Structure and Properties of Biopolymers

The First Cleveland Symposium on Macromolecules was held at the Case Western Reserve University, October 11–15, 1976. The objective of the organizers was to put together a meeting which was somewhat unconventional in its scope, bringing together researchers in three areas of biopolymers: proteins/polypeptides, nucleic acids/polynucleotides and polysaccharides. Topics discussed covered a wide range of fundamental and applied aspects. Three particular foci were identified – basic structure, materials properties and medical applications.

In the fundamental area Dr R. D. B. Fraser of the CSIRO, Melbourne, Australia, reviewed the status of fibrous protein structure and particularly focused attention on the relation of sequence to structure and hierarchies of structure. Although most of his review was directed towards wool and hair keratins and collagen, he presented some interesting concepts on the symmetry of molecules required to build repeat structures. Following this presentation, Dr Wolfie Traub of the Weizmann Institute in Israel reviewed the role of synthetic polypeptides in elucidating protein structure. One of the points of Dr Traub's lecture was that, with the exception of the α-helix coiled coil models for tropomyosin and keratin, which now seem to be at a most exciting stage of development, most of the structure modelling aspect of proteins is now almost completed. Another aspect of synthetic polypeptide research, that of poly L,D sequential peptides, has come to the fore in the past few years, mainly because a whole new series of structures, the π_{LD} helices, have been discovered. Dr Bernard Lotz of CNRS, Strasbourg, France, reviewed this area and showed how multiple helices can be produced. This area is attracting attention because of the probable role of π_{LD} helices in acting as membrane channels (and antibiotics). The structure of polysaccharides, particularly connective tissue and microbial polysaccharides, was addressed by Dr E. D. T. Atkins of Bristol University, UK. This area has undergone a veritable explosion of interest and information in the past few years, from a stage where the consensus that glycosaminoglycans were structureless to the present when a myriad of helical structures are known. Dr Struther Arnott of Purdue University, USA reviewed the structure of synthetic polynucleotides and their relation to native structures.

In the applied area, the materials properties and uses of collagenous materials (Dr E. J. Kramer, Cornell University) and polysaccharides (Dr S. H. Carr, Northwestern University) were reviewed.

An interesting review of native fibre structure and its relation to properties was presented by Dr Ludwig Rebenfield of the Textile Research Institute in Princeton, New Jersey. At the other end of the scale of biopolymer property use relationships is the food industry, where growing demands on 'synthetic' food production are forcing a more detailed approach to macromolecular structure and processing. Dr W. E. Marshall of General Foods Corporation, Tarrytown, presented an overview of the parameters required in producing acceptable foods.

Until recently the materials properties of synthetic polypeptides have either been ignored or treated as a scientific curiosity. Dr Phillip Geil, Case Western Reserve University, showed that the blossoming research in this area indicates a strong parallel with polymers of a non-biological origin.

In the medical area, four of the reviews were directed towards the ability of synthetic biopolymers to complex with biological molecules in animals. Dr Eric DeClerq (Louvain University, Belgium) showed how synthetic polynucleotides can induce interferon with the attendant implications in cancer treatment and viral control. Dr Brian Johnson (University of Alabama) and Dr Paul Maurer (Jefferson University, Philadelphia) examined the interaction of sequential polypeptides. The former reviewed the research of his group aimed at producing anticomplement drugs. Complement destroys tissue in autoimmune diseases and its complexation by synthetic biopolymers seems a therapeutically useful approach. Dr Maurer's work was also aimed at the immune response. By subtle changes in polypeptide sequence it is possible to obtain species specific responses and elucidate aspects of genetic engineering. Dr Alan Walton, Case Western Reserve University, reviewed the interaction of soluble and insoluble synthetic polypeptides with blood and its constituent proteins, enzymes and cells and Dr James Anderson of the same institution reviewed tissue compatibility of insoluble polypeptide films.

Clustered around these topics were the contributed papers, several of which appear in this issue of POLYMER.

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