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Effect of a chemical analogue of autoinducers of microbial anabiosis on the Ca2+ response of mycelial fungi

Kozlova O., Kupriyanova-Ashina F., Egorov S., El'-Registan G.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The microbial alkylhydroxybenzenes (AHB), autoinducers of anabiosis, or d1 factors, participate in stress response of mycelial fungi, as determined from changes in intracellular Ca2+ concentration. By using the genetically modified strain Aspergillus awamori 66A, which produces a recombinant Ca2+-dependent protein aequorin, the dynamics of Ca 2+ was studied in the cytosol of cells exposed to mechanical shock in the presence of the protective doses (0.001-0.01% w/vol) of a chemical AHB analogue, 4-n-hexylresorcinol. Like under stressful conditions, Ca2+ concentration increases in the cell cytosol in response to enhanced AHB level in a growing fungal culture; thus, AHB is perceived by cells as a stress signal. The level of cell response, which was determined from the amplitude of luminescence dependent on the Ca2+ concentration in cytosol was related to the physiological age of the cells and AHB concentration. Micromycete preincubation with AHB was found to protect cells from subsequent stress; this was reflected in the Ca2+ response. The protective AHB effect was manifested as (1) a significant decrease in the amplitude of luminescence and, thus, in Ca2+ accumulation in the cytosol during subsequent mechanical stress (as compared to the control-mechanical stress only); (2) development of the secondary Ca2+ response, which was not observed in the control; (3) a high level of Ca2+ retained in the cytosol for a long time in the presence of AHB (as compared to the control without preincubation with AHB). The mechanisms underlying the AHB effect on the Ca 2+ transport systems are discussed.

Keywords

Alkylhydroxybenzenes, Aspergillus awamori, Ca2+ dynamics, Mycelial fungi, Protection from stress, Recombinant aequorin, Stress