

Book review

K. Lukas (Ed.), Protein–Lipid Interactions. From Membrane Domains to Cellular Networks, Wiley-VCH, Tamm, 2005.

Protein–Lipid Interactions is an interesting book presenting an innovative and updated discussion of the knowledge collected in the last decades on the kind and role that the interactions between lipid bilayers and proteins exert both in healthy cells as well as in specific pathologic conditions. The structure and function of biological membranes are in fact the result of delicate equilibria between their components, namely lipids and embedded proteins, whose complex network of interactions is in some case yet unexplored or whose role is only partially known to scientists. Under this aspect, much information came from studies on viral infections, since the cell fusion and the following penetration of these microorganisms involve different levels of interactions that can be taken as models also for eukaryotic cells.

Most studies in this field are trying to update the *fluid mosaic* model for cell membranes, taking into account the lateral organization of membranes themselves. As the Editor states in the Preface, the new model would better fit with ‘a mosaic of fluid grains of different degrees of pseudo two-dimensional liquid order’.

The book is clearly organized into six parts. The first two, entitled ‘How Lipids Shape Proteins’ and ‘How Proteins Shape Lipids’, present the background of actual knowledge on how constitutive membrane polypeptides and proteins are allocated into biological membranes, after transmembrane insertion and translocation processes. In particular, Chapter 4 reports the consequences, in terms of diseases, of mistakes in assembly and folding of integral membrane proteins. In the meantime, the presence of proteins can induce important changes in the structure and function of membrane lipids, as different analytical techniques can demonstrate (Part 2).

The following chapters deal with the mechanisms and effects of interaction with cell membranes of potentially dangerous proteins, like bacterial toxins, and of viruses, whose membrane fusion properties have been explored in Chapters 10–12 also for their usefulness as models of interaction with biomembranes and intracellular fusion processes that lie at the basis, for instance, of exocytosis and synaptic transmission.

The last two parts of the book challenge the specific phenomena of protein targeting and binding to membrane surface

and signal transduction. Many targeting microdomains are present in eukaryotic cell membranes, such as cholesterol and lipid rafts, whose presence drives and selects the binding of biologically active proteins, in some cases leading to structure modification and protein activation. Within this topic, Chapter 14 gives an useful overview of several analytical techniques used to study such phenomena in simple or complex model membranes.

On the whole, this volume represents a highly updated source of knowledge, discussion and experimental approaches in the rapidly growing field of interactions and functions of cell membrane components. Its aim, well reached in my opinion, and value is to go beyond a rigid exploration of the structure and function of the individual membrane components and domains, instead investigating and correlating the many, and in some cases very weak, interactions existing or developed in pathologic conditions by human cells. The final ambitious goal remains to discover how cell membranes work and how to realize predictive models to study their interaction with foreign molecules, such as environmental agents or drugs, and many of the studies analysed in this book can certainly help in this direction.

Although in this book a very specific and technical language has been used, and in some cases a background of knowledge of biochemical processes is required to readers, I believe it can be suggested to all scientists who are involved in the very different aspects of cell–cell and cell–external environment interactions and trafficking, as well as to advanced courses’ students, because of the very high competence of the Authors of these chapters and the very updated level of information contained.

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Accepted 4 August 2006

Available online 28 September 2006

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doi:10.1016/j.ejmech.2006.08.013