Regulation of Bacterial Virulence
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EDITED BY

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Michael Vasil dedicates this book to the memory of Martin Stonehouse, Ph.D., who relished science and loved life to the fullest. He left his loving wife, Carly, his sons, Ronan and Morgan, his family, and all of us much too soon, 29 October 2011.

Andrew Darwin dedicates this book to his parents, Frank and Pauline. They have never pushed but always supported.
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IN THE TIME FOLLOWING THOSE KEY DISCOVERIES, THERE HAVE BEEN THOUSANDS OF PUBLICATIONS DIRECTLY RELATING TO THE TOPIC OF THIS BOOK (>8,000 REFERENCES FOUND IN A PUBMED SEARCH FROM 1980, WITH THE QUERY “REGULATION OF BACTERIAL VIRULENCE”). CLEARLY, THIS FIELD IS ADVANCING AT A REMARKABLE PACE. AS A CONSEQUENCE, WE FEEL THAT IT WOULD BE WORTHWHILE AT THIS TIME TO ASSEMBLE A COMPREHEND OF MANY OF THE MORE FASCINATING AND CONTEMPORARY INSIGHTS RELATING TO THIS TOPIC, FROM OUTSTANDING AUTHORITIES IN THE FIELD, WITH THE WISH TO STIMULATE FURTHER RESEARCH EFFORTS.

THESE CHANGES, IN THE BIOLOGY FIELD WE HAVE ATTEMPTED TO PROVIDE A WIDE RANGE OF TOPICS THAT REPRESENT A BALANCE BETWEEN THE NEWEST INFORMATION ALONG MORE ESTABLISHED LINES OF INVESTIGATION (E.G., IRON, CHAPTERS 5, 6, AND 16), AS WELL AS INFORMATION DESCRIBING REFRESHING NEW PARADIGMS THAT HAVE BEEN INVESTIGATED WITHIN ONLY THE PAST FEW YEARS (E.G., VESICLE FORMATION AND HOST SIGNALING, CHAPTERS 23 AND 27). IT IS TRUE THAT THE BOOK DEVOTES SIGNIFICANT FOCUS TOWARD SOME AREAS, SUCH AS THE EFFECTS OF IRON ON BACTERIAL VIRULENCE. MOST LIKELY THIS IS A CONSEQUENCE OF BOTH ITS EARLY DISCOVERY IN RELATION TO THE REGULATION OF BACTERIAL VIRULENCE (SEE ABOVE) AND THE INCREASING REALIZATION THAT THE ROLE OF ENVIRONMENTAL IRON LEVELS IN VIRULENCE IS MAGNIFICENTLY COMPLEX, FROM THE STANDPOINT OF BOTH THE PATHOGEN AND THE HOST. THAT IS, IRON HAS AN IMPACT THAT REACHES FAR BEYOND SIMPLY REGULATING THE EXPRESSION OF VIRULENCE DETERMINANTS. ALTHOUGH IRON WAS SUBSEQUENTLY DISCOVERED TO AFFECT THE EXPRESSION OF OTHER MAJOR BACTERIAL TOXINS (E.G., SHIGA TOXIN AND PSEUDOMONAS AERUGINOSA EXOTOXIN A), ENVIRONMENTAL IRON LEVELS HAVE ALSO BEEN SHOWN TO HAVE AN EXTRAORDINARY IMPACT ON INCREASINGLY INTRICATE PROCESSES RELATING TO BACTERIAL VIRULENCE, INCLUDING BIOFILM FORMATION, BASIC PHYSIOLOGICAL PROCESSES, RESISTANCE TO OXIDATIVE STRESS, AND BASIC INTERMEDIARY METABOLISM (SEE CHAPTERS 1, 5, 6, 9, 16, AND 22).


WE HAVE ALSO PROVIDED CHAPTERS (SEE CHAPTERS 2, 27, AND 28) FROM OUTSTANDING AUTHORS WHO ARE INVESTIGATING THE REGULATION OF EXTREMELY COMPLEX BEHAVIORS OF BACTERIAL PATHOGENS. THESE INCLUDE DESCRIPTIONS OF HOW SOME BACTERIA (E.G., P. AERUGINOSA) CONTROL GENE REGULATION BEFORE, DURING, AND AFTER THEIR TRANSITION FROM AN ACUTE INFECTION TO A MORE CHRONIC ONE. ALONG SIMILAR LINES, ALSO INCLUDED IS A CHAPTER (CHAPTER 28) THAT PROVIDES NEW INSIGHTS ABOUT THE REGULATORY TRANSITION OF V. CHOLERAE FROM INSIDE A HUMAN HOST TO ITS MORE NATURAL ENVIRONMENTS, SUCH AS ESTUARIES, WHERE
it exists in planktonic form as well as in biofilms, and then back into a human host.

Last, but not least, we gratefully acknowledge all the other outstanding chapters we were not able to mention above, due to space constraints of this preface. The omission of any chapter in this book would most certainly diminish its value. As the editors, we offer our sincere thanks to all of the authors for their dedication and hard work toward the production of this book.

It is hoped that the exciting discoveries described by all of the wonderful authors of this book will be as inspirational to both young and more seasoned investigators, as the early observations about the regulation of diphtheria toxin were to scores of scientists for decades. We can only hope that this will most certainly be so.

Michael L. Vasil
Andrew J. Darwin
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