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Hormones and Neural Development

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Preface

This special issue of Developmental Neuroscience represents a series of invited review papers that will interest those who study hormonal influences on neural development. Although the papers are heterogeneous in terms of the model systems that are employed, and the specific hormones that are studied, there are many themes that surface repeatedly in the various contributions.

One major theme is the relationship between hormones and neural plasticity. Hormones often signal major changes in developmental periods, and induce large functional and morphological changes in specific circuits of the nervous system. For example, Gould and Cameron review research on regulation by adrenal steroids of the processes of granule cell birth and death in the dentate gyrus of the adult rat. In moths and other insect ecdysteroids orchestrate the massive reorganization of the nervous system that must occur at metamorphic transitions. Truman discusses the role of steroid receptors in this kind of reorganization, and Levine and Weeks summarize recent research on direct effects of steroids on specific neurons in culture. Sex steroids direct sex-specific development of nervous systems of various vertebrates, as is discussed by Arnold et al., who review sexual differentiation of the neural song circuit in zebra finches. Meaney et al. review the plasticity within brain regions that mediate responses to stress, and describe research on environmental regulation of the stress response early in development.

All of the reviews in this issue consider a second major theme, which is the cellular mechanisms of steroid hormone action. This theme is especially dominant in the contribution by Toran-Auerand, who reviews the connection between estradiol and neurotrophins. Because steroid hormones are often trophic (growth-promoting) in their actions on target cells, their effects could be mediated by, or underlie the trophic effects of protein trophic factors. No doubt this hypothesis will eventually be tested extensively in the model systems discussed in this issue.

A third theme is the use of nontraditional model systems to study hormonal actions on the brain. These systems often offer novel biological perspectives and specific experimental advantages for study of hormonal actions on the nervous system. This issue contains reviews on hormonal effects in electric fish (Zakon), honey bees (Fahrbach and Robinson), moths and fruit flies (Levine and Weeks, Truman),

and zebra finches (Arnold et al.). The papers bear ample witness to the conclusion that research on nonmammalian systems has uncovered important principles of hormone action.

Of particular interest are the neurosteroids, which are defined as steroids synthesized de novo from cholesterol in neural tissue. Although progress was initially made in research on synthesis and mechanism of neurosteroid action, until recently relatively little has been known of the functional role of such steroids. Schumacher et al. review evidence for an interesting new role for locally synthesized progesterone in repair of myelin in peripheral nerve.

I thank iBL contributors to this special issue for their exciting papers which summarize the most recent research in important areas of hormones and neural development.

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