X-ray diffraction in the study of membrane structure-modifying lipids and membrane proteins-lipid interactions

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Biological membranes are complex systems composed of lipids and proteins. In addition to the membrane proteins, the lipid component is being increasingly recognized as an active part in cell function, e.g. some roles attributed to hexagonal (H_{II})-prone phospholipids include the regulation of G protein localization and activity [1, 2]. The modulation of the structural and functional properties of cell membranes is a possible pharmacological approach whose molecular basis has not been previously considered.

The biological interest of our project is based on the hypothesis that protein/lipid interactions and membrane structure could affect signal transduction through G proteincoupled receptors. To study the structure-function relationships, we are working with natural and synthetic fatty acids as well as with synthetic peptides and model membranes, the later containing the major phospholipids present at the cytoplasmic leaflet of the plasma membrane.

Our research is focused on the items: (1) Effect of natural and synthetic fatty acids, as potential modulators of structure and function of cell membranes and (2) Membrane protein-lipid interactions of lamellar-and nonlamellar-forming lipids with peptides, that are copies of the G_{γ} protein and α2-adrenergic receptor sequences, both involved in signal transduction. Our data illustrate that lipid-lipid and protein-lipid interactions can alter the thermotropic behavior of PE model membranes, thereby promoting the formation of hexagonal phases (H_{II}). These results point to the importance of membrane lipid polimorphism in (1) fatty acids as potential pharmacological compounds in membrane lipid therapy, and (2) membrane structure regulating membrane-protein in signal transduction.

References

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