Cold shock and heat shock

6. Introduction

Low Temperature

Insects at

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Cold shock is the stress inflicted by a brief and rapid exposure to low, but...
Cold Stock and Heat Stock

6.2 Overwintering Biology

The annual occurrence of freezing and thawing temperatures and the resulting overwintering strategies of many aquatic species are important in determining the fitness of populations and the success of species in cold and heat stress environments. The ability of species to tolerate cold and heat stress is closely related to their physiological and morphological adaptations to these environmental conditions.

Overwintering strategies can be categorized into two main groups: (1) those that remain active throughout the winter, and (2) those that enter a state of dormancy or hibernation. Active overwintering species usually maintain some level of physiological activity throughout the winter, while dormant species enter a state of metabolic quiescence.

Active overwintering species often exhibit increased metabolic rates and a capacity for rapid recovery from stress. These species typically have adaptations such as increased tolerance to cold and heat, as well as mechanisms for maintaining vital functions during periods of stress.

Dormant species, on the other hand, enter a state of dormancy or hibernation, during which their metabolic rates are greatly reduced. These species often have adaptations such as increased lipid storage, decreased water loss, and reduced oxygen consumption.

The ability of species to tolerate cold and heat stress is a critical factor in their survival and success in these environments. Understanding the physiological and morphological adaptations of species to cold and heat stress is essential for predicting their responses to climate change and for developing effective conservation strategies.
6.4. Injury due to heat shock

Heat shock response

The injury occurring in response to cold shock. For example, phae red dye is used to identify injury. The injury elicited by heat shock appears to be a delayed response similar to the heat shock response in C. elegans. Phae red dye is used to identify injury in C. elegans. In addition, to an own work on the response to injury, we review the injury caused by brief periods of high temperature.

6.3. Prevention of cold shock injury by

Graph depicting the effect of a higher temperature on the percentage of survivors. The graph shows that exposure to higher temperatures reduces the percentage of survivors. The y-axis represents the percentage of survivors, and the x-axis represents the duration of exposure to high temperature.
In these experiments of 20 flies each from Cern (e1), 1990, a moderate fly temperature of 20°C induces production of heat shock proteins without significant synthesis of cold shock proteins. However, in other experiments, cold shock proteins are produced in flies at 20°C, while heat shock proteins are not. This suggests that heat shock proteins are not induced at 20°C. In contrast, cold shock proteins are synthesized at 20°C, indicating that cold shock proteins are produced at 20°C, even in the absence of heat shock proteins.

**Figure 6.4**

Survival of flies exposed to moderate shock.

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**Figure 6.5.**

Emergence of flies after moderate shock.

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**Figure 6.6**

Effects of different temperatures on fly development and survival.
In the flea beetle, heat shock proteins (HSPs) are induced by high temperatures and are used to protect the insect from thermal stress. The expression of HSPs is controlled by a heat shock element in the regulatory region of the gene. When a temperature shock is applied, the expression of HSPs is induced, and this protective response helps the insect survive high temperatures. The expression of HSPs is also induced by other stresses such as viral infections and starvation. The induction of HSPs is a general response to stress, and it is important for the survival of the insect. The expression of HSPs is regulated by the heat shock response element, which is a conserved sequence found in the promoter region of many stress-response genes. The induction of HSPs helps the insect to tolerate high temperatures and other stressful conditions.
not immediately linked.

The phenomenon of normal protein synthesis and expression of genes for specific proteins in response to cold shock is well known to be a general stress response (section 6.4.1). But the possibility that cold stress could elicit the same response as seen in

Prominent heat shock proteins are encoded by the known

Fig. 66. A developmental switch in the expression of genes.

Heat shock protein synthesis

Heat shock proteins are expressed at high temperatures in all eukaryotic cells. In heat shock, a specific heat shock protein is induced, leading to the synthesis of additional proteins. The expression of these proteins is controlled by the HSF (heat shock factor) which is activated by the heat shock stimulus. The induced proteins are members of the HSP (heat shock protein) family, which includes HSP-22, HSP-70, and HSP-90. These proteins play a crucial role in cellular protection against stress, particularly heat stress. The figure illustrates the expression pattern of HSP-70 and HSP-90 in a developing tissue.

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