Regulation of intermediary metabolism in pathogenic protozoans

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Protozoans comprise a fascinatingly complex group of microorganisms which have challenged the curiosity and imagination of scientists and physicians for many years. Whether the organisms are free-living, commensal, or parasitic, they combine the characteristics of the procaryotic and the eucaryotic cell. Many protozoans undergo substantial morphological alterations during their life cycles which serve to mirror what must be even more complex alterations in their biochemistry, since it is these latter which permit the former to take place. The biology of the parasitic protozoans is probably the most provocative. These organisms demonstrate a remarkable adaptability in their transitions from vector to host and these transitions are accompanied by profound alterations in the mitochondrial apparatus and the soluble enzymes of biosynthetic and energy-yielding reactions. For the biologist, these protozoans serve as models for the understanding of the biochemistry of the eucaryotic cell, for the study of genetics, nucleic acid metabolism, cell transformation and intermediary metabolism. In the investigation of these organisms, one can use alternate approaches which are not incompatible in the least with one another: one may study the free-living or the commensal nonpathogenic protozoans per se or as models to be translated to the pathogenic protozoans. On the other hand, one may study the pathogens directly, although they are somewhat more difficult to work with. The information obtained from all these approaches is beginning to be interconvertible and several patterns of biochemical mechanisms are emerging.

Our topic this evening is intermediary metabolism in pathogenic protozoans and both the direct and indirect approaches to this subject will be developed. Dr. Morton M. Weber, Chairman of the Department of Microbiology at St. Louis University School of Medicine, has worked with *Crithidia fasciculata* for many years and has explored the biochemistry of intermediary carbohy-

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drate metabolism, electron transport, and mitochondrial biogenesis in these organisms. His presentation will be concerned primarily with electron transport in this non-pathogenic organism as well as some more recent work on mitochondrial biogenesis using synchronously dividing mitochondria. Dr. Stuart Krassner, Professor of Developmental and Cell Biology and Medical Microbiology at the University of California at Irvine, has contributed significantly to the understanding of amino acid metabolism in the leishmania. He will discuss the physiological interactions between proline and glucose in the culture forms of various leishmaniae. Dr. John Janovy is Professor of Life Sciences at the University of Nebraska at Lincoln, Nebraska. Dr. Janovy has been interested in the physiological differences which exist between trypanosomatid species which are similar morphologically but which produce very different patterns of infections in the mammalian host. He will describe for us some comparative investigations of carbohydrate metabolism in some trypanosomatid flagellates. Dr. Antony J. Mukkada is an Associate Professor in the Department of Biological Sciences at the University of Cincinnati, Ohio. Dr. Mukkada has investigated the enzymology of carbohydrate metabolism in several species of leishmania and he has recently completed a comparative survey of enzymes of carbohydrate metabolism in four leishmanial species. His topic is the tricarboxylic acid and glyoxylate cycles in leishmaniae. My own position is that of Associate Professor of Medicine and Pathology at the Washington University School of Medicine, St. Louis, Missouri[2]. I became interested in the leishmaniae from the perspective of medicine and have subsequently become involved in the study of their biochemistry. My approach has been to utilize a nonpathogenic protozoan as an investigative model for the pathogens and then apply this information to more specific studies of the enzymology of glycolysis in leishmaniae. My topic will be the comparative biochemistry of regulation of carbohydrate metabolism in pathogenic and nonpathogenic protozoans.

Let me conclude by mentioning that we have not overlooked several other excellent investigators both in this country and abroad but there was, simply, not time to include them and keep the symposium within reasonable bounds. For this reason, we have concentrated on the regulation of intermediary metabolism and hope at some future time to expand this meeting to include a wider range of investigations.

[2] Currently Professor of Medicine and Microbiology, St. Louis University School of Medicine, St. Louis, Missouri.