Salmonella Infections
Clinical, Immunological and Molecular Aspects

Salmonella enterica encompasses a diverse range of bacteria that cause a spectrum of diseases in many hosts. Advancements in prevention and treatment of S. enterica infections have at times been hampered by compartmentalization of research efforts and lack of multidisciplinary approaches. This book attempts to cover a diverse range of topics related to the biology of S. enterica infections, including epidemiological and clinical aspects, molecular pathogenesis, immunity to disease and vaccines. Salmonella enterica infections are important zoonoses and therefore material on infections of animals and public health issues have also been considered. Each chapter can be read independently, but the full contents of the book will provide the reader with up-to-date knowledge on all the key aspects of salmonellosis in humans and animals. It will therefore be of interest to graduate students and researchers, as well as to clinicians, whose research focuses on this important pathogen.

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Over the past decade, the rapid development of an array of techniques in the fields of cellular and molecular biology has transformed whole areas of research across the biological sciences. Microbiology has perhaps been influenced most of all. Our understanding of microbial diversity and evolutionary biology and of how pathogenic bacteria and viruses interact with their animal and plant hosts at the molecular level, for example, have been revolutionized. Perhaps the most exciting recent advance in microbiology has been the development of the interface discipline of Cellular Microbiology, a fusion of classic microbiology, microbial molecular biology, and eukaryotic cellular and molecular biology. Cellular Microbiology is revealing how pathogenic bacteria interact with host cells in what is turning out to be a complex evolutionary battle of competing gene products. Molecular and cellular biology are no longer discrete subject areas but vital tools and an integrated part of current microbiological research. As part of this revolution in molecular biology, the genomes of a growing number of pathogenic and model bacteria have been fully sequenced, with immense implications for our future understanding of microorganisms at the molecular level.

Advances in Molecular and Cellular Microbiology is a series edited by researchers active in these exciting and rapidly expanding fields. Each volume will focus on a particular aspect of cellular or molecular microbiology and will provide an overview of the area; it will also examine current research. This series will enable graduate students and researchers to keep up with the rapidly diversifying literature in current microbiological research.

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Salmonella Infections
Clinical, Immunological and Molecular Aspects

EDITED BY
PIETRO MASTROENI AND
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University of Cambridge
To our families and friends

TO CARLOS
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*Salmonella enterica* encompasses a diverse range of bacteria that cause a spectrum of diseases in many hosts. Typhoid fever is still a major killer of people in the developing world and rears its ugly head whenever war or natural disaster strikes. The increase in antibiotic resistance that has been observed in *S. enterica* serovar *Typhi* makes the understanding of this pathogen ever more important. But typhoid fever is not the only *Salmonella*-related disease that causes concern, with human gastrointestinal disease a major problem in developed and developing countries, not forgetting salmonellosis in livestock that bring with them economic losses as well as the problems of zoonoses and food-borne disease.

The different salmonellae make up a versatile and fascinating group of organisms that have inspired both of the Editors of this book since we were scientific juveniles studying the pathogenesis and immunity of these bacteria for our Ph.D. degrees. As we have moved through the stages of our scientific careers, other bacteria and immunological questions may have caught our attention for a while, but always the salmonellae persisted, providing the bedrock of our interests and the centrepiece of our scientific enquiries.

So why edit a book on salmonellae now? The easy answer to this question is that the study of the salmonellae is entering a brave new world with the completion of the genome sequences of serovars *Typhi*, *Paratyphi A* and *Typhimurium*, with other sequences hot on their tail. Add to this impetus the remarkable advances in whole genome analysis that have been allied to genome science, and that have especially opened the door on so many of the secrets of how salmonellae cause disease, and it begins to look like a really exciting time to be working with salmonellae. Add again advances in the study of the cellular biology of infection that have been made recently, especially in the context of the marvellous imaging technologies that are now...
available, and we begin to move to a position where the diseases caused by salmonellae might be understood at a level of detail unimaginable only ten years ago.

We hope that we have covered most of the key aspects of the biology of *Salmonella* infections in this book and that we have brought out some of the excitement in the field currently being felt by researchers. We have also been intent on embedding the basic science aspects of this book in real disease states, and so we have enthusiastically included chapters on the clinical diseases and public health problems caused by this group of bacteria.

Finally, science-based vaccines against salmonellae are already a reality. Improvements in our understanding of the immunology and vaccinology of these diseases may not only lead to control of these problems in the future but may also lead in unexpected directions. In fact, this intracellular pathogen can be used as a Trojan horse to introduce antigens from other organisms to a host’s immune system, or indeed deliver other immunotherapeutics that might lead to treatments for a range of non-infectious diseases. We have tried to cover these exciting advances in the book.

It has been a pleasure editing this book, and an enormous education. It would not have been possible without timely and high quality papers from our contributors, to whom we would like to say thank you, and we hope you like the end product. We also hope that you the reader like the book, find it useful and most importantly of all, are enthused by it and by these fascinating organisms.