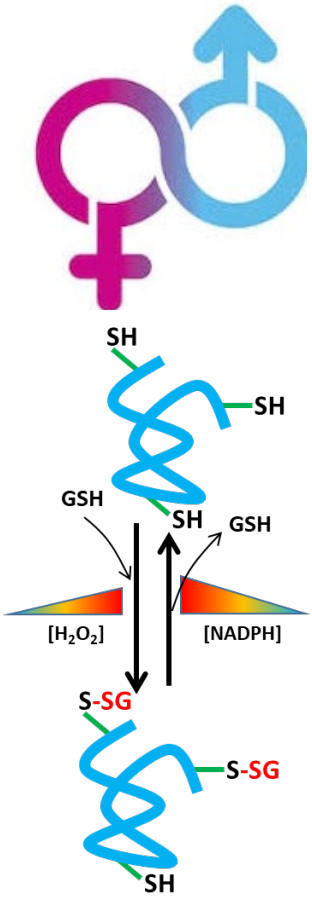
McGill
MACDONALD CAMPUS

Ryan Mailloux

Associate Professor
Director of the School of Human Nutrition

Dr. Ryan Mailloux completed his PhD in 2008 at Laurentian University in the Department of Chemistry and Biochemistry) in toxicology and liver metabolism. He served as a postdoctoral fellow for several years at the University of Ottawa and Carleton University, respectively, where he conducted research on mitochondrial bioenergetics, redox biology, and toxicology. He was recruited in 2019 by the School of Human Nutrition at McGill after serving in a tenure-track position at the rank of assistant professor in the Department of Biochemistry at Memorial University of Newfoundland. Professor Mailloux is now the Director of the School of Human Nutrition. He has published 90 articles in total during his career, has an h-index of 40, and his research has been cited over 5100 times (SCOPUS). He publishes his work in Redox Biology (IF:10.787), Free Radical Biology and Medicine (IF:8.101), Antioxidants and Redox Signaling (IF: 7.04), and Nature Metabolism (IF:19.89), is an Executive Member of the Canadian Oxidative Stress Consortium (COSC), and is assoicate editor for Frontiers in Cell and Development Biology and MDPI Cells. He has established himself as an international leader in mitochondrial redox biology.



Research and Scientific Expertise

Professor Mailloux's research focuses on mitochondrial redox biology and cell H_2O_2 signaling. His work in this discipline has two themes:

1. **How do mitochondria produce H_2O_2 and what are the mechanisms used to budget its availability?**. Professor Mailloux's team focuses on characterizing the H_2O_2 generating potential of the unconventional sources in mitochondria, mainly Krebs cycle enzymes like alpha-ketoglutarate dehydrogenase and pyruvate dehydrogenase, and other sources such as dihydroorotate dehydrogenase and prolife dehydrogenase. He is invested in decoding how these enzymes use H_2O_2 for the induction of cell proliferation, adaptation, and in ferroptosis. He is now applying his discoveries in this theme to better understand oncogenesis and sex differences in mitochondrial H_2O_2 generation.
2. **How do mitochondria control H_2O_2 generation?** Professor Mailloux studies H_2O_2 budgeting by focusing on the function of antioxidant defenses in the clearance of intra and extra mitochondrial H_2O_2. This includes examining the H_2O_2 quenching capacities of NADPH-dependent and independent antioxidant enzymes, but also the importance of transhydrogenase in supplying NADPH. Coupled with this, his group discovered glutathionylation, a protein modification that involves covalent bond formation between glutathione and a cysteine, is required to inhibit H_2O_2 generation. His group also discovered the first sex dimorphism in this redox regulatory pathway and that defects in glutathionylation cause obesity and fatty liver diseases. His group is now fully invested in decoding the importance of mitochondrial glutathionylation reactions in the maintenance of optimal hepatic health.

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