Oxidative Medicine and Cellular Longevity

Hindawi

Special Issue on

The Role of Heat Shock Proteins in Metabolic Diseases: from Simple Organisms to Human Beings

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The ability of all living organisms to respond with rapid and appropriate modifications against physiological challenges is an essential feature for survival. At the most basic cellular level, living organisms respond to unfavorable conditions such as heat shock, toxins, oxidants, infection, inflammation, and several other stressful situations by changing the expression of stress-related genes, also known as heat shock genes. This response involves the rapid induction of a specific set of genes encoding cytoprotective proteins, known as heat shock proteins (HSP). HSP are a family of polypeptide proteins clustered according to their molecular weight which have many intracellular functions, the most important being acting as a molecular chaperone to facilitate protein transport, prevent protein aggregation during folding, and protect newly synthesized polypeptide chains against misfolding and protein denaturation. Furthermore, HSP may be released to the extracellular space and have a wide variety of effects on other cells, including impacting cell to cell interaction and chemotaxis. Since the first discovery of HSP in 1962 by Ritossa, several *in vitro* and *in vivo* studies have demonstrated that an increase in intracellular HSP (iHSP) levels is an important mechanism of cell protection and survival against environmental and physiological stress challenges. Conversely, subsequent studies over the past 20 years have shown that the presence of HSP in the extracellular space (eHSP) can contribute to oxidative damage and inflammation, and, in some cases (chronic inflammatory and/or metabolic diseases), eHSP can be used as diagnostic or prognostic disease biomarker. Importantly, pharmacological and/or nonpharmacological interventions, for example, nutrients, exercise, or heat therapy, can modulate the level of iHSP and therefore impact cell resistance to stress. Furthermore, these controlled stress stimuli have several health benefits, including the reduction of chronic inflammation promoted by incessant nutrient overload. However, many studies have indicated that the HSP response may be dramatically impaired in metabolic diseases, which in turn is related to low grade chronic inflammation. Currently, it is already stablished that HSP activity can reprogramme transcription, translation, metabolism, and signal transduction events, which result in cell repair and survival or if necessary promote cell death. Although several scientific advances have been made, the mechanisms of the HSP response are still somewhat elusive and their optimal regulation is unknown. Also, until now, few studies showed nonpharmacological or pharmacological therapeutic effects simultaneously in metabolic parameters, redox state, and inflammatory profile and in HSP status, based on eHSP and iHSP levels. Therefore, much more research is needed to identify the main molecular mechanisms and functions of the HSP response, especially in the pandemic era of metabolic diseases. The purpose of this special issue is to publish original research papers as well as review articles in the field of HSP response related to metabolic diseases. We aim to publish different studies, using *in vitro* and/or *in vivo* approaches. We expect to provide our readers with a compilation of scientific discoveries related to the specific role of HSP in metabolic disease and complications.

Potential topics include but are not limited to the following:

- Inductors and inhibitors of HSP expression in the context of chronic metabolic diseases
- Control of HSP gene expression at transcriptional or posttranscriptional level in obesity, diabetes, and metabolic syndrome
- HSP and inflammation induced by metabolic disease situations
- HSP and oxidative stress induced by metabolic diseases
- The role of HSP in cellular repair and function
- Chaperone functions of HSP and their role in metabolic diseases
- Extracellular functions of HSP in metabolic disease situations
- Effects of pharmacological and/or nonpharmacological compounds, including nutrients in HSP expression and/or release in metabolic disease situations
- HSP and exercise effects on metabolic disease situations
- Heat therapy effects on metabolic disease situations

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/omcl/rhsp/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

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Thiago Heck, Regional University of the Northwest of the State of Rio Grande do Sul (UNIJUÍ), Ijuí, Brazil
thiago.heck@unijui.edu.br

Guest Editors
Vinicius Cruzat, Curtin University, Perth, Australia
vinicius.cruzat@curtin.edu.au

Kevin Keane, Curtin University, Perth, Australia
kevin.keane@curtin.edu.au

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