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## Stuart B. Levy: *The antibiotic paradox. How the misuse of antibiotics destroys their curative powers*, 2nd edn.

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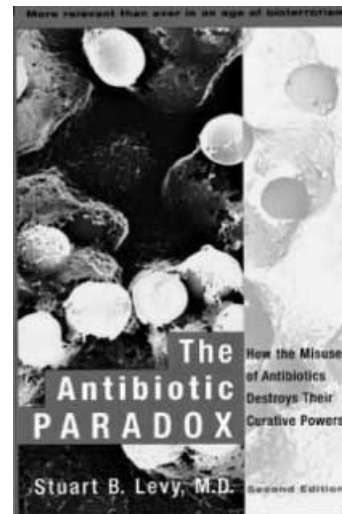
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Antibiotics are the most successful therapeutic drugs to fight infectious diseases, but they are also the cause of the selection of resistant microorganisms, which will be unaffected by them. This is the so-called antibiotic paradox. Since 1992, when Stuart B. Levy first published *The antibiotic paradox: How the miracle drugs are destroying the miracle*, the book has served as a major reference regarding the increase in antibiotic resistance in bacteria. Now, in the second edition, Levy states that many of the fears indicated previously, such as the dissemination of vancomycin-resistant enterococci, have unfortunately become true.

The book is easily read even by those not familiar with scientific terminology. Every subject and every concept is explained in very simple terms, making the text highly understandable. The book contains also many brief anecdotes and discussions of antibiotic misuse, bacterial resistance, and infectious diseases. Moreover, a review of national antibiotic policies from almost every part of the world contributes to reinforcing one of the central ideas conveyed in the book: antibiotic resistance is a *global* problem that needs a *global* solution. This book is highly recommended not only to physicians and other scientists, but also to journalists, public health authorities and the general public. The text is organized in 11 chapters. The first chapter clearly aims at getting the reader interested in the book, beginning with the very first line. Chapter 1 describes how penicillin became one of the first “miracle drugs” and how its success in preventing and combating diseases was the birth of the antibiotic era. It also includes some quotations from Fleming, who predicted that small doses of antibiotics would result in “microbes [that] are educated to resist penicillin.” It is worthwhile highlighting also this sentence from the author: “No matter what we do, the bacteria seem to be able to fight back.”

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Enthusiastic readers of the history of science will enjoy Chaps. 2 and 3. These describe the discovery of bacteria and their implication in certain diseases, and the history of drugs and antibiotics through their well-known discoverers: Leeuwenhoek, Pasteur, Koch, Gram, Waksman (who discovered streptomycin and coined the term “antibiotic”), and others. Chapter 4 describes antibiotic resistance mechanisms, their origin and their genetic basis. The description of the ability to transfer and exchange resistance mechanisms among bacteria, and the selection and accumulation of resistance under antibiotic pressure ends with this sentence: “Multidrug resistance is the rule, not the exception.” This is, unfortunately, one of the major threats in the case of organisms such as *Staphylococcus aureus* and *Mycobacterium tuberculosis*.

The antibiotic myth, which demonstrates the misuse and abuse of antibiotics, which has led to the emergence and spread of resistant bacteria, is discussed in Chap. 5. I really enjoyed this saying about the

ineffectiveness of antibiotics for colds: “An untreated cold goes on for seven days; a treated cold lasts a week.” This antibiotic myth is also responsible for the increasing use of antibacterial-containing cleaning products, which may become a serious problem in the near future, as discussed in Chap. 10. Chapters 6 and 7 describe the use of antibiotics in animals for treatment of diseases but also at subtherapeutic doses for promoting growth. In this situation, the treatment of animals with antibiotics for human use (or with antibiotics such as avoparcin, highly related to vancomycin, an antibiotic for human use) has contributed to the selection of resistance genes that, sooner or later, are incorporated into the genomes of our own commensal bacteria and may be transferred to major human pathogens. The use of antibiotics for other animals such as bees and fish, and also in agriculture, has many environmental consequences. It is also remarkable how antibiotics currently used for the treatment of human diseases can be easily obtained (without any prescription) for pets.

Although there have been promising advances in vaccination and alternative treatments for infectious diseases, antibiotics are still (and will be) essential for the control of bacterial infections, thus, their rationale use is absolutely necessary. Chapters 8, 9 and 11 discuss future prospects and how individuals and society can contribute to stop bacterial resistance, to preserve the power of antibiotics through its controlled and proper use, and to support the discovery of new antibiotics. The author emphasizes the environmental and global effects of

antibiotic misuse: “Antibiotics treat populations as well as individuals.”

Finally, the epilogue is concerned with the threats of anthrax and bioterrorism present after the September 11, 2001 attacks, an issue that raises the possibility of a sudden and massive craze about antibiotic use that eventually would destroy all the efforts to keep antibiotic resistance under control. Whether this is a real threat or not, we cannot know for the moment. But in any case, Chap. 8 describes eight principles to “safeguard our future and those of future generations.” If we all repeat these principles every day, like a mantra, and act consequently, we would be making a small but essential contribution to enlarging the healing power of Ehrlich’s “magic bullets.”

Apart from this and other books, Stuart B. Levy has authored or co-authored more than 200 articles on antibiotic use and abuse, the consequent appearance of antibiotic resistance, and the danger to public health of resistant bacteria. He is a fellow of many scientific organizations, has organized several meetings on antibiotic resistance, has been an adviser to international institutions such as the World Health Organization (WHO), and among other activities, has contributed to many newspapers, magazines and TV and radio programs aimed at the general public. Stuart B. Levy is also the president of the Alliance for Prudent Use of Antibiotics (this book can be purchased online from its Web site at <http://www.apua.org>), an international organization devoted to promoting the knowledge and proper use of antibiotics.