



Editorial

Membrane Interacting Peptides - Towards the Understanding of Biological Membranes



Alfred Blume

Biological membranes provide for cellular compartmentalization and control of the internal cell environment. They are sites for energy transduction and signalling, and many regulatory processes take place at membrane surfaces. The basis for understanding biomembrane structure and function was gradually laid during the last hundred years. One important step was the work of Singer and Nicolson published in 1972. They considered the membrane as a two-dimensional liquid with proteins adsorbed to the membrane surface or spanning through the membrane interior. With time, it became clear that membranes are not only homogeneous sheets separating two aqueous phases but possess an interesting structure with locally varying physical-chemical properties. It is now widely accepted that natural membranes are laterally inhomogeneous and display a particular temperature and pressure dependent phase behaviour, dynamic lipid domains of various sizes, lipid sorting, protein clustering, and compositional asymmetry between their apposed lipid monolayers.

Consistent with the foregoing developments, the status of lipids has been changing over the years. Biological membranes are viewed as outstanding examples of molecular assemblies of extreme complexity whose structure and function cannot be determined from the genome alone, and hence present a great challenge to researchers. Lipids are now known to be more than structural builders of the cell and an energy source for cell functioning. In the form of membranes, they are crucial for controlling indirectly a great variety of biological functions that take place at or are mediated by membranes. In the recent decade it has also become possible to study the location and dynamics of single molecules embedded in the lipid bilayer. Revealing more molecular details yields more insight into biological function, but owing to the extreme complexity of this many-body problem, a detailed understanding of membrane functional properties is still missing.

The idea of a Special Issue "Membrane Interacting Peptides - Towards the Understanding of Biological Membranes" arose from several symposia on this topic organized by Prof. Dr. Alfred Blume in recent years. In this themed issue, several articles address various aspects of membrane interacting peptides as well as the structural organisation of specific lipid systems (e.g. bola-lipids, ceramides). Many of the authors who participated in the last symposium have accepted to contribute to this Special Issue.

This Special Issue of Biophysical Chemistry is also dedicated to the 65th birthday of Alfred Blume. Alfred has been active in the field of biophysical chemistry for more than 40 years, and is deservedly considered one of the founding fathers of membrane biophysical chemistry. Many contributions to this issue are from colleagues, friends and associates of Alfred. During his long and successful career, his research has been focused on topics like the structure and lateral organisation of model biomembranes, domain formation in biological membranes, understanding lipid-detergent interactions, the development of lipid-based drug delivery systems, the characterisation of new lipid systems (like bola-lipids), and peptide interactions with membranes. Moreover, he has established new research milestones in the field of biomembrane thermodynamics, solid state nuclear magnetic resonance and infrared spectroscopy of lipids - just to mention some of his main achievements.

Alfred Blume organized various inspiring meetings, such as the 2nd International Conference on "Applications of Biocalorimetry" (1999), the International Bunsen Discussion Meeting "Interactions of Biopolymers with Model Membranes" (2000), the "Fast Reactions in Solution" meeting (2003), the Bunsen-Tagung "Biomolecular Interfaces" (2004), and the International Bunsen Discussion Meeting "Membrane Interacting Peptides and Proteins" (2007). Thanks to Alfred, the field of membrane biophysical chemistry is a vibrant area of study in Germany today. This volume is testimony to the current activity in the field.

With this Special Issue, we would like to acknowledge the scientific achievements of Alfred Blume and congratulate him to his 65th birthday. As the guest editors of this Special Issue, we are grateful to all authors that made this volume possible. Their contributions provide a rich cross-section illuminating this vast field.

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