

METHODS IN MOLECULAR BIOLOGY

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Leishmania

Methods and Protocols

Edited by

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Editor

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Cover Caption: Scanning electron micrograph of a *Leishmania donovani* promastigote, taken by Dr. Monica Hagedorn at the electron microscope facility of the University of Ulm, Germany.

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Preface

The Aims

Parasites of the genus *Leishmania* and other Trypanosomatidae are causative for three of the most important neglected tropical diseases (NTDs), affecting the lives of millions of humans in the tropical and subtropical regions of the world. New drugs against these obligate parasites and new tools for the control of their vectors are urgently needed, especially since all existing treatments have serious drawbacks and limitations. Therefore, additional efforts are needed; meaning, more researchers must enter the field, not only in applied science but also in basic research. This is often hampered by a lack of understanding of these organisms and the particular methodological challenges and chances with which they confront “newbies” and even established parasitologists. Fortunately, the last years have seen tremendous methodological advances, e.g., by the introduction of deep sequencing approaches and their combination with established strategies but also by the introduction of state-of-the-art genome editing strategies, and awareness for these new opportunities must be raised. This compendium is therefore aimed at established parasitologists wishing to broaden their spectrum but also for scientists from other disciplines who wish to enter *Leishmania* research or plan to collaborate with *Leishmania* researchers in the framework of multidisciplinary R&D consortia. Its long-term and ambitious goal is to help in getting leishmaniasis off the list of the NTDs by promoting research.

The contributing authors and I also entertain the hope that this compendium will help to implement experimental standard procedures. More often than not, similar experimental strategies are performed following diverse protocols in different laboratories, making direct comparisons of the results difficult and even impossible. Offering this collection of experimental protocols, we hope to reduce the inconsistency of procedures, to make results more comparable and to avoid confusion.

The Scope

The various chapters of this book cover a wide range of experimental strategies and techniques contributed by colleagues from the field. They deal with the cultivation of axenic amastigote forms (Chapter 1) and cover phylogeny and comparative genomics (Chapters 2 and 3) and other strategies collectively known as systems biology (Chapters 4–7). Also offered are the protocols for genetic manipulation of *Leishmania*, both classic and new (Chapters 8–11). A large part of this book is also dedicated to in vitro and in vivo infection models and their interpretation (Chapters 12–19), ranging from host cell lines to mammalian and arthropod hosts. This compendium cannot cover the entire range of experimental strategies that are used in *Leishmania* research. Some expert colleagues had no time to contribute, and some research fields are too diverse and complex to be covered by one or two chapters. On the whole, however, I entertain the hope that the protocols found in this

book will be a help and a starting point for established and emerging researchers. In addition to the core target group, *Leishmania* researchers, colleagues working with other protozoa of the order Trypanosomatida may also find the book useful, in particular Chapters 3–11, as most molecular techniques can be applied to those organisms as well.

Hamburg, Germany

Joachim Clos

Acknowledgments

For the completion of this compendium, I depended on the willingness of a large number of colleagues to contribute their expertise and to invest their time and that of their collaborators. I am happy to state that they embraced the idea of this book with enthusiasm, and I thank them for their readiness to open their lab manuals for the community. I also have to thank my colleagues at the Bernhard Nocht Institute for Tropical Medicine for their readiness to be test readers of selected chapters during the review process.

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