

Neuroendocrine Regulation and Homeostasis

This special issue of the *Journal of Neuroendocrinology* comprises five review articles, centred on the theme of the neuroendocrine regulation of homeostasis, and provides a snapshot of the sessions at the 2013 International Workshop in Neuroendocrinology (IWNE). The workshop was held in Santa Clara Resort, in the town of Dourado, São Paulo, Brazil, from 4–7 August 2013 and emerged from the unification of two independent neuroendocrine meetings held in August 2011: The First US–Latin American Workshop in Neuroendocrinology (Viña del Mar, Chile) and the First Brazilian International Symposium on Integrative Neuroendocrinology (Dourado, Brazil). The small, intimate venue not only facilitated scientific interactions between Neuroendocrinologists from the United States and South America, but also provided graduate students and post-doctoral fellows with the opportunity to interact with each other and with established investigators. It provided the unique opportunity for 11 competitively chosen young investigators to discuss their research findings as an oral or poster presentation in an informal setting. Several of these young investigators spearheaded the writing and compilation of the review articles, with input from the established investigators.

Stress coping mechanisms have evolved over phyla and play an important role in the survival of the species. In adaptive response to stress, living organisms redirect their physiological functions towards the maintenance of homeostasis, by mobilising energy stores and suppressing diverse processes such as feeding, body repair, reproduction and behaviours. Glucocorticoids, the end products of the stress-stimulated hypothalamic-pituitary-adrenal (HPA) axis, exert effects on multiple organ systems to regulate metabolic, cardiovascular, immune, behavioural and neuroendocrine activities to maintain homeostasis. Sex differences in stress reactivity as a result of the activational effects of gonadal steroids are well known. The HPA and hypothalamic-pituitary-gonadal axes are intimately intertwined, wherein activation of the former affects the function of the latter and vice versa. In addition, the adaptive stress response is determined by genetic, environmental, nutritional and developmental factors, which dictate the characteristics of the mobilised defences against stressors throughout the lifespan. The reviews in this special issue attempt to summarise current research on various aspects related to the central theme of the neuroendocrine regulation of homeostasis.

The first review by Uchoa *et al.* (1) discusses the current state of knowledge about the regulation of the HPA axis by glucocorticoids, and elaborates the role of glucocorticoids in neural plasticity, immunomodulation and feeding behaviours. Toufexis *et al.* (2) outline the complex interplay between the reproductive and stress axes. Based on studies from rodents to primates, the review highlights how stressors, during development and adulthood, disrupt gonadal hormone-mediated neuroendocrine and behavioural responses and impair reproductive health and emotional wellbeing. The review by Boersma *et al.* (3) discusses how environmental

perturbations such as stress and nutrition during development can lead to epigenetic alterations and maladaptive consequences (i.e. obesity and heightened stress sensitivity) in adulthood. Amaral *et al.* (4) emphasise the importance of circadian rhythms in the maintenance of physiological homeostasis and discuss the importance of hormonal and neural cues in the synchronisation of the circadian timing system to the light/dark cycle. No discussion on neuroendocrine regulation can be complete without due consideration of the environmental effects of oestrogens on homeostasis. The review by Cruz *et al.* (5) discusses how neonatal exposure to environmental oestrogens can modify epigenetic programming and produce alterations in reproductive function in adulthood.

The topics covered in this issue on neuroendocrine regulation of stress have important implications for the day-to-day lives of all living organisms. Although neuroendocrinologists have begun to unravel the multifaceted and integrative mechanisms involved in such regulation, we have barely touched the tip of the iceberg. Application of newer concepts and tools will potentially propel the field into revealing the nuts and bolts biology of how stress exposure can disrupt homeostatic functions, leading to pathophysiology.

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