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Thermotropic Effect of *Rhus typhina* Tannin on Model Membranes

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Abstract

Tannins are a class of polyphenols, which are under investigation for a wide range of pharmacological effects [1]. The present study aimed to ascertain the effect of 3,6-bis-O-di-O-galloyl-1,2,4-tri-O-galloyl- β -D-glucose (RT) – tannin isolated from sumac (*Rhus typhina*) on the thermodynamics of 1,2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) bilayers, in a way that will benefit the understanding of the biological effect of this class of biomolecules. For this purpose, neat DMPC and mixed DMPC:RT bilayers (0.7, 3.5 and 7.0% percentage in RT) were prepared, fully hydrated in phosphate buffer saline (PBS) and subjected to two heating-cooling scans of differential scanning calorimetry (DSC), by utilizing a DSC822^e Mettler-Toledo. The obtained calorimetric data were analysed by using Mettler-Toledo STAR^e software. Results highlighted the role of the preparation protocol on the thermodynamic stability and observed phases of the membrane:tannin system, which are reflected on the biological effect of this class of bioactive molecules, but also on the physical stability of a possible drug delivery system incorporating RT. The membrane surface approach versus the incorporation inside the bilayer of tannins brings about divergent thermotropic effects, which need to be assessed for the corresponding applications. Concerning the case of hydration with RT solution, the system exhibited a concentration-dependent behavior, including elimination of the pretransition, fluidization and loss of cooperativity inside the membrane. In addition, a new phase appeared, which above a certain tannin amount shifted from above to below the main transition. This phenomenon may be correlated with the ability of these molecules to alter the functionality of biological membranes at specific concentration ranges, leading to therapy of membrane-related diseases [2]. In these cases, DSC and other thermal analysis techniques could assist the discovery of the therapeutic range and index of tannins and other phytochemicals.



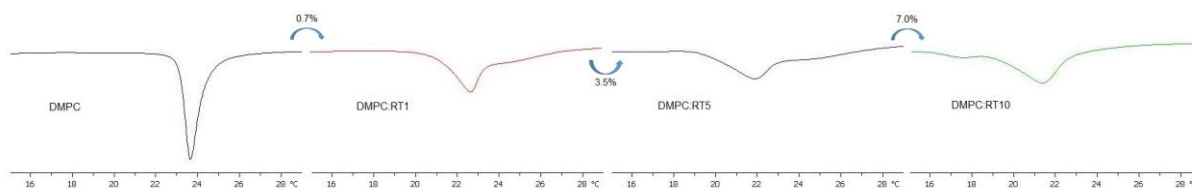


Figure: The effect of RT increasing concentration on the main transition of DMPC model membranes.

References

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- [2] Tarahovsky, Y.S.: Plant polyphenols in cell-cell interaction and communication. *Plant Sign. Beh.* 3, 609–611 (2008)

