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Concordia University**The dynamic genome: how environment shapes aging from human to wild vertebrates****JEUDI, 15 OCTOBRE 2026, 12H30****Pavillon Charles-Eugène-Marchand, salle Hydro-Québec (1210)**

The genome we inherit explains only a fraction of individual variation in phenotypic traits. Across a lifetime, external exposures can modulate molecular phenotypes (reshaping gene expression, protein abundance, or metabolite profiles) and simultaneously, they can also inflict damage through exogenous and endogenous mutagenic processes. These two complementary dynamics sit at the heart of a One Health framework: one that recognizes that human, animal, and ecosystem health are deeply intertwined, and that the genome serves as a molecular record of the environments we build, inherit, and inhabit. In the first part of this talk, I will explore how the genome *responds*. Drawing on large-scale Canadian population biobank data, I will present our work on how urban environmental exposures and cumulative social stressors leave signatures in molecular phenotypes in the context of kidney health, which is an organ with a unique readout of cumulative external exposures. By integrating polygenic risk, polyexposure, and polymetabolic scores, we show that genetics and social-environmental exposures represent largely independent upstream pathways that both converge on the metabolome level in the context of the aging kidney. In the second part, I will turn to how the genome is *damaged*. Somatic mutations accumulate throughout life in tissues, driven by replication errors, environmental mutagens, and inflammatory processes. I will present our emerging work on characterizing somatic mutations across diverse vertebrate populations. In humans, we showed that somatic mutation in the hematopoietic system is influenced by age, ancestry, sex, and also geography. We also recently developed an experimental and computational framework to profile somatic mutations in other long-lived species, including sea birds that are a model of extreme healthy aging under different environmental and physiological conditions. Preliminary results reveal similarities and differences in the type of somatic mutations that accumulate in long lived birds compared to humans. Collectively, our work reveals how the genome acts as a sentinel of environmental exposures and biological aging, and how different species may help understanding health in the Anthropocene across species.

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