

ENERGY METABOLISM IN INSECTS

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Edited by

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Preface

The scientific program for the XVI International Congress of Entomology, held in Kyoto, Japan August 3–9, 1980 included a symposium on the subject of “Energy Metabolism and Its Regulation in Insects.” The symposium provided an opportunity to integrate knowledge, and focus attention, on an important and fundamental aspect of insect biochemistry/physiology. The energy metabolism of insects differs from that of other animals in a variety of ways, including the prodigious amounts of energy expended by flying insects, the presence in hemolymph of large concentrations of sugar in the form of the nonreducing disaccharide trehalose, the transport of fat in the form of diacylglycerol, and the periodic mobilization and deposition of cuticular components during development. These differences, together with hormones, neurohormones, and neurotransmitters that are specific to (or functionally different in) insects, serve to demonstrate the unique nature of energy metabolism in insects. An obvious corollary from the demonstrated uniqueness of insect energy metabolism is that an understanding of the process may lead to the development of new, specific agents or strategies for the suppression of insect pests.

The present volume is an expanded version of the Kyoto symposium. It includes contributions from authors who were unable to attend the original symposium and provides an account of our current understanding of energy metabolism in insects. The first chapter introduces the subject and indicates environmental and physiological factors that effect changes in the basic pattern of energy flow. Chapter 2 identifies the chemical factors responsible for mediating changes in energy metabolism and describes the action of these factors in regulating the mobilization, transport, and utilization of energy-rich substrates. The next three chapters deal with the roles of carbohydrate, lipid, and proline respectively in fulfilling the energy requirements of particular tissues under particular physiological conditions. Chapter 6 describes the nature and role of the specific lipoprotein responsible for transport of diacylglycerols and other lipids

in insects. Chapter 7 considers supply and utilization of energy in the insect nervous system and compares these processes with energy supply in other tissues and organisms. The final chapter describes the properties, nature, and functional development of the mitochondrion.

In a volume of this nature it is inevitable that some redundancy occurs between certain contributions; such overlap is not necessarily a negative feature and indeed may serve to enhance the volume by permitting a more balanced and integrated treatment of the subject. A more serious concern arises through omissions and/or inappropriate depth of treatment given to particular topics; these constraints are occasioned in part by the withdrawal of some invited participants, the individual interests and biases of contributors, and, undoubtedly, oversight on the part of the editor. It is hoped that any such shortcomings will not detract seriously from the usefulness of the volume, and that the book will stimulate interest in a relatively neglected area of insect biochemistry/physiology.

It is a pleasure to acknowledge the assistance that I have received from several individuals in bringing this volume to press. Professor Haruo Chino and the organizing committee of the XVI International Congress of Entomology proposed the symposium and provided the impetus that was required to initiate the project. Kirk Jensen of Plenum Press has provided valuable counsel in the organization and production of the volume. Finally, I express my appreciation to the individual authors for their enthusiastic cooperation in producing excellent manuscripts that included many unpublished observations. Any success that the book enjoys can be attributed to their efforts.

R.G.H. Downer

Waterloo, August 1980

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