

Adaptation to different types of stress converge on mitochondrial metabolism - DTU Orbit (09/11/2017)

Adaptation to different types of stress converge on mitochondrial metabolism

Yeast cell factories encounter physical and chemical stresses when used for industrial production of fuels and chemicals. These stresses reduce productivity and increase bioprocess costs. Understanding the mechanisms of the stress response is essential for improving cellular robustness in platform strains. We investigated the three most commonly encountered industrial stresses for yeast (ethanol, salt, and temperature) to identify the mechanisms of general and stress-specific responses under chemostat conditions in which specific growth rate-dependent changes are eliminated. By applying systems-level analysis, we found that most stress responses converge on mitochondrial processes. Our analysis revealed that stress-specific factors differ between applied stresses; however, they are underpinned by an increased ATP demand. We found that when ATP demand increases to high levels, respiration cannot provide sufficient ATP, leading to onset of respirofermentative metabolism. Although stress-specific factors increase ATP demand for cellular growth under stressful conditions, increased ATP demand for cellular maintenance underpins a general stress response and is responsible for the onset of overflow metabolism.

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