysis," *American Journal of Physiology-Renal Physiology*, vol. 322 (2), Feb. 2022.

2. T. Aougab, M. Beck, P. Carter, S. Desai, B. Sandstede, **M.M. Stadt**, and A. Wheeler, "Isolas versus snaking of localized rolls," *Journal of Dynamics and Differential Equations*, vol. 31 (3), Sept. 2019.

1. I. Chen, J. Fay, and **M.M. Stadt**, "Increasing efficiency for United Way's free tax campaign," *SIAM Undergraduate Research Online*, vol. 11, Mar. 2018

Articles in production

- A. Kent, K. Leiderman, A.C. Nelson, S. Sindi, **M.M. Stadt**, L. Xiong, and Y. Zhang, "Studying the effects of oral contraceptives on coagulation using a mathematical modeling approach," *Mathematical Modeling for Women's Health - Collaborative Workshop for Women in Mathematical Biology*, The IMA Volumes in Mathematics and its Applications, in production.

Articles under review

- **M.M. Stadt** and A.T. Layton, "A mathematical model of whole-body potassium regulation: Global parameter sensitivity analysis," under review.
- A. Mukherjee, **M.M. Stadt**, L. Podina, M. Kohandel, and J. Liu, "Denoising diffusion restoration tackles forward and inverse problems for the Laplace operator," under review.

PRESENTATIONS

Contributed & Invited Conference Talks

- Applied Mathematics Modeling and Computational Science (AMMCS) Conference, Waterloo, ON   August 2023
  Impact of feedforward and feedback controls on potassium homeostasis: A mathematical modeling analysis
- Society of Mathematical Biology (SMB) Annual Meeting, Columbus, OH   July 2023
  Maternal calcium homeostasis: A mathematical modeling analysis of the differential impacts of pregnancy and lactation
- Joint Mathematics Meetings, Seattle, WA   April 2022
  Adaptive changes in GFR, tubular morphology, and transport in pregnant rat kidneys: Modeling and analysis

Invited Seminar Talks

- Dynamics Club at USC, Los Angeles, CA (virtual)   May 2023
  Investigating the effects of feedforward and feedback controls on potassium homeostasis using a mathematical modeling analysis

Poster presentations

- American Physiology Summit, Long Beach, CA   April 2023
  Differential impacts of pregnancy and lactation on maternal calcium homeostasis: A mathematical modeling analysis
- Math and Computing Research Discovery Days, Waterloo, ON   April 2023
  Impact of pregnancy and lactation on maternal calcium homeostasis: Mathematical modeling and analysis
- Canadian Mathematical Society Winter Meeting, Toronto, ON   December 2022
  Impact of feedforward and feedback controls on potassium homeostasis: Mathematical modeling and analysis
- Experimental Biology, Philadelphia, PA   April 2022
  Renal adaptations in gestational hypertension preserve K^+ while minimizing Na^+ retention during pregnancy
- Canadian Applied & Industrial Mathematics Society (CAIMS) annual meeting, Waterloo, ON   June 2021
  Epithelial transport during pregnancy along the rat nephron
  - Poster prize - 1st place

WORKSHOPS

Mathematical modelling for model-informed drug development	Banff, AB (virtual)
Career & Innovation Hub, Banff International Research Station	May 1-2, 2023
Sex differences in physiology: Mathematical modelling and analysis	Banff, AB
Banff International Research Station	March 5-10, 2023

Collaborative workshop for women in mathematical biology	Minneapolis, MN
Institute for Mathematics and its Applications, University of Minnesota	June 20-24, 2022
QSP approaches to problems in the pharmaceutical industry	Toronto, ON (virtual)
Centre for Mathematical Medicine, The Fields Institute	August 5-6, 2021
Workshop on computational modelling of cancer biology	Montréal, QC (virtual)
Centre de Recherches Mathématiques, University of Montréal	July 19-21, 2021
Summer school in nonlinear dynamics for the life sciences	Montréal, QC (virtual)
Centre for Applied Mathematics in Bioscience and Medicine, McGill University	May 31-June 11, 2021
Summer@ICERM undergraduate research program	Providence, RI
Institute for Computational and Experimental Research in Mathematics, Brown University	Summer 2016
Pacific undergraduate research experience in mathematics REU	Hilo, HI, USA
National Science Foundation REU, University of Hawaii-Hilo	Summer 2015

Scholarships and Awards

Scholarships

NSERC Canada Graduate Scholarship - Doctoral (CGS-D)	University of Waterloo
Award Amount: $105,000 CAD	May 2022 - April 2025
President's Graduate Scholarship	University of Waterloo
Award Amount: $35,000 CAD	May 2022 - April 2025
Provost Doctoral Entrance Award for Women	University of Waterloo
Award Amount: $5,000 CAD	May 2022 - December 2022
NSERC Canada Graduate Scholarship - Master's (CGS-M)	University of Waterloo
Award Amount: $17,500 CAD	September 2020 - August 2021
President's Graduate Scholarship	University of Waterloo
Award Amount: $5,000 CAD	September 2020 - August 2021
Louise Borin Fiess Scholarship	University of Washington
Award Amount: $2,500 USD	January 2015 - April 2015
Academic Excellence Scholarship	University of Washington
Award Amount: $1,900 USD	September 2014 - June 2015

Conference and Travel Awards

• AIM's SQuaREs program	2024–2026
• GSPA Graduate Student Research Dissemination Award	July 2023
• IMA Collaborative Workshop for Women in Mathematical Biology	June 2022
• GSPA Graduate Studies Conference Assistantship	April 2022
• CAIMS Annual Meeting poster prize - 1st place	June 2021
• Undergraduate Research Program Conference Travel Award	January 2016

TEACHING

- **Teaching Assistant**, University of Waterloo   September - December 2021
  Advanced Calculus 1 for Electrical and Computer Engineers (ECE 205)

- **Grader**, University of Washington   September 2016 - June 2017
  Elementary Number Theory (MATH 301), Introduction to Mathematical Reasoning (MATH 300)

SERVICE

Supervision/mentorship

Mentor, Women in Mathematics Directed Reading Program, University of Waterloo   January - April 2024
Developed and supervised projects of two undergraduate students on research on applications in mathematical modeling of potassium regulation.

Mentor, Women in Mathematics Directed Reading Program, University of Waterloo   May - August 2022
Developed and conducted a directed reading program for two undergraduate student mentees about research in mathematical physiology related to women's health.

Undergraduate Research (Co-op) Supervisor, University of Waterloo   January - April 2022
Supervised an undergraduate co-op project on developing a whole-body mathematical model of potassium regulation. Project resulted in a paper published in PLoS Computational Biology.

Organization

Organizer, Minisymposium at the Society for Mathematical Biology Annual Meeting, Columbus, OH   July 2023
Modeling sex differences in health and disease

Journals Refereed

- Mathematical Biosciences
- Experimental Physiology
- Physiological Reports

OTHER

Press Coverage

- Research on mathematical modelling of potassium homeostasis featured in Waterloo News
  New mathematical model shows how the body regulates potassium   January 2023
- Research on mathematical modelling of kidney function during pregnancy featured in Waterloo News
  Computational models reveal effects of pregnancy on kidneys   January 2022

Book Reviews

- S. Abo, C. Cheung, R. Dasgupta, P. Dutta, S. Hakimi, A. Kaur, A.T. Layton, M. Sadria, **M.M. Stadt**, V. Swaroop, K. Zheng, "Mathematical modeling for epidemiology and ecology," *SIAM Reviews*, 2023.
- S. Abo, S. Hakimi, A.T. Layton, M. Sadria, D. Smith, **M.M. Stadt**, C. West, "Control applications for biomedical engineering systems," *SIAM Reviews*, 2022.