

THE CELLULAR RESPONSE TO HEAT SHOCK

C. GINZBURG

Dept. of Ornamental Horticulture, Agricultural Research Organization, The Volcani Center, Bet Dagan 50250, Israel.

This review presents a cell's heat shock response at the molecular level. Specific proteins, that are induced in the cells of all living organisms during exposure to heat stress, and the cellular control mechanisms that regulate this response, are described.

Most heat shock proteins belong to protein families. Some of the protein-members of these families are heat-induced, while others are synthesized constitutively. The cellular function of some of these proteins was studied, and all of the proteins were found to have a common feature: they are able to interact with other proteins in a way that stabilizes their conformation. This type of interaction helps to preserve proteins in their active state during stress.

Cells and entire organisms can be hardened, and acquire thermotolerance to extreme heat stress following prior exposure to mild stress. Heat shock proteins are synthesized in the cell under such conditions, and the duration of the acquired thermotolerance is correlated with the half-life of heat shock proteins in the cell. Such an acquired thermotolerance is induced daily in field-grown plants exposed to the gradual increase in temperature during hot summer mornings. This helps plants overcome the more extreme conditions at noontime.

Key Words : Heat stress, heat tolerance, heat shock proteins.