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Enabling discovery through multi-omics and systems genetics

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Our laboratory is using systems approaches to map the signaling networks that govern mitochondrial function and as such regulate organismal metabolism in health, aging and disease. We apply a state-of-the-art biological toolkit to study a variety of model systems, ranging from the plant *Arabidopsis thaliana,* over the nematode *Caenorhabditis elegans,* to the mouse and all the way to humans. Our research has not only allowed the development of new methodologies and scientific approaches applied to population, as exemplified by the development of cross-species multi-layered genetics/omics gene mapping strategies, but also contributed to improved understanding of how signaling pathways control mitochondrial function and metabolism. Although our research addresses basic biomedical questions, we aim at translating our research into novel preventive and therapeutic strategies for common diseases, such as type 2 diabetes, frailty, and obesity, as well as rare inherited mitochondrial diseases. The translational value of our work is testified by the fact that several drugs targeting processes and pathways which we elucidated are currently used in the clinic.

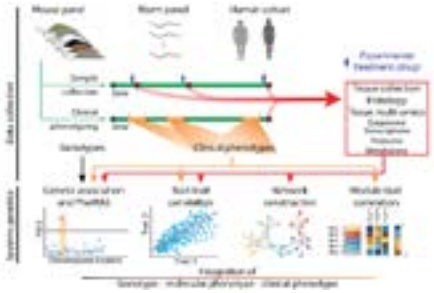

Figure Description: An overview of the systems genetics framework. Subjects can be either laboratory organisms or humans. multiomics data are collected at the clinical (phenome) as well as at the molecular levels. Most established systems genetics techniques follow a discovery framework, where the aim is finding associations or correlations that can explain a trait's variation

Recent Publications:

1. Jha P et al. (2018) Genetic regulation of plasma lipid species and their association with metabolic phenotypes. Cell Systems. 6(6):709-721.e6. Doi:10.1016/j.cels.2018.05.009.
2. Jha P et al. (2018) Systems analyses reveal physiological roles and genetic regulators of liver lipid species. Cell Systems. 6(6):722-723.e6. Doi:10.1016/j.cels.2018.05.016.
3. Li H et al. (2017) An integrated systems genetics and omics toolkit to probe gene function. Cell Systems. 6(1):90-102. Doi:10.1016/j.cels.2017.10.016.
4. Williams E G et al. (2016) Systems proteomics of liver mitochondria function. Science. 352(6291):aad0189. Doi:10.1126/science.aad0189.
5. Quiros P M et al. (2017) Multi-omics analysis identifies ATF4 as a key regulator of the mitochondrial stress response in mammals. Journal of Cell Biology. 216:7. Doi:10.1083/jcb.201702058.

Biography

Maroun Bou Sleiman obtained his PhD in the Laboratories of Professor Bart Deplancke and Professor Bruno Lemaitre, working on the genetic and molecular bases of infection in the Drosophila Genetic Reference Panel. He is a Scientist in the Laboratory of Integrative Systems Physiology headed by Professor Johan Auwerx at the Swiss Federal Institute of Technology (EPFL) in Lausanne (Switzerland). He works at the frontier between genetics, systems biology, and multi-omics in order to understand complex traits and diseases in different panels such as the BXD, HDP, and ITP in mice, as well as *Caenorhabditis elegans* RIAILs (recombinant inbred advanced intercross lines). These systems genetics approaches pave the way for a better mechanistic understanding of complex biological systems and pave the way for mechanistically-informed precision medicine.

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