
Preface

In this book we aimed to describe a variety of techniques that reflect the wide range of research currently being performed in the field of coronavirology. However, most of the techniques described are also applicable to a wide variety of other virology fields, so we hope that this book will have wider appeal. As such, we have started this book with an overview chapter of current understanding of coronavirus replication and pathogenesis to introduce nonspecialist readers to the field.

Since the emergence of SARS-Coronavirus in 2003, numerous new coronaviruses have been identified. The emergence of MERS-Coronavirus in 2012 and the continued occurrence of human cases highlight the importance of techniques to verify the presence of coronaviruses in a sample as well as identify new coronaviruses that may pose a potential threat to the health of both humans and livestock. As such, chapters have been chosen to describe identification, diagnosis, and study of evolution of coronaviruses.

To allow the study of viruses, propagation and quantification of virus is essential. Therefore, we have included chapters describing preparation of cells and organ cultures useful in propagating coronaviruses and titration techniques. In addition, several techniques for analyzing virus function require purification of virus, so purification protocols suitable for different downstream techniques have been included.

The ability to reverse engineer virus genomes and recover recombinant viruses with defined mutations is invaluable in the progression of understanding the mechanisms for virus pathogenicity, viral protein and RNA function and understanding virus-host interactions. Therefore, chapters describing two commonly used reverse genetics techniques for coronaviruses are included.

A key step in virus replication is attachment to and entry into the host cell. Techniques detailing identification of cellular receptors, binding profiles of viral attachment proteins, and virus-cell fusion are described.

Finally, a major area of coronavirus research currently is the interaction between the virus and the host cell to gain insight into requirements of the virus to enable replication but also how the host cell responds to virus infection. Understanding these processes is vital in enabling future control of virus replication with antiviral therapeutics or prevention through vaccination. Therefore, several chapters have been included covering a broad spectrum of techniques to identify virus-host protein-protein interactions, confirm the functional role of these proteins in virus replication, study host cell responses through genome-wide or pathway-specific approaches, and visualise virus replication complexes.

We would like to thank the authors who have contributed to this book for the time they have taken to prepare detailed methods as well as provide practical hints and tips that are often essential to get a new working protocol.

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Coronaviruses

Methods and Protocols

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