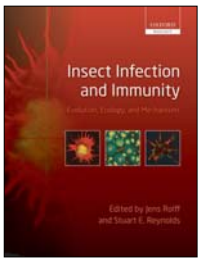

Book review

ROLFF, J. & REYNOLDS, S.E. (Eds.) 2009: Insect infection and immunity: evolution, ecology, and mechanisms

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Insects are ubiquitous and successful. Judging from their sheer cumulative biomass and species diversity, they must be doing something right! In *Insect infection and immunity: evolution, ecology, and mechanisms*, Jens ROLFF and Stuart E. REYNOLDS compile fifteen chapters exploring the proximate and ultimate causes of immune investment, function, and phenotypes primarily in insects. This text propels the field into the next phase of integrative and comparative research.

Each chapter synthesizes current information, and concludes with future questions and testable hypotheses. The range of study systems includes *Drosophila*, *Daphnia*, *Gryllus*, *Manduca*, *Anopheles* and *Aedes*, with brief reference to *Apis* and *Tribolium*, among others. Myrmecologists will enjoy Chapter 14's inclusion of *Formica* and *Acromyrmex*. The impressive list of thirty-five contributing authors were speakers at the Royal Entomological Society's Symposium on "Insect infection and immunity" in Sheffield, England, July 2009. This book is the most comprehensive source of information on the topic since SCHMID-HEMPEL's *Parasites in social insects* (Princeton University Press, 1998).

Insect infection and immunity: evolution, ecology, and mechanisms is a significant contribution and an excellent resource to anyone interested in the growing field of ecological immunology, particularly graduate students, investigators and professors. It is unique in that it integrates previously disjointed camps – researchers interested in mechanistic immunology and those interested in evolutionary ecology – into one, mostly cohesive approach. As such, the text should help settle the needless, ongoing, polarized debate amongst researchers (HAUTON & SMITH 2007, LITTLE & al. 2008). For those of us in the field, the timing of this work is perfect.

The first chapter surveys the history of invertebrate immunology research. Chapters 2 - 7 highlight immune mechanisms and integration, reviewing pathogen recognition and response, cellular and humoral activity, signal transduction cascades such as the Toll and Imd pathways, antiviral defenses, comparative genomics, and physiological exchanges with immune function. Chapters 8 - 15 cover immune interactions and evolution. This latter section examines relationships between both hosts and symbiotic microbes, parasitoids and polydnaviruses in addition to the evolution of resistance, stress and host physiology, immunity tradeoffs, population genetics, immune specificity, and reproductive implications.

At times, chapters present contradictory interpretations of data. For example, in Chapter 2, anti-microbial peptides (AMPs) are described as produced solely by the fat body, a point that is later contradicted by Chapter 3. Chapter 2 also states how one type of pathogen-associated molecular pattern – lipopolysaccharides – is not recognized by the invertebrate pattern-recognition receptors to induce an immune response, which is again countered by Chapters 3, 5, and 6. These incongruities may reflect variation in immune function across study systems; species may have evolved different solutions to common problems. The second half of this book is better integrated than the first, perhaps because of the distinct topics that each evolutionary chapter covers, relative to the somewhat overlapping mechanistic information of the first half.

Unfortunately, in our view, this volume misses an opportunity to present an evolutionary explanation for the existence of forms of immunity across the animal kingdom: innate, acquired, and adaptive. The probability exists that these three types of immunity are part of an evolutionary continuum where acquired immunity can be seen as an intermediary or transitional system linking the more primitive innate responses to the most derived adaptive modes of resistance seen in vertebrates. Indeed, acquired immunity exhibits levels of specificity and lasting memory, albeit to a lower degree than adaptive immune systems. Accordingly, memory and specificity can, to some degree, be considered convergent traits between acquired and adaptive immune systems. This mild criticism, however, does not negate the impressive amount of material covered in this text.

The idea of acquired immune phenomenon certainly broadens the scope of research topics under the invertebrate immunology umbrella. Additional chapters could have included reviews of the following topics: the evolution of virulence, influences of different life-history traits (such as those between holo- and hemi-metabolous insects) on immune investment, theoretical models of disease transmittance and its effects on populations, and more detailed research on the immunological function of social insects. But as fans of the work we are perhaps just being greedy! Ultimately, the information presented in *Insect infection and immunity* represents a comprehensive synthesis of important topics currently being investigated by invertebrate ecological immunologists, and as such, it is a synthesis that is long overdue and gladly welcomed.

References

HAUTON, C. & SMITH, V.J. 2007: Adaptive immunity in invertebrates: a straw house without a mechanistic foundation. – BioEssays 29: 1138-1146.

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