

Editorial

I am very pleased to offer to the readers of *Protein and Peptide Letters* this special issue entitled “Developments in membrane fusion” highlighting the latest findings in the field. The aim of this issue is not to provide an exhaustive collection of data on membrane fusion but rather to present an updated, hopefully general, overview on this process and provide ideas and information that could contribute to the reader’s own research.

Membrane fusion has attracted great interest among scientists in recent years. This process is fundamental to health and disease: it occurs at fertilization, is needed for hormones release into the bloodstream and during development, but it is also the mechanism used by enveloped viruses to enter cells or carcinogenesis. In the last few years, great strides have been made in our understanding of the molecular machinery and mechanism of membrane fusion. Fusion machines are adapted to fit the needs of different reactions but operate by similar principles in order to achieve merging of the bilayers. In spite of the ubiquity of membrane fusion, scientists are still trying to solve the mystery of how different molecules drive vesicles fusion. Understanding the details of membrane fusion may help scientists to find the appropriate conditions for preventing viruses from fusing to and thereby infecting human cells and could also lead to the design of systems in which a drug, enclosed in a membrane known to fuse with specific cells in our body, may be delivered or to improve gene therapy.

A number of research groups in the world are focused on cellular and biophysical aspects of fusion and are directed at understanding the protein components and/or membrane interactions that are necessary to facilitate and trigger fusion. These groups are making leading contributions to understanding the membrane perturbations and protein interactions that promote fusion as well as the cellular machinery that directs fusion. This special issue includes several papers describing the know-how on membrane fusion.

In the opening review by Jena the molecular mechanism of membrane fusion is considered in terms of the role of the calcium ion in the formation of conducting channel by SNARE proteins.

The characteristics of viral fusion peptides and their relation to membranes are addressed in the following two reviews. Charlotiaux *et al.* describe the fusogenic properties of peptides derived from glycoproteins of enveloped viruses and their ability to insert obliquely in membranes. Loura and Prieto present an overview of Resonance Energy Transfer (FRET) methods for the understanding of interaction of fusogenic or membrane-perturbing peptides with lipid bilayers.

The important issue of antimicrobial peptides and the permeabilization of membranes has been taken up by Pieters *et al.* and Joanne *et al.* In particular, the first review is related to the activity of these peptides against resistant pathogens, while Joanne *et al.* present an overview on the molecular mechanisms of antimicrobial peptides (AMPs) and of viral fusion peptides (FPs) that trigger membrane fusion and focuses on the structural properties that are mainly responsible for their different mode of interaction with membranes.

The next five reviews present specific topics concerning enveloped viruses. Falanga *et al.* describe similarities in fusion and fission mechanisms; Browne describes the herpes virus glycoprotein gH which is involved in the fusion process; Cross *et al.* provide a detailed overview on the structure and sequence features of the fusion peptide of Influenza virus; Da Poian *et al.* review several studies on the structural rearrangements of vesicular stomatitis virus glycoprotein G during cellular recognition and the crucial role played by the protonation of His residues; Vitiello *et al.* describe recent advances in the understanding of viral-mediated fusion mechanisms concentrating on the development of peptidic inhibitors of membrane fusion.

All papers were subjected to two rounds of review with a minimum of two reviewers. We hope that the audience will find this special issue both useful and enjoyable.

As guest editor, I would like to take this opportunity to thank all the authors for their contributions to this special issue, the reviewers for their valuable input, insight, and expert comments, and the Editor-in-Chief, Distinguished Professor Ben M. Dunn, for giving me the chance to compose this special issue.

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