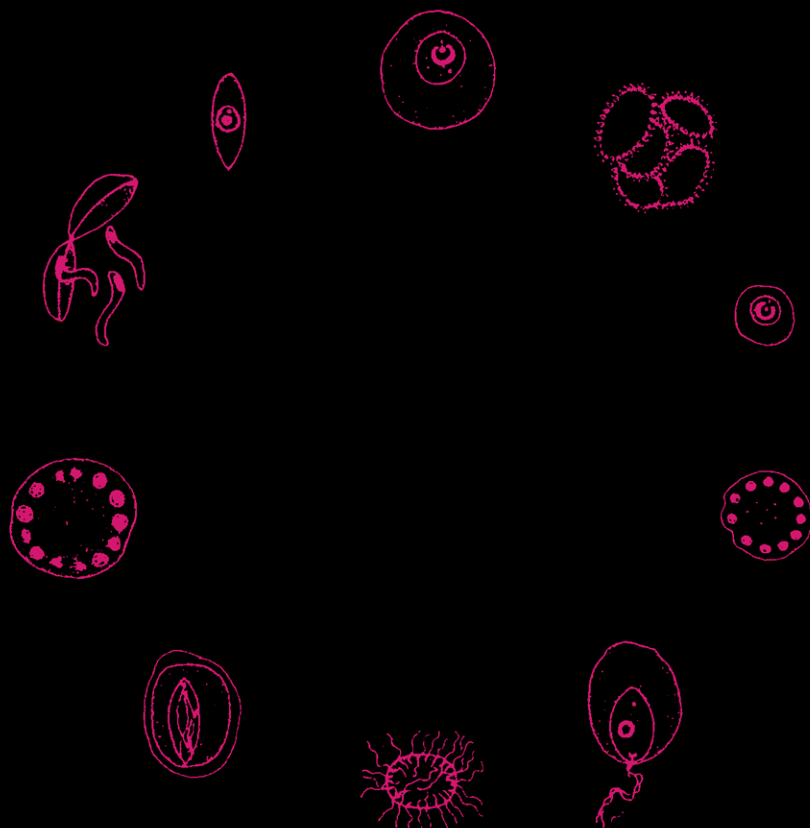


Current Topics in Comparative Pathobiology

Edited by **Thomas C. Cheng**



Volume 2

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**Current Topics in
Comparative Pathobiology**

Volume 2

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Current Topics in Comparative Pathobiology

Edited by THOMAS C. CHENG

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BETHLEHEM, PENNSYLVANIA

Volume 2



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Preface

In selecting the contributors to this volume, the second of this series, I have intentionally invited recognized authorities in several diverse areas of pathobiology to contribute comprehensive reviews. The rationale, at least in part, is once again to expose the readers to the multidisciplinary nature of pathobiology. As a result, I have selected contributors who are parasitologists, insect pathologists, a tissue culturist, an ecologist who is interested in the “systems analysis” approach to epizootiology, and a marine biologist. By placing their contributions within one volume I hope once again to reinforce the concept that the relatively young discipline of pathobiology is actually a hybrid, in many ways, of the best of biology. All too often, we biologists become so specialized and intimately interested in our own little part of the mother science that we fail to appreciate that many of us from many parts of the biological world are actually interested in similar or compatible problems but have become so rigid in our thinking that we fail to see the relevancy of contributions of others who do not wear the same subdisciplinary brand as ourselves. A part of the blame, of course, lies with our nature to establish boundaries delineating our areas of specialty. This, rather than being a practice biologists ought to be proud of, should be deplored. All too often, immunochemists speak only to immunochemists, zooparasitologists do not even communicate with those interested in plant parasitic nematodes, etc. Furthermore, too many societies representing subspecialties have been established and we tend to gather in “mutual admiration societies.” This series was established with the intent of breaking down these artificial boundaries. To validate this broad approach we need to be reminded of Louis Pasteur,

who qualified as a chemist, bacteriologist, parasitologist, invertebrate pathologist, immunologist, and protozoologist. Obviously he did not permit man-made boundaries to discourage him from making great discoveries in science.

In the first chapter of this volume, Dr. F. Sogandares-Bernal and Dr. J. R. Seed have reviewed a fascinating area of parasitology, the biology of those trematodes of the genus *Paragonimus* that occur in the Americas. These internationally recognized authorities have presented an insight into the intriguing problems, some yet unresolved, associated with the history, ecology, life cycles, and pathology of these platyhelminths. There can be little doubt that their contribution will serve as a landmark in the literature pertaining to trematode biology.

Dr. Grant St. Julian and Dr. Lee Bulla are well known in insect pathology circles. Their review of the literature pertaining to milky disease of beetles serves to point out what can be done by exploring a host-parasite relationship from a basic viewpoint and yet provides tremendous practical implications. Again, this contribution will no doubt serve as a landmark.

The chapter contributed by Dr. W. A. Smirnoff should be of interest to all invertebrate pathobiologists since he has pointed out rather vividly that the application of biochemical tools in insect pathology is not only scientifically challenging but also rewarding. Vertebrate, especially mammalian, pathologists have developed this approach into an essential part of medical and veterinary pathology. Those interested in invertebrate pathology, as Dr. Smirnoff has done, must follow the trail and capitalize on the biochemical approach to resolving pathobiological problems in insects and other invertebrates.

Dr. Jowett Chao is well known for his work in invertebrate tissue culture. In his review article he has pointed out that the application of this technique to studying animal parasites is still in its infancy. Nevertheless, it holds great promise. As a parasitologist I recognize that one of the major handicaps facing the physiologically and biochemically oriented parasitologist is the lack of methods to maintain and/or culture most zooparasites *in vitro* as bacteriologists have been able to do. The employment of homologous and heterologous host tissues and cells in *in vitro* systems appears to be the first step toward overcoming this handicap and will no doubt pave the way toward the development of chemically defined media. Those being initiated into this area of pathobiology will find his comprehensive review a real time-saver as a guide to the primary literature.

Dr. Alan Stiven is widely recognized as an authority in mathematical

ecology. During a recent visit to his laboratory at the University of North Carolina at Chapel Hill he explained to me why he has selected the hydra-hydramoeba relationship as a model for analytical studies on the factors influencing or governing this epizootiologic relationship. His rationale, as explained in his chapter, is precise and logical and should prove to be a guiding force and model for those interested in ecological pathobiology. The late Dr. Edward A. Steinhaus recognized the value of Dr. Stiven's approach to invertebrate pathobiology and as a consequence invited him to serve a term on the Editorial Board of the *Journal of Invertebrate Pathology*. When I took over the editorship of that journal, Dr. Stiven was still a member and it became quite apparent to me from his reviews that he is a critical thinker. I am sure those who read his chapter in this volume will immediately recognize that he has presented what must be a prototype for an analytical approach to the understanding of epizootiology and epidemiology.

Some may wonder how Dr. Larry Harris's contribution fits within the realm of pathobiology. I have spent many pleasant hours conversing with Dr. Harris about nudibranchs and their relationship with their hosts. As a consequence, it became quite apparent to me that nudibranchs are symbionts (see definition in T. C. Cheng (1973) "General Parasitology" Academic Press, New York) which have evolved beyond that stage where their presence evokes conspicuous pathologic alterations in their hosts. In fact, during the course of evolution these molluscs have acquired the ability to utilize their hosts' defense mechanisms to their advantage, e.g., nematocysts and their cnidarian hosts. Dr. Harris's fascinating review of the biology of nudibranchs is extremely comprehensive and should be of interest to pathobiologists as an indication of "things to come" as our present pathogens evolve. In this light, we can evaluate our present findings relative to pathogenic parasites more imaginatively and in a way that has not been given serious consideration until now. It is for this reason that I invited Dr. Harris to contribute to this series.

The time has come to relate some regrettable news. Because of the current sad state of affairs in federal funding of scientific research, the publisher has found it necessary to suspend the publication of *Current Topics in Comparative Pathobiology*, hopefully only temporarily. This decision was made because of severe cutbacks in funding to support scientific collections of libraries and to individual investigators for the purchase of reference volumes. Nevertheless, it is hoped that this series has served to emphasize and promote the concept that pathobiology is interdisciplinary and represents one of the more "liberated" areas of biology, i.e., it is serving to break down artificial, man-made disciplinary boundaries.

With the suspension of this series, I wish to take the opportunity to thank the members of the Editorial Board who have suggested ideas and authors. Hopefully this series will be resumed in the not-too-distant future, when scientific vigor in this country is once again recognized as a necessary ingredient of an advanced society.

THOMAS C. CHENG

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American Paragonimiasis

F. Sogandares-Bernal and J. R. Seed

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I. Introduction

Paragonimiasis is a parasitic disease affecting molluscs, crustaceans, and mammals. Its etiological agents are platyhelminthic malacobothridian digenetic trematodes of the family Troglotrema Odhner, 1914 (=Paragonimidae Dollfus, 1939 *Partim*). Species of *Paragonimus* Braun, 1899, utilize operculate snails as first intermediate hosts and decapod crustaceans, primarily freshwater crabs and crayfishes, as second intermediate hosts. The adults of *Paragonimus* Braun, 1899 and related genera, such as *Troglotrema* Odhner, 1914, *Pholeter* Odhner, 1914, and *Achillurbainia* Dollfus, 1939, to name a few, are usually tissue-inhabiting forms. Adult *Paragonimus* species are zoonotic polyxenous