Helicobacter pylori colonizes the gastric mucus layer of about half of the world’s population. The bacterium was discovered in 1983 by the Australian scientists Robin Warren and Barry Marshall and designated as a gastric pathogen, causing peptic ulcer disease. In 2005, they received the Nobel Prize in Physiology or Medicine for their discoveries, primarily because the application of antibiotics to treat ulcers has changed radically the practice of medicine since that time. Colonization by H. pylori results in superficial gastritis without clinical symptoms in most individuals, but can progress to gastric or duodenal ulcers, gastric adenocarcinomas, and mucosa-associated lymphoid tissue-lymphomas. Disease outcome is highly complex and depends on the interplay between host, bacterial, and environmental parameters. However, irrespective of disease outcome, the majority of H. pylori-infected people remain colonized for their entire lifetime. Today, H. pylori is established as a prime example of a persistent pathogen and cancer-inducing bacterium. H. pylori exhibits very unique characteristics in its metabolism and survival strategies, and has been the subject of intensive research to discover the mysteries of its genetics and cellular biology. In contrast to this high importance of H. pylori for human health, it appears that a comprehensive volume on molecular infection mechanisms and intracellular signal transduction pathways during colonization is not fully developed.

The number of publications in the H. pylori field has increased substantially in recent years, making it very difficult for even the most diligent readers to stay abreast of research progress. With the breathtaking expansion of studies on H. pylori, this is an opportune time to review the present knowledge about this exciting research topic. Accordingly, a comprehensive collection of reviews on the multiple facets of H. pylori pathogenesis and signal transduction mechanisms seems both timely and appropriate for a book series. The present volume on “Molecular Pathogenesis and Signal Transduction by H. pylori” summarizes our current scientific understanding of H. pylori biology in 14 chapters by internationally recognized experts in this research field. It is designed to provide important cutting-edge findings on this fascinating microbe and molecular pathogenic processes for advanced undergraduates, graduate students, medical students,
postdoctoral fellows, clinicians, and (bio)medical investigators, who are interested
in infectious diseases and host cell signaling. We discuss the most recent insights
into the major signal transduction pathways and highlight their mechanism of
action, in particular in response to infection with *H. pylori* and the corresponding
disease pathologies.

The first chapter was designed to provide the necessary background and a
general overview for understanding the topics covered in the following chapters.
This introduction includes advances in the general strategies of *H. pylori* infection
and specialized metabolism at the molecular level. In the subsequent chapters, we
specifically discuss the current state of research concerning the regulation and
action of bacterial virulence factors, genetics, and infection biology of *H. pylori*.
The chapters include frontline findings and discuss the overall strategies of
*H. pylori* infection, replication and persistence, cross talk with the microbiota,
innovative and novel model systems and signaling mechanisms, risk factors and
genetics of gastric disease and stomach cancer, as well as the impact of *H. pylori*
infection on non-gastric diseases.

As will become evident from these detailed review articles, there is much more
complexity in the triggered pathways than was originally anticipated, adding greatly
to the overall interest in these signaling factor cascades. Within the individual
chapters, readers will find not only consensus and paradigm, but also differing
perspectives on the regulation and functions of the multitude of *H. pylori* factors.
Importantly, all of the reviews point out specific areas, where the lack of sufficient
knowledge and understanding raises intriguing new questions for further experi-
mentation in the future. These outstanding questions often pertain to the increas-
ingly complex biological functions of the infection and diverse mechanisms of
regulation in a variety of applied systems, ranging from mouse models via gastroids
to humans. Recurring themes are: (i) How the pathogen can dampen the host
immune system in order to establish long-term chronic infection, (ii) what is the
evolutionary benefit for *H. pylori* by hijacking distinct host signaling pathways,
(iii) how many and which signal cascades are most crucial for developing gastric
malignancy, (iv) what exact molecular mechanism(s) decide whether a patient
remains asymptomatic or develops a given type of gastric disease and not another,
and (v) can we define biomarkers for the different gastric diseases. In the future,
better characterization of the cellular and molecular biology of the *H. pylori*
infections will pinpoint important new therapeutic targets for the treatment and
prevention of multiple infectious gastric diseases. If this comprehensive collection
of reviews on *H. pylori* pathogenesis and disease-associated mechanisms stimulates
fresh new thinking and research on the involved signaling pathways, this book will
have accomplished its goal.

The above-discussed advances in the field have helped to shape the core of this
volume. We are very grateful to all the scientific contributors from around the
globe, who have participated in the preparation of these outstanding chapters
covering our growing knowledge of *H. pylori* pathogenesis and signaling. We hope that this volume will become an invaluable resource to readers new to the field and expand the resources for those professionals already working in the *H. pylori* area. We would like to thank all participants for their support and help in making this book a tremendous success.

Erlangen, Germany
November 2016

Nicole Tegtmeyer
Steffen Backert
Molecular Pathogenesis and Signal Transduction by Helicobacter pylori
Tegtmeyer, N.; Backert, S. (Eds.)
2017, XXIV, 347 p. 33 illus., 31 illus. in color., Hardcover
ISBN: 978-3-319-50519-0