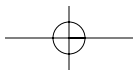
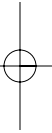
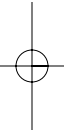
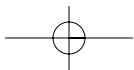
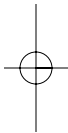
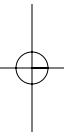
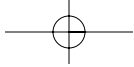


HUMAN PARASITOLOGY





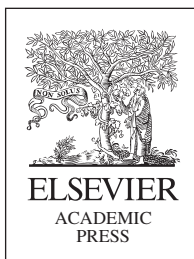
HUMAN PARASITOLOGY

THIRD EDITION

Burton J. Bogitsh, Ph.D.

Clint E. Carter, Ph.D.

Thomas N. Oeltmann, Ph.D.



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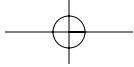
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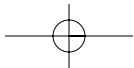
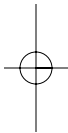
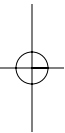
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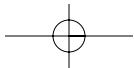
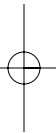
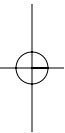
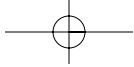
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*Dedicated to the memory of Mafoi C. Bogitsh, who
was “the wind beneath my wings.”*
—BJB





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Preface to the Third Edition

Several years ago we recognized the need for a textbook of human parasitology designed specifically for premedical, medical technology, and biology students who required basic knowledge of the biology of parasitism, and we began to consider collaborating on such a text. As the idea germinated, we decided that, while emphasizing the medical aspects of the topic, the book should incorporate sufficient functional morphology, physiology, biochemistry, and immunology to enhance appreciation of the diverse implications of parasitism. It would also explore the potential of certain parasites for producing morbidity and mortality and would present available data regarding the *modus operandi* of certain modern chemotherapeutic agents. Through considerable discussion and several revisions of the manuscript, the first edition of *Human Parasitology* evolved. One of the goals for *Human Parasitology* was that it would serve as a bridge between classical clinical parasitology texts and the more traditional encyclopedic, advanced treatises that include in-depth consideration of biochemistry and immunology as well as more exotic parasites, such as strigeids of fishes, amphibians, and birds.

In this era of expanded use of radiation therapy and immunosuppressive drugs to treat cancer, tissue rejection in organ transplants, and AIDS, all of which serve to reduce immunocompetency in the human host, a number of parasites, some of which were formerly considered inconsequential, have become life-threatening. The subject of opportunistic parasites was introduced in the second edition of *Human Parasitology* and is expanded in the

third edition. Intrinsic to the study of opportunistic parasitism is the topic of immunology. Accordingly, we have expanded the treatment of this subject in the third edition in a manner that we feel is understandable to the beginning student. We have also added a section in which the immune response of an individual host is discussed relative to the parasite in question. The marked increase in world travel, immigration, and conflicts has made it imperative that students preparing for careers in the allied health sciences, medicine, and public health, as well as those interested in various aspects of environmental studies, acquire a working knowledge of parasitic diseases and how they affect their human hosts. In addition, the increased introduction of foodstuffs from countries throughout the world has increased the occurrence of several parasites that have hitherto been rarely seen in the country. To that end, we have included expanded coverage of such topics as waterborne parasitic diseases and food-borne zoonoses.

So as not to diminish the importance of the biological aspects of parasites, the opening chapter of the portion devoted to each major group of parasites is entitled "General Characteristics." These introductory chapters deal with the evolution and biology of each group and include ample light and electron micrographs to illustrate the various points of the text. An abridged classification of parasites covering the major nomenclature of only those forms discussed in the text has been placed at the end of each chapter. Also at the end of each chapter is a section entitled "Selected Readings." We have attempted to list a few significant publications that present some in-depth information on selected topics pertinent to the topics discussed in the chapter. This section is not intended to present an updated literature for research or graduate studies. Indeed, the reader may find some classical reports as well as more recent citations.

The field of chemotherapy is advancing at such a rapid pace that new drugs and regimens become available continually. Consequently, sections of the book dealing with information about current drugs of choice as well as regimens will possibly become obsolete more rapidly than other sections of the book. Nevertheless, in the individual sections and at the end of the book, specific, currently prescribed chemotherapeutic regimens are included and may prove useful to prospective medical students.

During the past few years, a number of essentially unheralded protozoans such as *Cryptosporidium parvum* and *Cyclospora cayentanensis* have become public health problems. We have not attempted to identify and discuss all parasites that have been reported in humans, concentrating instead on only those considered to be of major significance.

Because the third edition, as previous editions, is designed for a one-semester course, the material is somewhat condensed, particularly in the areas of physiology and biochemistry. We believe this edition will appeal particularly to those students interested not only in the medical aspects of parasitology but also to those who require a solid foundation in the biology of parasites in order to further their studies in a graduate school of their choice.

Preface to the Second Edition

Several years ago, we recognized the need for a textbook of human parasitology designed specifically for premedical, medical technology, and biology students who required basic knowledge of the biology of parasitism, and we began to consider collaborating on such a text. As the idea germinated, we decided that, while emphasizing the medical aspects of the topic, the book should incorporate sufficient functional morphology, physiology, biochemistry, and immunology to enhance appreciation of the diverse implications of parasitism. It would also explore the potential of certain parasites for producing morbidity and mortality and would present available data regarding the *modus operandi* of certain modern chemotherapeutic agents. Through considerable discussion and several revisions of the manuscript, the first edition of *Human Parasitology* evolved. One of the goals for *Human Parasitology* was that it would also serve as a bridge between classical clinical parasitology texts and more traditional encyclopedic, advanced treatises that include in-depth consideration of biochemistry and immunology as well as more exotic parasites, such as strigeids of fishes and birds.

In this era of expanded use of radiation therapy and immunosuppressive drugs to treat cancer, tissue rejection in organ transplants, and AIDS, all of which serve to reduce immunocompetence in the human host, a number of parasites, some of which were formerly considered inconsequential, have become life-threatening. Although this aspect of parasitology was discussed throughout the first edition of *Human Parasitology*, its significance has

expanded to such an extent that a new section titled “Opportunistic Parasites” was deemed essential for the second edition. The marked increase in world travel and immigration has made it imperative that students preparing for careers in the allied health sciences, medicine, and public health, as well as those interested in various aspects of environmental studies, acquire a working knowledge of parasitic diseases and how they affect their human hosts. To that end, we include expanded coverage of such topics as water-borne parasitic diseases and food-borne zoonoses.

So as not to diminish the importance of the biological aspects of parasites, the opening chapter of the segment devoted to each major group of parasites is titled “General Characteristics.” These introductory chapters deal with the evolution and biology of each group and include ample light and electron micrographs to illustrate the various points of the text. An abridged classification of parasites covering the major nomenclature of only those forms discussed in the text has been placed at the end of each “General Characteristics” chapter. Updated references recommended as ancillary reading are found at the end of each chapter.

The field of chemotherapy is advancing at such a rapid pace that new drugs become available continually. Consequently, sections of the book dealing with information about current drugs of choice will become obsolete more rapidly than other sections of the book. Nevertheless, in the individual sections and at the end of the book, specific, currently prescribed chemotherapeutic regimens are included and may prove useful to prospective medical students.

Newly discovered organisms that parasitize humans, as well as adaptations among normally nonpathogenic parasites, continue to be documented. For instance, during the past few years a number of essentially unheralded protozoans such as *Cryptosporidium parvum* and *Cyclospora cayentanensis* have become public health problems. We have not attempted to identify and discuss all parasites that have been reported from humans, concentrating instead on only those considered to be of major significance.

Because the second edition, like the first, is designed for a one-semester or one-quarter course, the material is somewhat condensed, particularly in the areas of physiology and biochemistry. We believe this edition will appeal particularly to those students interested not only in the medical aspects of parasitology but also to those who require a solid foundation in the biology of parasites in order to further their studies in a graduate school of their choice.

Preface to the First Edition

Several years ago, the authors began to consider writing a textbook of human parasitology designed for premedical, medical technology, and biology students in need of basic knowledge of the biology of parasitism. While emphasizing the medical aspects, the book would include sufficient functional morphology, physiology, biochemistry, and immunology to foster greater appreciation of the diverse implications of parasitism. In addition, it would explore the means by which certain parasites cause morbidity and mortality and would present, where known, the modes of action of certain modern chemotherapeutic agents. Through considerable discussion and several revisions of the manuscript, this volume evolved. The authors believe that *Human Parasitology* serves as an intermediate between textbooks devoted almost exclusively to the “classical” clinical parasitology approach and more advanced treatises that provide in-depth treatments of parasite taxonomy, physiology, biochemistry, and immunology.

In this age of radiation therapy, immunosuppressive drugs, and AIDS (Acquired Immune Deficiency Syndrome)—all of which serve to reduce immunocompetence in the human host—the importance of parasites once considered inconsequential has mushroomed. Toxoplasmosis, pneumocystosis, and other parasitic infections have become diseases of major consequence. For this reason and others, including marked increases in world travel and immigration, it has become imperative that students preparing for careers in the allied health sciences, medicine, and public health acquire

some knowledge of parasitic diseases of humans. This book has been written with such students in mind.

Classification of parasites is an integral part of the discipline. This book has been organized by placing the classification schemes most widely favored in current usage at the end of the first chapter in each part. This leaves the level of emphasis to the discretion of the instructor. References that are recommended as ancillary reading are also included at the end of each chapter.

It must be recognized that the field of chemotherapy is advancing at such a rapid pace that new drugs become available constantly. Consequently, current information about drugs of choice will become obsolete more rapidly than will information presented in other sections of the book. Nevertheless, at the end of the book is an appendix listing the specific, currently prescribed chemotherapeutic regimens that may prove useful to prospective medical students.

Newly discovered organisms that can and do parasitize humans, as well as adaptations among normally nonpathogenic parasites, continue to be documented. For instance, during the past three decades there have been fascinating discoveries that free-living amoebae such as *Naegleria fowleri* and *Acanthamoeba* species can become highly lethal pathogens as a result of facultative parasitism. Furthermore, it has been established that a number of essentially benign protozoans can become highly pathogenic in immunologically compromised hosts. The authors have not attempted to identify and discuss all parasites that have been reported from humans but only those considered to be of major significance.

This volume is designed for a one-semester or one-quarter course and, as such, presents the material in a less detailed format.

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