NUS National University of Singapore | Department of Biological Sciences, Faculty of Science

BIOLOGY COLLOQUIUM

Friday, 7 Sept 2018 | 4pm | DBS Conference Room 1

Hosted by A/P Cynthia He

Human African Trypanosomiasis evolution and Cell Death in *Trypanosoma brucei brucei*.

By **David Pérez-Morga**

Professor, Université libre de Bruxelles, Université D' Europe, Belgium

Humans can survive bloodstream infection by African trypanosomes, such as *Trypanosoma brucei brucei*, owing to the trypanosome-killing activity of serum complexes. The two trypanosome subspecies that are responsible for human sleeping sickness, *T. b. rhodesiense* and *T. b. gambiense,* can evade this defence by expressing distinct resistance proteins. In turn, sequence variation in the gene ApoL1 that encodes the trypanosome-killing component in human serum, has enabled populations in western Africa to restore resistance to *T. b. rhodesiense,* at the expense of the high probability of developing kidney sclerosis. These findings highlight the importance of resistance to trypanosomes in human evolution. Apolipoprotein L1 (APOL1) induces both lysosomal and mitochondrial membrane permeabilization (LMP and MMP) and cell death coincides with MMP and consecutive release of the mitochondrial TbEndoG endonuclease to the nucleus, where it mediates DNA fragmentation. APOL1 is associated with the kinesin TbKIFC1, of which both the motor and vesicular trafficking VHS domains are required for MMP, but not for LMP. The presence of APOL1 in the mitochondrion is accompanied by mitochondrial membrane fenestration, which can be mimicked by knockdown of a mitochondrial mitofusin-like protein (TbMFNL). Thus, cell death by APOL1 is linked to apoptosis-like MMP. A recent update on this will also be presented.

About the speaker

David Pérez-Morga is a professor at the Université Libre de Bruxelles (ULB) in Belgium, where he heads the laboratory of Molecular Parasitology and the Electron Microscopy facility of the Center for Microscopy and Molecular Imaging. David grew up in Oaxaca, southern Mexico, and completed his undergraduate and graduate studies at the National Polytechnic Institute (IPN) in Mexico City, at the ENCB and CINVESTAV, respectively. During his postdoctoral work at Johns Hopkins University (USA), he learned trypanosome biology and electron microscopy. When not doing science, David enjoys spending time with his kids, reading, cycling and traveling.

Main scientific achievements:

- *Identification of the ionic pore activity of the human protein APOL1, its relationship to bacterial colicins and the mechanism by which it kills T. b. brucei (Science 2005). This lead to the discovery of a novel mechanism of cell death in this parasite (Nature Comm. 2015, Nature Microbiol. 2017).*
- *Contribution to the identification of the mechanism of resistance to human serum in T. b. gambiense, responsible for human sleeping sickness (Nature 2013).*
- *Discovery of the rotation of a biological structure (kinetoplast) associated to mitochondrial DNA replication in C. fasciculata and T. brucei. (Cell 1993, J. Cell Biol. 1993).*

Artwork by Ann Nee, DBS, NUS