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Extracellular Regulation of the Stress Response in Eukaryotic Cells

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AIM

The aim of the present study was the investigation of the extracellular protective signaling in the heat stress response. All experiments were performed in stationary phase growing cells of the unicellular eukaryote *Saccharomyces cerevisiae* ATCC2366, which is widely used as an experimental model in genetic, molecular and pharmacological research regarding the mechanisms underlying the cellular stress response.

METHODS

Yeast viability, expressed as the percentage of the viable cells in the culture, was determined microscopically using the vital exclusion dye methylene blue. Statistical analysis of the results was performed by Anova, followed by Scheffé and Dunnett tests.

RESULTS

Following pretreatment with mild heat stress (2h, 37°C), the yeast cells acquired thermotolerance (71.1±4.4%, n=20) to a subsequent heat shock (30', 53°C). The cell-free supernatant of the thermotolerant cultures increased the viability of the non-pretreated yeast cells from 36.1±4.4% (n=18) to 70.3±5.1% (n=17, $p<0.001$). The acquisition of thermotolerance was not affected by the presence of 10mM EDTA (n=5, $p>0.9$), while the potential extracellular protective factor was not heat-labile (10', 100°C, n=4, $p>0.9$). The presence of 100μg/ml cycloheximide during the mild heat stress reduced the viability to 34.9±4.5% (n=7, $p<0.001$), and it partially, statistically non-significantly inhibited the effects of this factor ($p>0.5$). The action of cycloheximide was observed solely in the process of acquisition of thermotolerance.

CONCLUSIONS

In conclusion, these preliminary data provide evidence for the production or release of potential heat-resistant extracellular protective factor(s) during the pretreatment with mild heat stress. The production of such substances appears to be related to *de novo* protein synthesis, whilst their actions might be independent of this process.