

# reviews

## Membrane-bound glycoproteins

Gilbert Ashwell

*Membrane Glycoproteins: A Review of Structure and Function.* By R. Colin Hughes. Pp. 367. (Butterworth: London and Boston, Massachusetts, March 1976.) £15.00.

FOR years, the presence of carbohydrates covalently linked to protein molecules was regarded with disbelief, dismay, or even indifference, by classical protein chemists intent on structural determination. Eventually, as a result of the brilliant pioneering studies of men such as Dische, Neuberger, and Winzler, delineation of the chemical bond between carbohydrates and proteins was accompanied by a growing awareness of the role of surface glycoproteins as 'informational macromolecules' mediating a variety of biological phenomena on a cellular level. As a consequence, the past decade has seen a logarithmic growth in the number of publications documenting the ubiquitous presence and complex interactions of membrane-bound glycoproteins.

It is to this problem that the author has addressed himself in a valiant and impressive effort to organise, systematise, and summarise the diffuse and multidisciplinary reports which comprise the current literature on glycoproteins. It is, perhaps, the latter consideration which epitomises the difficulty in maintaining an integrated perspective on the relevance of findings in widely diverse scientific disciplines. Few investigators, actively pursuing their immediate research interests, are either willing or able to devote the time and effort necessary to master the vast amount of potentially relevant information available in journals and disciplines with which they have an only peripheral acquaintance.

Fortunately, that task has been brilliantly accomplished in this monograph. Beginning with a detailed examination of the methodology used in the detection and distribution of membrane glycoproteins, a number of well referenced tables are provided to summarise the important properties and chemical composition of plasma membranes isolated from various species, the surface characteristics of the commonly used tissue culture lines, and the availability of specific glycosidases useful in the analysis of terminal carbohydrate residues. Although

the major thrust of current studies on cell surface glycoproteins has been directed mainly at the outer surface of the cell, the membranes of the sub-cellular organelles are similarly rich in glycoproteins, and their participation in intracellular phenomena is largely speculative. This problem is considered in some detail in a provocative chapter which summarises the available information and seeks to interpret current views on the genesis of primary and secondary lysosomes.

Following this, the role of oligosaccharide determinants involved in human blood group activity and the chemical nature of the ABO and MN antigens is reviewed. The judicious use of illustrative diagrams and chemical formulae facilitate comprehension of the necessarily cumbersome nomenclature used for carbohydrate chains. This section also provides a good overview of the chemistry of the histocompatibility antigens which is quite adequate for the non-specialist reader; extensive referencing is included for those seeking more detailed information. A minor point that requires comment is the statement (p126) that histocompatibility antigens are precipitated by anti-H antisera. To the best of this reviewer's knowledge this is not quite accurate in that a second precipitating agent is always required.

The middle portion of the book covers the extensive literature on lectins and their fascinating reactivity

toward the membrane glycoproteins of the lymphocyte, with emphasis on the biological implications of cellular transformation. Finally, the current status of the biosynthetic and degradative mechanisms involved in the overall metabolism of glycoproteins is presented in elaborate detail. Especially noteworthy is the section on lipid intermediates which is written with commendable lucidity and insight. The discussion on the role of specific carbohydrates in the 'recognition' phenomena is thoughtful and well-documented. The speculation (p297), however, that the hepatic binding protein participates as a glycosyltransferase in the adhesive properties of membranes, as described by Roseman, is unlikely since the purified binding protein was shown to be devoid of both sialyl- and galactosyl-transferase activity.

In summary, this monograph provides an impressive synthesis of the glycoprotein literature up to and including 1974. The author has earned the gratitude of innumerable investigators in diverse disciplines, who are concerned with the biochemical basis of membrane function and its role in cell biology.

*Gilbert Ashwell is Chief, Laboratory of Biochemistry and Metabolism, US Public Health Service, National Institutes of Health, NIAMDD, Bethesda, Maryland.*

## Membrane recipes

*Biochemical Analysis of Membranes.* Edited by A. H. Maddy. Pp. ix+513. (Chapman and Hall: London; Halsted: New York, July 1976.) £16.50.

THIS is a most timely book. In recent years a considerable expertise has grown up in membrane biology. But all the expertise in the world is wasted unless studies are carried out using pure samples of known origin. For studies of molecular events in membranes, the problem boils down to the isolation and characterisation of single membrane fractions with minimal loss of intrinsic components or gain of extrinsic components. Although progress in this direction has been fairly rapid, the development of suitable procedures

has remained more of an art than a science: hence the need for a book of this kind.

What Dr Maddy has done is to persuade a number of authors to present background discussion and experimental recipes for the preparation and analysis of the most common membranes and membrane constituents. The general format of each chapter is excellent. The first part consists of a comparative literature survey and the second of fully detailed experimental procedures, aimed largely at the level of the novice. The only real test of a collection of recipes is, of course, to try them in the kitchen, and this I have not yet had a chance to do. The couple of procedures published here