

The influence of steroidal and triterpenoid saponins on an outer leaflet model of human erythrocytes membrane

Marta Orczyk^{*}, Kamil Wojciechowski

Department of Microbioanalytics, Warsaw University of Technology, Warsaw, Poland

^{*}e-mail: morczyk@ch.pw.edu.pl

Some of the biologically active compounds present in our environment have a strong influence on biological membranes, modifying their structure and functions. The effect of these substances is very often associated with damaging the target cell membrane and affecting basic membrane processes [1]. The main purpose of the present research was an analysis of how saponins affect model lipid monolayers simulating real biological cell membranes.

Saponin are a family of glycoside type biosurfactants, produced by plants, microorganisms as well as some marine organisms. These natural biologically active substances are an interesting object of research, mostly because of a wide spectrum of their biological properties [2]. Although several studies have been conducted to date, the mechanism of interaction between cellular membranes and saponins remains unclear. Hence the need to study these phenomena [3].

The present study is based on measurements using monolayers closely mimicking the lipid composition of biological membranes of erythrocytes in the context of hemolysis by saponins. The influence of two different saponins – steroidal (obtained from *Digitalis purpurea*) and triterpenoid (obtained from *Quillaja saponaria*) on the model Langmuir monolayers was examined. Firstly, the influence of saponins on the monolayers consisting of single lipids, and in the next stage - on mixed monolayers was examined. In order to study the resistance of monolayers against saponins, a combination of surface pressure relaxation and surface dilational rheology was employed. This latter technique also allowed us to obtain information about viscoelastic properties of the studied Langmuir films. To gain additional information about the changes of packing and orientation of lipid molecules in Langmuir monolayers after contact with saponins, the surface potential measurements were carried on. The morphology changes and phase transitions of the single and mixed monolayers exposed to different saponins was imagined using the fluorescence microscopy.

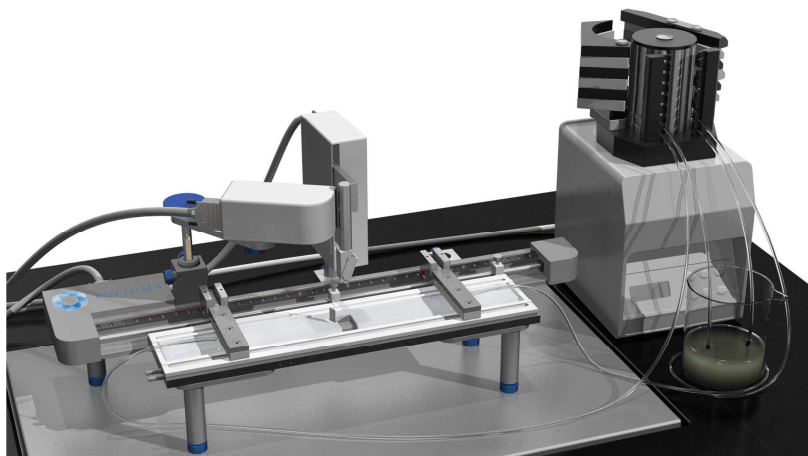


Figure 1 Experimental setup for a subphase exchange.

Acknowledgements: The financial support of the Polish National Science Centre, grant no.UMO-2014/13/N/ST4/04122.

- [1] M.J. Kang, J.Y. Cho, B.H. Shim, D.K. Kim, J. Lee, *Journal of Medicinal Plants Research*, 2009, **3**, 1204.
- [2] I. Podolak, A. Galanty, D. Sobolewska, *Phytochemistry Reviews*, 2010, **9**, 425.
- [3] J.H. Lorent, J. Quetin-Leclercq, M-P. Mingeot-Leclercq, *Organic and Biomolecular Chemistry*, 2014, **12**, 8803.