Cellular Response to Change in Mitochondrial DNA Levels in Yeast Yarrowia lipolytica

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Correct function of mitochondria is essential for many cellular processes. In animal cells, imbalance between the amounts of proteins encoded by the mitochondrial DNA (mtDNA) and nuclear DNA (mitonuclear protein imbalance) triggers defensive mechanism known as the mitochondrial unfolded protein response (UPRMT). Yarrowia lipolytica is a strictly aerobic species of yeast. Although its strain ?mhb1 suffers from lower mtDNA levels and mitonuclear protein imbalance, it does not show any growth defect. Therefore, it is possible that this imbalance triggers a mechanism similar to UPRMT. The aim of this study was to investigate symptoms related to this defensive mechanism. Replicative aging of individual cells have been investigated by the micromanipulator. Length of the one generation; growth of colonies during 156 hours; number, diameter and localization of the mitochondrial nucleoids have been also evaluated. I have observed significantly slowed replicative aging and faster growth of the colonies during late growth phase. Changes in the number, diameter and local layout of mitochondrial nucleoids have been also detected. My findings correspond with the symptoms of UPRMT in animal cells and together with the fact that homological proteins to those involved in the UPRMT are present also in the yeast Yarrowia lipolytica indicate that this mechanism is more evolutionary conserved. These observations may also help with the further understanding of the pathogenesis of certain mitochondrial and aging related diseases.

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