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SÉMINAIRE

From the individual chemical exposome across sub-individual toxic effects to predict population level outcomes, modelling as an integrative framework

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The ever-increasing development, production, and use of chemicals had led to the exposure of organisms (including humans) to a complex universe of chemicals in their environment. Identifying the potential implications of such exposure at a population level is critical for decision making regarding conservation actions (e.g., is a population likely to decline or go locally extinct) and the identification of health priorities (e.g., is a disease likely to become prevalent). Nevertheless, chemical exposure occurs at the level of individuals, and strongly depends on the environmental context of the individual. Meanwhile, toxic effects are initiated at sub-individual level through altered gene expression, a process which also varies among individuals. Genomics has enabled the identification of such sub-individual toxic effects for (mixtures of) chemicals which can be correlated with adverse effects in individuals. Nevertheless, the final, observed effect of a chemical exposure at the population level integrates the dynamic interactions of all these sub-individual and individual level processes. Consequently, there is a critical need for tools that can link exposure and effects across levels of biological organisation. Building on my work using mechanistic modelling to link individual-level processes to population-level outcomes, I aim to present the use of modelling as a framework to predict outcomes of chemical exposure at population level, taking into account interactions of individuals with a heterogeneous environment, biological variability between individuals, and potential transgenerational effects.