

Preface

Living systems have to continuously interact with an environment which is not always kind to them. As a result, they encounter a variety of stresses at the organismal and cellular levels. Because stresses can lead to serious damage, even so-called primitive organisms have evolved ways of protecting themselves from the effects of stress. The evolution of biological diversity is a reflection of this incessant antagonism between the organism and aspects of its environment.

Two discoveries laid the foundation of modern cell stress studies. In 1962 F Ritossa (**A new puffing pattern induced by temperature shock and DNP in *Drosophila***; *Experientia* **18** 571–573) found that new puffs appeared in polytene chromosomes of salivary glands in *Drosophila* larvae that were briefly exposed to elevated temperature (or to certain other conditions that disrupt oxidative metabolism in the cell). About ten years later Tissieres *et al* (Tissieres A, Mitchell H K and Tracy U M 1974 **Protein synthesis in salivary glands of *Drosophila melanogaster*: Relation to chromosome puffs**; *J. Mol. Biol.* **84** 389–398) reported that synthesis of a set of new polypeptides was induced in heat-shocked cells of *Drosophila*. One of the most exciting findings made in the 1970s was that a variety of chemical and physical factors evoke a highly conserved common cellular response in organisms ranging from primitive prokaryotes to highly evolved eukaryotes. In view of the genesis of its discovery, this ubiquitous response to stress came to be known as the heat shock response.

During the past 10 years an ever-increasing number of studies have focussed on the biological significance of the stress response, particularly on possible functions of stress proteins. Once again, a common theme has emerged: many stress-activated gene products (as well as cognates synthesized in a developmentally regulated or constitutive manner in unstressed cells) act as molecular chaperones. They are primarily involved in preventing mis-folding and aggregation of polypeptides and in translocation of proteins across the membranes separating different compartments in a cell. The concept of chaperones has contributed significantly to our understanding of many basic issues in cell and molecular biology. Thermal (low and high temperature), osmotic, oxidative and starvation stresses are among the common conditions that biological systems encounter as part of their normal life cycles. As mentioned earlier, organismal-level adaptations to such stresses have evolved in many

species. But what is remarkable is the capacity of individual cells to respond to stress in a manner that is conserved across phyla.

Due to the enormous increase in research activity in stress-related research, scientists working with a given cellular stress and organism are often not able to keep pace with developments in other fields of stress biology. There is always a need for specialists working on different stress responses to collectively discuss the cell's ways of surviving the multitude of stresses that it faces. An International Workshop on "Molecular Biology of Stress Responses" was organized at the Banaras Hindu University from October 14–17, 1997 with a view to fulfilling the need. The workshop brought together scientists from different countries studying responses of cells of diverse organisms (bacteria, plants and animals) to a variety of stresses (thermal, oxidative, starvation, osmotic, etc.). The speakers reviewed a given field and also presented their own data. Summaries of the scientific discussions at this meeting have been published (Lakhotia S C 1998 **Stress biology: a challenging area in integrated biology**; *Biol. Int.* **36** 18–30; Csermely P and Lakhotia S C 1998 **Molecular biology of stress responses in India** (Meeting review); *Cell Stress Chaperones* **3** 1–5). In view of the wide application of the knowledge generated through stress-related research, it was felt that publication of the papers presented at this meeting would be of considerable interest not only to those working in different areas of stress biology but also to biologists in general.

This special issue of the *Journal of Biosciences* is based on updated versions of 25 of the presentations made at the meeting. The themes range from the regulation of the stress response to functions of stress genes under normal and stressed conditions. Some articles deal with possible applications of the knowledge gained from stress biology research to issues concerning the environment and public health. The nature of presentations also varies from typical reviews to original research papers and a mix of the two. We hope that this collection of articles, providing as it does a broad view of current trends in stress research, will benefit both specialists and all those who have an interest in understanding the varied strategies that cells make use of to survive in hostile environments.

We thank all the authors who contributed the articles and the reviewers who refereed the manuscripts, often at short notice.

Guest editors:

S C LAKHOTIA and A K TRIPATHI
Banaras Hindu University, Varanasi, India