CONFÉRENCE

Hisao Moriya, Ph.D.
Faculty of Environmental, Life, Natural Science and Technology, **Okayama University**

Constraints of protein expression

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Pavillon Charles-Eugène Marchand, salle Hydro-Québec (1210)

Abstract:

It is believed that the expression level of proteins within a cell is optimized to most efficiently achieve the cell's functions. The evolutionary principles determining this expression level can be broadly divided into two categories: demand and constraint. Demand is the evolutionary pressure to increase expression levels in response to the functional requirements of the protein, whereas constraint is the evolutionary pressure to decrease expression levels to prevent the toxicity inherent in the protein from manifesting. Demand is exposed as a reduction in fitness (growth rate) due to knockdown, while constraint is exposed as a reduction in fitness due to overexpression.

We have been investigating the mechanisms behind these constraints using yeast as a model eukaryotic cell, specifically the mechanisms by which overexpression inhibits growth. Integrating our research with that of others, we believe that the mechanisms of constraint can be broadly classified into four categories. Furthermore, we have devised a hierarchical model of constraints in which the expression limit of a single protein - the expression level that causes growth inhibition - is determined by the type of constraint it falls under.

In this seminar, I will focus on a constraint known as 'protein burden', which occurs only in the overexpression of a limited number of proteins with extremely low toxicity, yet is present in all proteins. I would like to explore with you what kind of physiology occurs when these surplus proteins are ultimately overexpressed in large quantities.

Hôte : Christian Landry

Responsables**:** Juan Carlos Villarreal Aguilar et Davoud Torkamaneh
juan-carlos.villarreal-aguilar@bio.ulaval.ca et davoud.torkamaneh.1@ulaval.ca