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Berberine loaded liposome system structure investigated by SANS and SAXS

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In the recent years, plant extract became more and more used, worldwide in allopathic treatment of different types of disease associated symptoms. Several studies showed that plant extracts containing a certain alkaloid, known as berberine, has different beneficial effects such as antitumoral effect (Andreicuț et al, 2019; Milata et al, 2019). Other effect of these berberine based plant extract, are antioxidant and anti-inflammatory (Andreicuț et al, 2018).

Liposomes are concentric bistratified vesicles, in which the liquid phase is fully locked in a double lipidic layer, mainly made of synthetic or natural phospholipids. One liposome can be synthesized in different forms, such as unilamellar and multilamellar vesicles (Shukla et. All, 2018).

Since berberine is an instable alkaloid (Duong et. all, 2021) and vegetal extracts of interest for our study (*Berberis vulgaris*, *Mahonia aquifolium* and *Phellodendron amurese*) have a considerable amount of berberine, we can assume that enclosing them into liposomes would offer them a more chemical stabile form, compared with the use of these extracts as they are (in a freeway). The vegetal extracts were obtained through cold percolation method (Pârvu et. all, 2013), with plant parts collected from „Alexandru Borza” Botanical Garden, Babeş-Bolyai University, Cluj-Napoca, Romania.

For obtaining more information about our systems, such as form and structure, we have considered using small angle X-ray and neutron scattering (SAXS and SANS) methods. Our systems were composed from unilamellar vesicles (ULV), multilamellar vesicles (MLV) and our vegetal extracts of interest: *Berberis vulgaris*, *Mahonia aquifolium* and *Phellodendron amurese*. The vesicles were obtained from Dimyristoylphosphatidylcholine –DMPC. SANS measurements were performed at the YuMO neutron spectrometer at the IBR-2 reactor, Frank Laboratory of Neutron Physics and SAXS measurements were performed at BioSAXS instrument, BM29 beamline, European Synchrotron Radiation Facility.

From the obtained data we can say that our systems have demonstrated a stabilizing effect of the vegetal extracts, but in the case of *Mahonia aquifolium* this effect was more visible. We can also say that temperature does not influence the stability or the structure of the systems. Also with the obtained data we can make theoretical models for our systems, to see their form and structure more clear.

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