

Biology and Medicine of Peptide and Steroid Hormones: Special Issue for the Fifth Workshop on Peptide & Hormone Research

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Preface

The fifth Workshop on Peptide & Hormone Research was held at Asahikawa Medical University in Asahikawa, Hokkaido on December 13, 2014 (Table 1). The meeting brought together approximately 30 young scientists, including students, and covered recent topics related to the discovery, synthesis and function of various hormones and their involvement in normal and disease-related physiology. It was co-organized by Takashi Yazawa (chief organizer, Asahikawa Medical University), Hiroyuki Kaiya (National Cerebral and Cardiovascular Center Research Institute), Kazuyoshi Ukena (Hiroshima University), Takahiro Nemoto (Nippon Medical School), Takanori Ida (University of Miyazaki), Takahiro Sato (Kurume University) and Toshio Sekiguchi (Kanazawa University), and held under the auspices of the Zoological Society of Japan, Hokkaido Branch.

Hormones are signaling molecules generally produced in endocrine organs that are transported via the circulatory system to receptors in target organs where their effects are

carried out. In vertebrates, there are various classes of hormones. Among them, peptide and steroid hormones are representative of hydrophilic and hydrophobic ligands, respectively. Hormones in different classes typically act on different types of receptors. For instance, peptide hormones canonically activate membrane receptors, whereas steroid hormones generally target nuclear receptors. These hormone and receptor systems contribute to the maintenance of homeostasis via intracellular signal transduction cascades and transcriptional regulation. Dysregulation of the production and function of hormones underlie pathophysiological mechanisms in various endocrine disorders.

The articles that comprise this special issue of American Journal of Life Sciences primarily reflect the scientific research discussed at the meeting. All of the articles were peer-reviewed, and include five reviews and five original papers, grouped under the following topics: identifying novel peptide hormones and their functions, the role of hormones in endocrine disorders and therapy, and the biosynthesis and functional activity of steroid hormones.

In the first topic (identifying novel peptide hormones and their functions), Ida *et al.* described their attempt to discover novel peptides in fruit flies. Applying the methods for purifying mammalian peptide hormones, they identified two RY-amide peptides, which bind to the *Drosophila* neuropeptide Y-like receptor. The study provides novel strategies useful in searching for unidentified peptides from various animal species. Sato and colleagues outlined the history of ghrelin from their original discovery to the present day. This article is a potentially comprehensive review for understanding the progress of ghrelin research. Masuda *et al.* reported details regarding the expression and function of the neurotensin (NT) precursor and its receptor in chicken hypothalamus. Their results provide new insight into the function of NT and its related peptide with respect to the field of comparative endocrinology.

In the second topic (the role of hormones in endocrine disorders and therapy), Nemoto *et al.* reported on the involvement of microRNA in the reduction of the glucocorticoid receptor (GR) during restraint-induced corticosterone elevation. The expression of miR-142-3R, the suppressor of GR translation, is increased in the hypothalamus and hippocampus of restraint-induced animals. In contrast, this feedback mechanism was impaired in animals fed a high fat diet. Suzuki and colleagues reported on the positive effects of tryptophan derivatives on osteogenesis. Using ovariectomized rats, they revealed the function of tryptophan derivatives in bone formation, in addition to their possible application in bone diseases. Nagata and colleagues investigated the effects of adrenomedullin (AM) in a rat model of inflammatory bowel disease (IBD). Treatment with AM markedly improved various symptom of colitis in these animals. These results strongly suggest AM may be useful for the treatment of patients with IBD. Hasegawa *et al.* characterized macrophages in macrophage-specific guanylin and guanylyl cyclase-C double transgenic (dTg) rats, to reveal the underlying mechanisms of the anti-obesity phenotype.

Macrophages derived from dTg animals showed lower expression levels of inflammatory genes and accelerated chemotaxis than those derived from wild type animals. Such properties of macrophages derived from dTg animals are hypothesized to be involved in resistance to obesity.

In the third topic (the biosynthesis and functional activity of steroid hormones), Nara and Komiya reviewed the functions of STARD3 in placental steroidogenesis. Although STARD3 is known to be involved in the transport of cholesterol to mitochondria, researchers have been unable to identify the mechanism underlying endosomal localization of proteins. From the electron microscopic analyses, they offer a unique model to explain this process; STARD3 contributes to bridge between endosome and mitochondria for transporting cholesterol. Nishimura describes how steroid hormones can act as mediators for transporting macromolecules into the nuclei of target cells. It is possible that this process results in the integration of foreign DNA fragments into the host genome. These findings provide novel insight to the functions of steroid hormones. Yazawa and colleagues provided an overview of the stem cell biology of gonadal and adrenal steroidogenic cells. In their overview, they summarized the current knowledge regarding stem cell precursors of steroidogenic cells, as well as the processes that induce the differentiation of these cells in non-steroidogenic organs.

Although many hormones were discovered in previous decades, or even a century ago, advances are still being made in hormone research and identification. The articles described above provide an opportunity to update our current knowledge and highlight questions still remaining in the field of endocrinology. I am certain that readers will find this Special Issue of interest. Finally, I would like to thank the contributing authors for their expertise and submissions. I would also like to thank the American Journal of Life Sciences editorial staff for their involvement in support and coordination.

Table 1. A milestone of the Workshop on Peptide & Hormone Research

| | Chief organizer | Place | Date |
|---------|------------------------|--------------|-------------------|
| The 1st | Takanori Ida | Miyazaki | March 4, 2011 |
| The 2nd | Kazuyoshi Ukena | Hiroshima | March 16, 2012 |
| The 3rd | Takashi Yazawa | Fukui | November 29, 2012 |
| The 4th | Takahiro Nemoto | Tokyo | December 7, 2013 |
| The 5th | Takashi Yazawa | Asahikawa | December 13, 2014 |