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BOOK REVIEW

HOFFMANN J.A., JANEWAY C.A., JR. & NATORI S. (eds): PHYLOGENETIC PERSPECTIVES IN IMMUNITY: THE INSECT HOST DEFENSE. R.G. Landes Company, Austin, USA, 1994, 197 pp., ISBN 1-57059-043-5. Price GBP 78.00.

The book includes 15 contributions of a Round Table Symposium at which immune mechanisms of insects were compared with those of other animals, notably the vertebrates. It was concluded that the basic components of the non-adaptive immunity are shared by Proto- and Deuterostomia, while only the vertebrates possess the adaptive immunity that is based on antibodies *discriminating* between different types of non-self molecules and which increases upon repeated exposure to a *specific* non-self antigen. The complement system, which links the non-adaptive and the adaptive immunity, is also fully developed in the vertebrates only. The insect immune system does not contain molecules highly homologous to and functionally comparable with immunoglobulins and complement proteins.

All book chapters deal primarily with serum immunity, thus reflecting on the enormous progress made since 1980 in identifying insect defense proteins and elucidating their structure. The chapters are arranged into the parts Defense molecules, Immune reactions in arthropods, Recognition systems, and Control of immune gene expression. Most attention is paid to the antibacterial peptides, which are produced in the fat body and the midgut epithelium. Their production is stimulated by bacteria and other potential pathogens (sometimes also by injury), but there is growing evidence that some of them are involved in the regulation of morphogenesis. For example, in *Sarcophaga,* a defensin and a lectin seem indispensable for proper imaginal disc differentiation during metamorphosis. Interestingly, a regulatory gene cascade that operates in early *Drosophila* embryogenesis seems to play a role in the regulation of the immune genes. From the evolutionary point of view, it is noteworthy that *Drosophila* immune genes contain similar response elements as mammalian acute phase genes (acute phase is a general response to stress that is induced within minutes); for example, the *Drosophila* Dorsal-like immunity factor is a homologue of the mammalian transcription factors NFκB.

The first antibacterial peptides of insects were named cecropins after the source species, but this generic name is now used for about 20 insect and one porcine compound of similar structure (31–39 amino acids, two amphipathic α-helices). Hemolymph cecropins attack the cellular membranes of bacteria but not of eukaryotic cells. A related peptide, the andropin, occurs in the reproductive tract of *Drosophila* males. Other groups of insect antibacterial peptides are called defensins (29–35 amino acids, 3 intramolecular disulphide bridges, active against gram-positive, less against gram-negative bacteria), proline-rich peptides (mostly 18 amino acids, lysis of gram-negative bacteria), and glycin-rich proteins (9–30 kDa, active mostly or exclusively on gram-negative bacteria). The last group is structurally and functionally diversified and different forms are known from Lepidoptera (attacins), Diptera (sarcotoxin II and diptericins), Coleoptera, Hymenoptera, and Heteroptera. The cecropins, defensins, and prolin-rich peptides have structural and functional counterparts in mammals.

The book pays less attention to insect immune proteins that do not fall into the categories listed above. Lectins are represented only by a description of some properties of the *Sarcophaga* lectin (130 kDa), which is essential for the elimination of erythrocytes injected into the abdomen of *Sarcophaga* and which is also expressed constitutively by unidentified embryonic tissues and by differentiating imaginal discs. A relationship of this lectin to mammalian defense systems can be deduced from the observation that it activates murine macrophages to lyze tumor cells. An apparently unrelated *Periplaneta* lectin seems to function as an opsonin, i.e. it flags foreign bodies to be phagocytized by insect hemocytes. Other classes of insect immune proteins, such as the lysozymes and components of the prophenoloxidase activating system, are hardly mentioned at all. These are closely related to cellular immunity which is also insufficiently treated in this book.

On the other hand, the reader will become well acquainted with the present knowledge of the mechanisms by which foreign molecules and cells are recognized. There is increasing evidence that insect defense is based on the recognition of 1,3-β-glucans (present in fungal cell walls), lipopolysaccharides (gram-negative bacteria), and peptidoglycans (gram-positive bacteria). For example, the 1,3-β-glucans activate the prophenoloxidase pathway in the hemocytes, which release factors interacting with certain plasma proteins and triggering phagocytosis and encapsulation of foreign particles and the melanization. Hemolymph coagulum with entraped hemocytes forms a plug closing a wound, and upon melanization provides an infection-resistant seal.

In summary, the book is not very suitable for a general entomologist who seeks on overview of insect defense mechanisms. but it is very useful to the students of insect serum immunity and will be most appreciated by those interested in the evolution of immune systems.

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