Bacterial Resistance to Antimicrobials

Edited by Kim Lewis, Abigail A. Salyers, Harry W. Taber and Richard G. Wax, Marcel Dekker, 2002, Price US$175.00, 495 pages, ISBN 0-82470-635-8

Bacterial resistance to antimicrobial agents (often called antibiotics after their most famous subclass) is a frequently reviewed topic. So why do we need this book?

First, it is encyclopedic in its coverage of epidemiological trends, with descriptions of agents and mechanisms of resistance for many important bacterial agents. It would be a useful reference for teaching and for researchers wanting a quick introduction to the topic. Furthermore, some chapters are generously referenced, balancing the trend to decrease the size of bibliographies in many review journals.

Second, this book guides the reader across the traditional discipline boundaries to interpret the phenomenon of resistance to antimicrobials over several ecological levels; from the global genome (created by horizontal gene transfer), through populations of resistant bacteria (epidemiology), to networks of biochemical pathways that interact in a cellular ecosystem. The articles by Miller and Rather (pp. 37–59) and separately by Novak and Tuomanen (pp. 209–222) provide holistic discussions on gene control networks and phenotypic tolerance, respectively. These articles complement the much larger number of discussions on genomics, microarrays and target screening technologies. The power of the genomics-based technologies [e.g. Telenti and Tenover (pp. 239–264)] might yet lead to the much anticipated overthrow of current paradigms of drug discovery. However, as our ability to properly wield that power is so far unproven (see Youngman's amusing account of the search for the universal essential genes on pp. 458–459), we need to balance our understanding of the technologies with an understanding of how whole organisms work.

That said, the book is, at best, an incremental update on the review literature. The value of the book is in its collection rather than the novelty of particular articles (with the exception of Youngman's refreshing contribution). Although the book has a broad coverage, at times it risks raising truisms to representative generalities. For example, the truism that the most important factor in developing resistance is the use of antibiotics (a useful reminder to clinicians, veterinarians and crop dusters) (p. 441), ignores the subtle but insightful science that tells us how antibiotics have influenced the evolution of resistance and done more than simply stabilize populations of initially rare resistant microbes.

In this respect, an article or two on how some of the ecological systems could be self-propagating would have been useful. What about, for example, the epigenetic transmission of the protoplastic state, or aminoglycoside resistance [1,2]? From the social perspective, an article on the cultural inheritance of resistance-promoting behaviors of individuals, governments, drug makers and drug dispensers, would have extended Williams' public health perspective on society's contribution to resistance.

A chapter on the social ecology would have been a logical extension of the article by Salyers *et al*. (pp. 1–17) and a foil for Youngman. Although, Salyers *et al*. argue that 'it is important to consider not only the ecology of resistant bacterial strains but also the ecology of resistance genes' (p. 1), by doing so we might also change the relative weightings of our priorities in drug development. So, whereas there is an immediate value in traditional killing (inhibiting) agents for the infected patient, and although these agents have an unrivaled 'track record of success' (p. 457) in treatment of patients and stifling outbreaks, they do not have a long-term track record (i.e. beyond decades). Infectious diseases are a long-term problem and our approach to them requires some long-term strategies. This might necessitate a move away from drugs that kill bacteria – thereby selecting resistant pathogens – to a strategy that uses anti-infective agents instead to reward the evolution of health-cooperative microbial communities [3].

By contrast, Youngman notes that these target-based approaches have so far yielded nothing new (p. 473). Moreover, it might be impossible to completely avoid resistance unless the drugs are highly specialized and with a narrow-spectrum. However, such drugs are enormously expensive to develop relative to the size of the market, and would only be useful with more sophisticated diagnosis technologies.

In my opinion, the social ecology of resistance could be as important as the genomics technologies (p. 476) for paradigm busting; perhaps governments will reconsider delegating their responsibility for drug design and development to the profit-motivated industry. Maybe it is not always possible to profit from the treatment of infectious diseases.

References

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3 Alksne, L.E. and Projan, S.J. (2000) Bacterial virulence as a target for antimicrobial chemotherapy. *Curr. Opin. Biotechnol.* 11, 625–636

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