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Fungal prions, stress and cellular memory

Prions are alternatively folded self-perpetuating protein isoforms involved in a variety of biological and pathological processes, and typically based on self-assembled protein aggregates (amyloids). In humans, amyloids and prions are associated with important diseases, such as Alzheimer, Parkinson or Huntington diseases, and transmissible spongiform encephalopathies. In yeast and other fungi, prions are protein-based non-Mendelian elements controlling heritable traits. Due to relative simplicity of cultivation procedures and availability of convenient phenotypic assays, fungi provide a great opportunity for deciphering both mechanisms of prion formation or propagation and biological impact of prions. Fungal prions influence a variety of physiological functions. By using a yeast model, it has been shown that prion formation and loss are modulated by environmental and physiological conditions. *De novo* formation of a yeast prion can be induced by a transient overproduction of a prion-forming protein. Protein quality control machinery of the cell plays a key role in the processes of prion formation and propagation in yeast. Propagation of yeast prions is controlled by the same cytosolic chaperone machinery (Hsp104/70/40) that is involved in protection of cells against proteotoxic stresses. Chaperones fragment prion polymers, generating oligomeric seeds for new rounds of prion propagation. Ribosome-associated chaperones antagonize prion formation and interfere with the ability of cytosolic chaperones to promote prion propagation. Chaperone balance and cytoskeletal networks mediate effects of environmental stresses on prions. Heat stress induces metastable prions, persisting for a number of cell generations after stress and thus maintaining a cellular memory of stress.

Biography

Yury O Chernoff has completed his PhD from St. Petersburg State University (Russia) in 1985, and performed Postdoctoral studies at Okayama University (Japan) and University of Illinois (Chicago, USA). He is a Professor and the Center Director at Georgia Institute of Technology (Atlanta, USA), supervises a lab at St. Petersburg State University (Russia), is a founding Editor-in-Chief of the journal *Prion* (Taylor & Francis, Inc.), and has been elected a Fellow of the American Association for the Advancement of Science (AAAS). He has published about 100 papers (h-index 41). His expertise is in protein biosynthesis, misfolding, amyloids/prions and protein-based inheritance.

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