

## Heat shock proteins (HSP) - As vaccines vehicle

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Since the report on the heat-induced appearance of chromosomal puffings in salivary gland tissue of *Drosophila busckii* in 1962, a new research domain has been intensively explored. This research resulted in the discovery of large number of related proteins and their physiological role in many prokaryotic and eukaryotic organisms, tissues and individual cells and at the level of sub-cellular structures. These proteins were originally called “heat shock proteins”, because they were discovered in salivary glands and other tissues of *Drosophila melanogaster* recovering from a so-called transient sublethal heat shock, during which body temperature was increased nearly 5°C above normal body temperature care.

Heat shock proteins (HSPs) are highly conserved,

organisms, from bacteria to humans. These are named according to their molecular weights. Most notable is their role as molecular chaperons, facilitating the synthesis and folding of proteins throughout the cell. In addition HSPs have been shown to participate in protein assembly, secretion, trafficking, protein degradation and the regulation of transcription factors and protein kinases. Increased level of HSPs after stress plays a central role in homeostasis. Increased expression of HSPs is mediated at multiple levels: mRNA synthesis, mRNA stability, and translation efficiency. In fact, accumulation of unfolded or misfolded proteins is a form of stress that induces expression of HSPs. HSPs 60, 70 and 90 are generally found in the cytosol and mitochondria. A more distantly related family of chaperons, including group 96 and calreticulin, are located in the endoplasmic reticulum.



Fig. 1:

ubiquitous and abundant proteins, essential for cellular viability. Their expression increases in response to a variety of different metabolic insults. HSPs are induced when a cell undergoes various types of environmental stresses like heat, cold and oxygen deprivation. HSPs are also present in cells under perfectly normal conditions. This increase in regulation is transcriptionally regulated. The dramatic upregulation of HSPs is a key part of the heat shock response and is induced primarily by heat shock factor (HSF). HSPs are found in virtually all living

### Importance of Heat shock proteins:

The function of a protein is determined by its three-dimensional structure. When excessive heat is applied to proteins, chains of amino acids which are folded into spirals, loops and sheets begin to lose their shapes. When the interior of these proteins gets exposed, proteins can adhere and form globs. This can make them dysfunctional. Protein conformational defects are responsible for a number of pathologies, ranging from Alzheimer's disease and oncogenic transformation in humans to heat and drought susceptibility in plants. Chaperones protect against denaturation. Heat Shock Proteins bind to denatured proteins to prevent aggregation. Some Heat Shock Proteins, like Hsp104, have the ability to rescue already aggregated proteins.

### Different types of heat shock proteins:

Human, fruit flies and plants all have HSPs very similar in sequence and in structure. Heat Shock Proteins are classified by their molecular weight, size, structure, and function. They are divided into several families such as.

#### HSP100:

– Function as chaperones solubilizes protein aggregates there by dissociating them facilitates