Abstracts

– Membrane Structure and Domains –

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A bacterial monorhamnolipid alters the biophysical properties of DEPE model membranes

A. Ortiz[1], F. J. Aranda[1], H. Abbasi[2], J. A. Teruel[1]

[1]Department of Biochemistry and Molecular Biology-A, Veterinary Faculty, University of Murcia, E-30100 Murcia, Spain, [2]Department of Chemical Engineering, Jundi-Shapur University of Technology, Dezful, Iran

The interaction of a monorhamnolipid (monoRL) produced by *P. aeruginosa* MA01 with dielaidoylphosphatidylethanolamine (DEPE) membranes has been studied. Incorporation of monoRL into DEPE shifts the temperature of the L_β-to-L_α and the L_α-to-H_{II} phase transitions toward lower values. DSC indicates the coexistence of lamellar and hexagonal-H_{II} phases at 60°C, at which pure DEPE is lamellar, i.e., monoRL facilitates formation of the hexagonal-H_{II} phase in DEPE, and destabilizes the bilayer organization. The phase diagram indicates a near-ideal behavior, with better miscibility in the fluid phase than in the gel phase. As indicated by FTIR spectroscopy, incorporation of monoRL into DEPE shifts the frequency of the CH_2 symmetric stretching band to higher wavenumbers, both below and above the main gel to liquid-crystalline phase transition temperature. Examination of the C=O stretching band of DEPE indicates that monoRL/DEPE interactions result in an overall dehydration effect on the polar headgroup of DEPE. These results are discussed on the light of the possible role of rhamnolipids as bilayer stabilizers/destabilizers during cell membrane fluctuations events.

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Brazilian propolis: comparison of antioxidant activities and interactions with lipid bilayers by FCS

W. M. Pazin[1], A. E. E. Soares[2], A. S. Ito[1]

[1]Departamento de Física, Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto, Universidade de São Paulo, Brazil, [2]Departamento de Genética, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Brazil

Propolis, a product resulting from the collection of resinous compounds processed by bees, has a broad spectrum of preventive actions and diseases treatment, especially antimicrobial, anticancer and antioxidant activities. It is known that the resinous compounds that bees collect in vegetation, such as terpenoids, flavonoids and cafeic acids, are closely linked to the therapeutic action and affect the properties of biological membranes of target cells. In this study, we measured the antioxidant activity of propolis collected by four bee species (one type was collected by Africanized bees specie and the others by Indigenous species) by optical absorption and electron spin resonance (ESR) experiments, using scavenging assays of 1,1-diphenyl-2-picrylhydrazyl (DPPH) radicals, showing that the propolis of indigenous bees specie has a greatest potential to scavenging the radical and inhibit its oxidant action. We also investigated the interaction of propolis with model membranes, by fluorescence techniques, including fluorescence correlation spectroscopy. We concluded that the resins have affinity for lipid bilayers of DMPC (zwitterionic vesicles) and DMPG (anionic vesicles), and, from this interaction, the antioxidant action may be active against lipid peroxidation in cell membranes.

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Fluorescence spectroscopy and microscopy to re-evaluate the properties of sphingolipids domains

S. N. Pinto[1], F. Fernandes[1], A. Fedorov[1], A. H. Futerman[2], L. C. Silva[3], M. Prieto[1]

[1]CQFM and INN, IST, Universidade Técnica de Lisboa, [2]Department of Biological Chemistry, Weizmann Institute of Sciences, [3]iMed.UL - Researa Pch Institute for Medicines and Pharmaceutical Sciences, Faculdade de Farmácia, Universidade de Lisboa

The aim of this study is to provide further insight about the interplay between important signalling lipids and to characterize the properties of the lipid domains formed by those lipids in membranes containing distinct composition. To this end, we have used a fluorescence spectroscopy, confocal and two-photon microscopy and a stepwise approach to re-evaluate the biophysical properties of sphingolipid domains, particularly lipid rafts and ceramide (Cer)-platforms. With this strategy we were able to show that, in binary mixtures, sphingolipids form more tightly packed gel domains than those formed by phospholipids with similar acyl chain length. In more complex lipid mixtures, the interaction between the different lipids is strongly dictated by the Cer-to-cholesterol (Chol) ratio. The results show that in quaternary phospholipid/sphingomyelin/Chol/Cer mixtures, Cer forms gel domains that become less packed as Chol is increased. These results suggest that in biological membranes, lipid domains such as rafts and ceramide platforms, might display distinctive biophysical properties depending on the local lipid composition at the site of the membrane where they are formed.

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Interaction of selected anthocyanins with lipid bilayers

H. Pruchnik, D. Bonarska-Kujawa, R. Żyłka, H. Kleszczyńska

Department of Physics and Biophysics, University of Environmental and Life Sciences, Norwida 25/27, 50-375 Wrocław, Poland

It was studied the effect on model lipid membranes of compounds from the anthocyanins group: Cyanidin-3-O-glucoside chloride (*Kuromanin chloride*), Delphinidin-3-O-glucoside chloride (*Myrtillin chloride*) and Malvidin-3-O-glucoside chloride (*Oenin chloride*). Model membranes were formed of DPPC, egg phosphatidylcholine (eggPC) and lipids extracted from erythrocytes. The interaction of anthocyanins with lipids was studied using the differential scanning calorimetry (DSC), infrared spectroscopy (ATR IR) and fluorimetrically. The calorimetric measurements indicate that the compounds studied do not cause changes in the main phase transition temperature DPPC, only a small change in the pretransition – the most changed was *Kuromanin chloride* and the least *Oenin chloride*. The results obtained with the ATR IR method did not show changes in the alkyl chain region, only a small shift of bands from the phosphate groups for *Kuromanin chloride* and *Myrtillin chloride*. At the choline group level a change was observed for *Kuromanin chloride* only. Distinct changes are, however, caused by anthocyanins in the polar part of the lipid membranes, which was evidenced by fluorimetric examination.

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