Preface

INFLUENZA VIRUSES HAVE LIKELY PLAGUED us for thousands of years, manifested by annual epidemics and occasional pandemics. Although the excess morbidity and mortality of epidemics is lower than that of pandemics, the cumulative burden of epidemics is substantial. Influenza pandemics occur at irregular intervals when viruses with novel antigenic properties encounter an immunologically naive population, resulting in fast virus spread around the globe. The impact on public health, health-care systems, and the world economy can be devastating. The influenza pandemic in 1918 caused about 50–100 million deaths worldwide, and the current SARS-CoV-2 pandemic demonstrates how a respiratory virus can bring the world to a near-standstill. Research on respiratory viruses that can acquire the ability to transmit among humans via aerosols thus needs to remain a high priority.

Much has been accomplished since the isolation of the first influenza virus in 1933, including the development of the first influenza vaccines in the 1940s, the characterization of the influenza virus life cycle and of the influenza virus genes and proteins in the 1960s–1990s, and the establishment of the first influenza virus reverse genetics system in 1999, which has allowed researchers to generate and modify influenza viruses from scratch, opening the door for a multitude of studies including the generation of genetically engineered vaccine viruses.

Despite the many advances in influenza virus research, multiple challenges remain. The immunogenicity and protective efficacy of influenza vaccines to seasonal and potentially pandemic influenza viruses remain suboptimal. We still do not understand why certain influenza viruses emerge and cause a pandemic. We still do not understand the antigenic evolution of seasonal influenza viruses, knowledge that would open the possibility that vaccines could be generated before novel antigenic variants become dominant in human population. And we still do not understand the detailed molecular mechanisms that cause disease and sometimes death upon influenza virus infection.

This book aims to summarize the current knowledge in several key areas of influenza research. We structured it into chapters addressing the molecular virology of influenza viruses, influenza in humans, influenza in animals, immunology, and vaccines and antivirals to influenza viruses. Although the chapters in this book cannot comprehensively cover all of the data in the field, they are intended to shine a light on important topics and recent advances in the respective areas.

We thank all of the contributing authors for finding time in their busy schedules, especially because many of them are also working on the pandemic SARS-CoV-2 virus. Our special thanks go to Barbara Acosta at Cold Spring Harbor Laboratory Press for her expertise and guidance and for her patience with multiple delays in the completion of this book.

We hope that readers find the book informative and inspiring, and that it might motivate them to read the many additional, excellent influenza virus studies that are not covered here.

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