SynCTI Seminar Series

NUS Synthetic Biology for Clinical and Technological Innovation (SynCTI)

Professor Hiroshi Takagi
Graduate School of Biological Sciences
Nara Institute of Science and Technology, Japan

Nitric Oxide in Yeast: A Double-edged Sword "Cell Protection vs Cell Death"

Nitric oxide (NO) is a ubiquitous signaling molecule involved in the regulation of many cellular functions. The molecular function of NO in unicellular eukaryotic yeast is poorly understood due to the lack of mammalian NO synthase (NOS) orthologues. Recently, we reported that the flavoprotein Tah18, which was previously shown to transfer electrons to the Fe-S cluster protein Dre2, was involved in NO synthesis in yeast. Gene knockdown analysis demonstrated that Tah18-dependent NO synthesis confers high-temperature stress tolerance on yeast cells. NOS-like activity requiring Tah18 was shown to induce cell death upon treatment with H2O2. The Tah18-Dre2 complex might regulate cell survival or death as a molecular switch via Tah18-dependent NOS-like activity in response to environmental changes. We also focus on the antioxidative mechanism by NO. Interestingly, NO produced under high-temperature stress conditions nicely induced the copper transporter gene CTR1, which is under the control of the transcription factor Mac1. Furthermore, NO increased intracellular copper content, Cu,Zn-superoxide dismutase Sod1 activity, and cell viability after exposure to high-temperature in a Mac1-dependent manner. Like mammalian cells, it appears that Tah18-dependent NO production exhibits two opposed effects in yeast cells, so called "a double-edged sword". For example, appropriate NO level confers tolerance to high temperature to cells via Mac1-mediated Sod1 activation or to low levels of H2O2. In contrast, under severe stress conditions, such as high levels of H2O2, excess NO may induce cell death.

Biography

Prof. Hiroshi Takagi earned his Ph.D. in Molecular Biology and Protein Engineering from The University of Tokyo and was Chief Biochemist with the Food Research & Development Laboratories at Ajinomoto Co., Inc prior to entering academia. His research interest lies in applied molecular microbiology in which in-depth understanding of the molecular, metabolic and cellular aspects of yeasts and bacteria is used for the molecular breeding for useful microorganisms, production of valuable biomaterials and the development of promising technologies to solve environmental issues. Prof. Takagi developed a new yeast strain "101H" that was used to brew "Awamori" which is a traditional distilled alcoholic beverage made from rice in Okinawa.

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CeLS Seminar Room 1
28 Medical Drive, Centre for Life Sciences, Singapore 117456
http://syncti.org/
Hosted by Dr Chen Ee Sin

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