BOOK REVIEWS

Advances in Microbial Physiology (Volume 13)

A. H. ROSE and D. W. TEMPEST (Editors)


This latest volume in the Carry-On in Microbial Physiology Series commences with unnatural monosaccharides, enlarges on peptides, considers the whole mycobacterium, and concludes with a study of peptidoglycan structure.

In a survey of the catabolism of unnatural carbohydrates R. P. Mortlock reviews, not only the facilities that micro-organisms possess in utilizing these substrates, but also the questions that are raised by their ability to do so. In order to establish a reasonable growth rate with these sugars mechanisms of their transport into the cell and conversion into more natural metabolites familiar to the catabolic machinery of the cell must exist. What is the metabolic pathway of the substrate and the origin of the structural and regulatory genes of the enzymes involved? In attempting to answer these questions the author has reviewed the field, commencing with the pioneering work of F. J. Simpson. Of the 121 references half relate to publications that are more than a decade old and about a quarter refer to work produced since 1970. The advances appear to be slowing. The microbial world considered embraces bacteria, yeasts and fungi. The sugars catabolized are xylitol, L-arabitol, D-arabinose, L-xylose, L-lyxose, D-lyxose, L-mannose, D-allose, D-tagatose and D-fucose. As the author remarks, a lot of the results are descriptive. Bacteria grow or they do not grow. The review is clearly constructed on considerations of the nature and origin of the transport mechanisms, and of the kinase, dehydrogenase and isomerization activities, and pathways of catabolism are depicted where possible. The evolutionary studies with xylitol are described, and the last paragraph ends on a note of speculation that invites the genetic engineer to persuade yet more cells to indulge in unnatural acts of catabolism.

It has long been a routine act of faith of the microbiologist to include peptone in culture media. The rationale for this is now apparent, and in a little over 300 references J. W. Payne has assessed the research describing peptide utilization in micro-organisms. The review is taken from the standpoints of peptide cleavage and transport, most of the publications abstracted coming from the last decade. The mysteries of streptogenin are revealed and resolved with the realization of the fastidious nature of organisms. Peptidase activity, its nature, location and level, are discussed, and the distinctions between peptide hydrolysis and transport examined. Indeed the latter section is dealt with at length and embraces cell-surface binding proteins and the energetics and regulation of transport, together with a description of methodology. However, the preoccupation with assimilation is not a total one and, taking the opposite viewpoint, the last section deals with cell products that are of a peptide nature, notably toxins, antibiotics and ionophores. It also describes 'smugglins', a term that should have committees on nomenclature shifting uneasily in their seats.

In reviewing the physiology of the mycobacteria Colin Ratledge has taken that term to include, not only the cell wall, its structure and organization, but also the properties that the organism must have, first to enable it to survive on gaining entry to the host, and secondly to bring about the changes that are manifest in the host. The mycobacteria are perceived from their point of view rather than that of the clinician. Taxonomy and epidemiology are not dealt with, neither are the antimycobacterial agents systematically covered, though they have been described where they have been shown to contribute to a better understanding of the organism's physiology. With a comprehensive list of a little over 800 references the author describes the cell wall and organelles, the structure and biosynthesis of the mycobacterial lipids, and aspects of growth in vivo and in vitro. Finally, there is a description of the ability to convert L-lactate into acetate through the mediation of an apparently unique and specific oxidase, some observations on central pathways of metabolism, and a brief survey of nucleic acid and protein biosynthesis. With 31000000 cases of tuberculosis and leprosy present in the world the mycobacteria cannot be ignored.

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It has been observed that the differences in amino acid composition and sequence of the peptidoglycans may be used for the classification of bacteria. With a view to refining this taxonomic probe, K. H. Schleifer, W. P. Hammes & O. Kandler have surveyed, using some 130 references, the effects of endogenous and exogenous factors on these structures to see to what extent they are subject to genetic variations and phenotypic modifications. The stability during the growth phase is contrasted with changes that occur where the bacteria have a morphological life-cycle. The exogenous factors of oxygen tension and ionic strength are, on the whole, incapable of altering the primary structure, whereas, as might be expected, the amino acid composition of the growth medium is. The article concludes with an examination of the effect of antibiotics and growth inhibition by glycine and D-amino acids. It is apparent that considerable gaps, anathema to both man and cell, still exist in our understanding of the composition and assembly of bacterial peptidoglycans; nevertheless the framework that has already been built, part of which is reported with clarity in this final section, is substantial.

B. J. CATLEY

Quantitative Problems in Biochemical Sciences

R. MONTGOMERY and C. SWENSON

W. H. Freeman, San Francisco, 1976, pp. 370, $5.95

This book provides a very elementary set of numerical exercises. In British universities it will be found useful by students and lecturers in a first-year biochemistry course. However, the first 77 pages only rarely go beyond the 'O'-level syllabus, and I hope I am right in saying that this is unnecessary pessimism even for the present-day biochemistry student. A good set of more advanced numerical problems will soon show the student where he has to brush up his school notes.

Chapters dealing with equilibria of various types (ionic, chemical and oxidation-reduction) give useful but not very exciting examples. They will teach the diligent student, but they will not fire anybody with enthusiasm for quantitative biochemistry.

This lack of originality comes out most strikingly in the chapter on enzyme kinetics. One would think that kinetics in biochemistry is important only in terms of enzymes. Many other biochemical problems in transport, toxicity and protein and nucleic acid structure are solved by kinetic analysis. The steady-state examples provided in this book will not help the student in the understanding of the behaviour of reactions. In my experience it is important for students of biochemistry to get a feel for handling data from first- and second-order reactions and the use of half-times for diagnostic purposes.

Anybody can write down numerical problems 'but how can one make it interesting?'

H. GUTFREUND

Biochemistry and Neurology

H. F. BRADFORD and C. D. MARSDEN (Editors)


This book gives an excellent record of a meeting, that organized by the Neurochemical Group of the Biochemical Society a year ago and concerned with two themes, here presented successively: in Part I, dyskinesias; in Part II, epilepsy. These are good subjects with which to exemplify current relationships between biochemistry and neurology, especially at research level. However, they exemplify only, and the book's title misleads by being too general; prospective readers should beware and be prepared to enjoy the more limited fare offered.