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**BOOK REVIEWS**

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Annual Review of Microbiology, Vol. 41, 1987, (ed.) L. N. Ornston (Published by Annual Reviews Inc., 4139, El Camino Way, Palo Alto, California 94306, USA), pp. 746. Price: USA \$ 31, Elsewhere \$ 34.

The present volume has 30 articles of current interest in microbiology which are informative and up-to-date. In reviewing these articles, closely related ones have been grouped for the benefit of the readers.

The mechanism of survival of bacteria under zero nutritional conditions is not only of fundamental interest but is of value in analysing the causes of epidemic diseases in man. The article on the 'Transient phase between growth and non-growth of heterotrophic bacteria with emphasis on marine environment' by Kjelleberg, Hermansson, Marden and Jones of the University of Goteberg, Sweden and the University of Michigan summarizes the latest researches in this area. *Escherchia coli* is considered as an important etiologic agent in hemorrhagic colitis. The review on 'The epidemiologic, clinical and microbiologic features of hemorrhagic colitis' by Riley of the Stanford University outlines the results of surveillance studies in North America of food-borne outbreaks of diarrhoea. One of the mechanisms of bacterial survival is the formation of biofilms on surfaces to scavenge available nutrients. Medical biomaterials like plastic, rubber and metallic structures are few examples of surface substrates for bacterial biofilm development leading to potential access to pathogenic bacteria such as *Pseudomonas* and *E. coli* which become resistant to antibiotics. The article on 'Bacterial biofilms in nature and disease' authored by seven scientists (medical as well as non-medical) from North America describe how the new techniques for direct observation of biofilm bacteria help in advancing research in this area. Bacterial plasmids classified in *E. coli* as IncP and in *Pseudomonas* as IncP-1 are capable of conjugal transfer among and stable maintenance in almost all gram-negative bacterial species. Such promiscuity play a role in the spread of antibiotic resistance and can be exploited to genetic manipulation in diverse bacterial species. This aspect has been reviewed by Thomas and Smith of the University of Birmingham, England under the title 'Incompatibility group P plasmids: genetics, evolution and use in genetic manipulation'.

Sulphur containing  $\beta$ -lactam antibiotics are all derived from the same amino acid precursors, L- $\alpha$ -aminoadipic acid, L-cysteine, L-valine, which ultimately lead to the fermentation products penicillins, cephalosporins and cephamycins by various fungi, actinomycetes and by a few unicellular bacteria. The progress made in the purification of these antibiotics has been reviewed by Nuesch and associates of Ciba-Geigy of Switzerland under the title 'The biosynthesis of sulphur containing  $\beta$ -lactam antibiotics'. A related review is the 'Chromosomal cephalosporinases responsible for multiple resistance to newer  $\beta$ -lactam antibiotics' by Sanders of the Creighton University, Nebraska. He emphasizes that future research must be oriented towards an understanding of the genetic control in the expression of  $\beta$ -lactamases responsible for the resistance of gram-negative bacteria to those 'antibiotics'. Another review on 'Biosynthesis of peptide antibiotics' by Kleinkauf and von Dohren of Berlin University directs attention on the biosynthesis of antibiotics such as nisin (a food preservative) and subtilisin produced by *Bacillus subtilis*, epidermin a peptide active against *Propionibacterium acne* and ancovenin an inhibitor of angiotensin converting enzyme.

The lifelong research of Dagley of the Department of Biochemistry, University of Minnesota was concerned with the role of micro-organisms in biodegradation and he relates his studies in the first article entitled 'Lessons from biodegradation'. Research on lignin biodegradation has been rapid recently because of the potential applications in industries related to pulping, bleaching and waste treatment. White rot fungi (*Sporotrichum pulverulentum* and *Phanerochaete chrysosporium*) are by far the best lignin decomposers. In a review on 'Enzymatic combustion: the microbial degradation of lignin', Kirk of the USDA pays particular attention to the physiology, biochemistry, genetics and molecular biology of degradation of lignin by *P. chrysosporium*. The cockroach gut harbors a variety of bacteria. Some of them like *Eubacterium* and *Clostridium* exhibit cellulolytic activity while others produce methane and hydrogen possibly due to *Methanospirillum* isolated from the hindgut of cockroach and the review on 'Microbial ecology of the cockroach gut' by Cruden and Markovetz of the University of Iowa deals exclusively on this subject.

A majority of the root-nodulated legumes lose 30–50% of their nitrogenase electron flux (capable of reducing elemental  $N_2$  into  $NH_3$ ) as  $H_2$ . One of the questions which has not been unequivocally answered is whether efficient  $H_2$  recycling capacity by  $hup^+$  strains of rhizobia results in measurable increase in  $N_2$  fixation and consequently yield. The review by Evans and associates of the Oregon State University, Corvallis, Oregon on 'Physiology, biochemistry and genetics of the uptake hydrogenase in rhizobia' interprets some of the conflicting results in this area of research. A second review on biological  $N_2$  fixation by Kennedy and Toukdarian of the University of Sussex deals with methods for genetic manipulation and various aspects of nitrogen, oxygen and hydrogen metabolism of *Azotobacter vinelandii* and *A. chroococum*. Non-sulphur purple photosynthetic bacteria (ex: *Rhodospseudomonas capsulatus*) grow and fix nitrogen under photoheterotrophic, microaerobic organotrophic, microaerobic chemoheterotrophic and fermentative conditions. The genetic research on these nitrogen-fixing bacteria is dealt with in the third review by Scolnik and Marrs of the E.I. duPont de Nemours and Company, Delaware.

There are plenty of accounts on biocontrol of insect pests notably on *Bacillus thuringiensis* but not much is known about the molecular basis for the immune reaction of insects against bacteria. The review on 'Cell-free immunity in insect pests' by Boman and Hultmark of the University of Stockholm fills this gap. *Mycobacterium leprae*, the causative agent of leprosy has been the subject of intensive research during the last decade, more particularly with reference to the characterization of antigen and immunity to the disease. A review on 'Leprosy and leprosy bacillus' by Gaylord and Brenan of the Colorado State University deals with immunology of the disease. Exoantigens are antigens or soluble immunogenic macromolecules produced by fungi which are useful in the identification of pathogens which is the subject matter of a review on 'Specific and rapid' identification of medically important fungi by Kauffman and Standard of the Centre for Infectious Diseases and Control, Atlanta.

Steinhauer and Holland of the University of California at San Diego discuss the factors behind the heterogeneity of RNA viruses and their evolution in the review on 'Rapid evolution of RNA viruses'. Recently much work has been done on the genetics and molecular basis of non-virulence in polio virus. In an article on 'The attenuation of

poliovirus neurovirulence', Almond of the University of Reading, England reviews this area of research. Herpes Simplex virus causing initial lesions on genitals and mouth can lie latent in human beings for a life time without modifying or destroying cells in which they hibernate. The resistance may be due to the host immunity or the virus becomes diluted due to the higher copy of the preexisting genomes, we do not clearly know. Roizman and Sears of the University of Chicago throw light on this subject in a review on 'An inquiry into the mechanisms of Herpes Simplex virus latency'.

There are three reviews on protozoa. The one on 'Compartmentalization of carbohydrate metabolism in trypanosomes' by Opperdoes of the International Institute of Cellular and Molecular Pathology in Brussels deals with *Trypanosoma* and *Leishmania*, the two protozoans which cause a number of human diseases such as sleeping sickness in Tropical Africa. The review on 'The mitochondrial genome of kinetoplastid protozoa' by Simpson of the University of California, Los Angeles brings about a synthesis of studies on the most unusual DNA structure seen in protozoa. The third review on 'Repetitive proteins and genes of Malaria' by Kemp, Coppel and Anders of the Walter and Eliza Hall Institute of Medical Research, Victoria, Australia deals with the immunology of *Plasmodium*.

Prokaryotes do not usually contain sterols. In some bacteria and cyanobacteria where they are reported to contain sterols, they are suspected to be contaminants except in *Methylococcus capsulatus*. The review by Ourisson, Rohmer and Poralla on 'Prokaryotic hopanoids and other polyterpenoid sterol surrogates' give a fresh look at the question — Are there bacterial sterols?

Randall, Hardy and Thom of the Washington State University, USA and University of York, England write on 'Export of protein: a biochemical view'. They synthesize the advancing knowledge on the subject of movement of proteins across biological membranes in prokaryotic as well as eukaryotic systems.

The review on 'High resolution NMR studies of *Saccharomyces cerevisiae*' by Campbell-Burk of Brandeis University, Massachusetts and Shulman of Yale University provides a detailed account of the *in vivo*, non-invasive NMR spectroscopy studies of yeast, (an organism amenable to high density growth) which contributes to our understanding of the metabolism and energetics of yeast cells.

Mathematical modelling for dealing with heterogeneity within populations of pathogens causing

infectious diseases. to evolve a rational plan for control of epidemics is advocated. Black and Singer of Yale University School of Medicine describe how 'Elaboration versus simplification in refining mathematical models of infectious diseases can improve man's attempts to predict or avert infectious diseases'.

Organ cultures are useful in understanding the molecular mechanisms of the pathogenic process when micro-organisms cause damage by means of attachment and deliver toxins to the host tissue. The review by McGree and Woods Jr of the University of Utah's School of Medicine, Salt Lake City deals with individual organ culture and their use in understanding pathogenic interactions in human beings.

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**Annual Review of Nutrition, Vol. 7, 1987, (ed.) R. E. Olson, (Published by Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California 94306, USA), Price: USA \$ 31, Elsewhere \$ 34.**

The frontiers of nutrition science are highlighted in the Annual Review of Nutrition Series. Nutrition is a dynamic, multidisciplinary subject. While the understanding of the cellular processes, regulatory mechanisms and physiological interactions fall within the purview of basic sciences such as biochemistry, biophysics, physiology and molecular biology, the end result viz. good nutrition depends on a host of socio-economic and cultural factors and sciences dealing with them. In the selection of topics for the Annual Review of Nutrition, the editors show a distinct bias for more precise and objective clinical and experimental subjects rather than the socio-economic and cultural aspects. However, the latter are not totally ignored as is evident from the prefatory assay of this volume which deals with the "Phenomenon of famine". In this assay Dr N. S. Scrimshaw, concludes that some of the worst famines are due to disruption of existing food supplies and lack of purchasing power rather than global food shortage *per se*.

The present volume includes five papers on molecular biology and gene expression. It is obvious

that future thrust of basic and experimental nutrition research will depend on new knowledge in molecular biology and use of more precise analytical, statistical and systems, methods for reexamining some of the accepted concepts of nutrient requirements and health. While nutrition deficiency diseases in younger age groups continue to be the problems of developing countries, the developed countries are concerned more about geriatric nutrition and some of the degenerative and chronic diseases such as atherosclerosis, osteoporosis, cancer and diabetes.

The volume begins with the above mentioned prefatory assay. Other topics related to metabolic and regulatory aspects of nutrition are: Assessment of energy expenditure and fuel utilization in man by Eric Jequier, Kevin Acheson and Yves Schutz; From dietary glucose to liver glycogen: The full circle round by J. D. McGarry, M. Kuwajima, C. B. Newgard, D. W. Foster and J. Katz; Effects of fat-modified diets on cholesterol and lipoprotein metabolism by D. J. McNamara; The metabolic significance of mammalian fatty-acid-binding proteins: Abundant proteins in search of a function by D. A. Sweetser, R. O. Heuckeroth and J. I. Gordon; Mechanisms of transport of amino acids across membranes by E. J. Collarini and D. Oxender; Phenylketonuria by Richard Koch and Elizabeth Wenz; Dietary D-amino acids by E. H. Man and J. L. Bada; Intracellular protein catabolism and its control during nutrient deprivation and supply by G. E. Mortimore and A. R. Pösö; Diseases associated with defects in vitamin B<sub>6</sub> metabolism or utilization by A. H. Merrill Jr and J. M. Henderson; Inherited defects of vitamin B<sub>12</sub> metabolism by B. A. Cooper and D. S. Rosenblatt; Intracellular vitamin A-binding proteins by F. Chytil and D. E. Ong; A global view of human selenium nutrition by O. A. Levander; Zinc in DNA replication and transcription by F. Y. H. Wu and Cheng-Wen Wu; Iron overload: causes and consequences by V. R. Gordeuk, B. R. Bacon and G. M. Britterham; Water homeostasis by T. Vokes; Dietary tannins and salivary proline-rich proteins: interactions, induction and defense mechanisms by H. Mehansho, L. G. Butler and D. M. Carlson; Dietary regulation of gene expression: Enzymes involved in carbohydrate and lipid metabolism by A. G. Goodridge; Nutrient effects on DNA and chromatin structure by C. E. Castro.

In the fields of clinical and public health nutrition the following topics are covered: Nutritional requirements of the elderly by H. N. Munro, P. M. Suter and R. M. Russell; Nutritional requirements of low- and very-low birthweight infants by O. G. Brooke;

Starvation and semistarvation diets in the management of obesity by J. S. Fidler and E. J. Drenick; Nutritional application of the health and nutrition examination surveys (HANES) by Elizabeth Yetley and Clifford Johnson; Evolution of recommended dietary allowances — New directions by A. E. Harper.

The volume ends with a comparative nutrition assay on the pig as a model for human nutrition. A list of related articles from other Annual Reviews is also provided.

Most topics have received scholarly treatment. While the book is of special interest to research scientists practising clinicians and nutritionists will also profit from it.

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## SCIENCE NEWS

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### INDO-UK SYMPOSIUM ON BIOMATERIALS TO MARK THE RAMAN CENTENARY— 5 AND 6 JANUARY, 1988, AT SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY, TRIVANDRUM

The coming years will undoubtedly see major advances in the development and applications of biomaterials. In this context, the two-day Indo-UK Symposium on Biomaterials organized at the Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, as part of the Raman Centenary Celebrations was trend-setting. The purpose of the symposium was primarily to bring together a multidisciplinary group of scientists from the Indian universities for intensive interaction with experts from India and UK, on the state of the art and frontiers of biomaterials research.

The inaugural session, held at the Kanakakkunnu Palace was marked by a sparkling keynote by Dr Ramanna who stressed the vital need for self-reliance in biomaterials and devices-technology as in other areas of technology development. The scientific sessions started with an interesting presentation by Dr R. A. Mashelkar of the National Chemical Laboratory, Pune who spoke on transport phenomena and reaction engineering in living systems. Providing a chemical engineer's viewpoint, he drew analogy between the reaction processes in the living cell and those in a chemical plant. The human body, he pointed out, can be viewed as a chemical plant under the control of the brain. The conservation equations, such as the mass transfer, momentum transfer and energy transfer equations which applied to a chemical engineering plant apply to the human body as well. Future research should be based upon this basic premise, Dr Mashelkar emphasized.

Dr Gopinath of the Bhabha Atomic Research Centre, Bombay spoke on 'Radiation processed polymers as biomaterials. He dwelt upon the advantages of using gamma radiation for the production of polymeric materials for biomedical applications. He discussed the work carried out at BARC on the development of haemodialyser using activated charcoal coated with poly (vinyl alcohol). Cross-linked poly (vinyl alcohol) films prepared by gamma irradiation have been used by his group to detect urinary bilirubin.

Dr K. I. Petrark of UK highlighted the problems posed by the body's defence mechanism to the designing of materials for directed drug delivery. He discussed transdermal drug delivery systems which have assumed considerable importance in recent years. The thrust of the presentation of Prof. David Annis (UK) related to the development of small diameter vascular grafts. The University of Liverpool had been working on the development of a small diameter (< 6 mm) graft based on polyurethane fabricated by electrostatic spinning, a process developed by ICI, Inc. Prof. Annis said that such small diameter grafts should be microporous so that blood percolates into the pores and clots and promotes scar tissue formation. But for the biodegradability problems encountered lately and being overcome, polyurethane made by electrostatic spinning techniques holds promise for the production of small diameter vascular grafts.