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UMG Dubium sapientiae initium

ADDLab Advanced Drug Delivery Lab

A COMPARATIVE STUDY BETWEEN UFASOMES OR UNSATURATED FATTY ACID VESICLES AND OTHER NANOCARRIERS ON THE DEFORMABILITY INDEX

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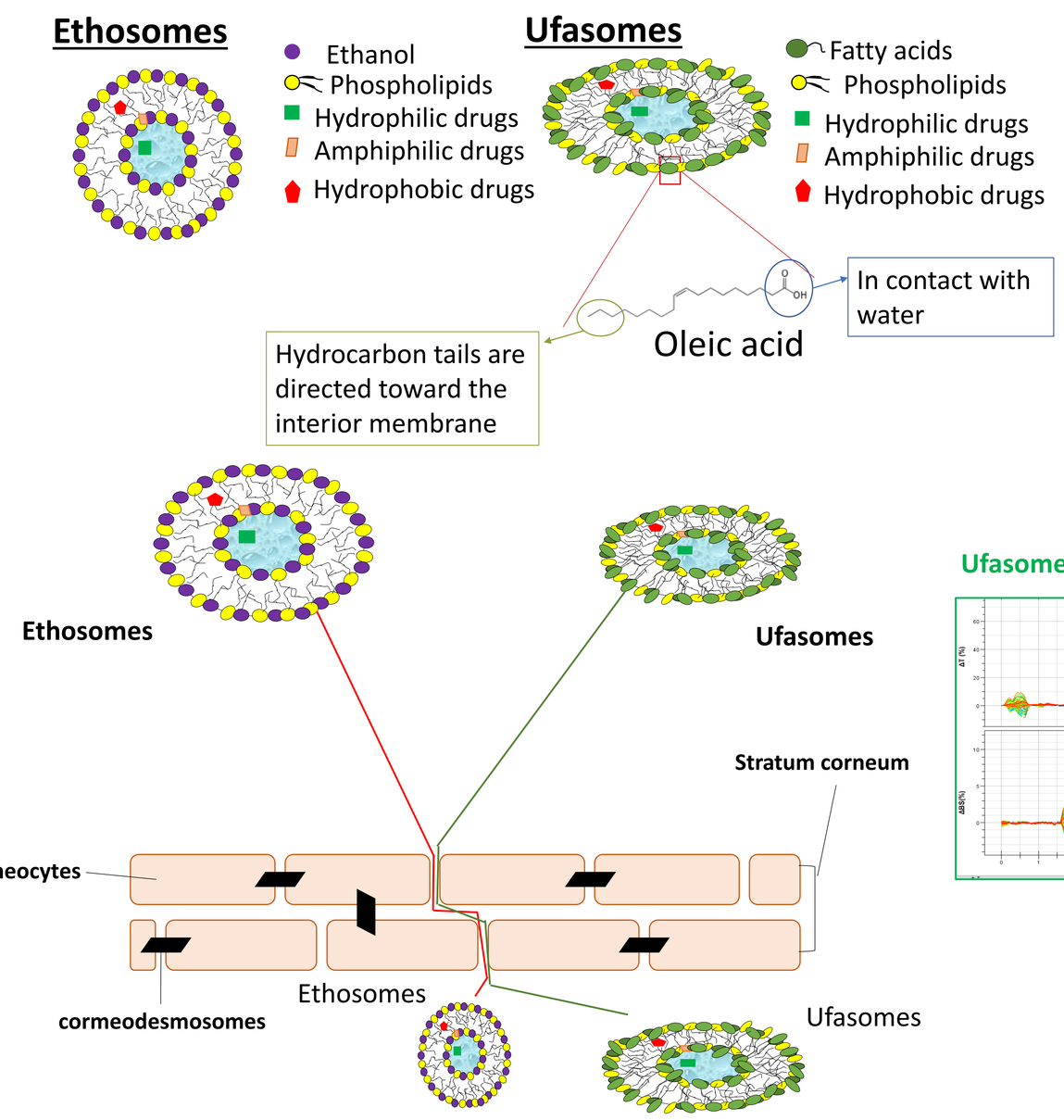
Abstract

The aim of this work is the study of unsaturated fatty acid vesicles (ufasomes) and the evaluation of their deformability index. The deformability of nanosystems is defined as the ability of vesicles to cross pores equal to one third of their average size without self destructuring. The deformability of vesicles could be important feature for transdermal delivery of drugs to overcome the biological barrier that is the stratum corneum.

The ufasomes are colloidal suspensions of closed lipid bilayers that are composed of fatty acids (for example oleic acid), with the hydrocarbon oriented inside and the carboxylic group in contact with water [Patel et al. 2011]. Moreover, ufasomes are composed by oleic acid, that is considered a *penetration enhancer* and - like ethanol for ethosomes - it seems to destabilize the membrane phospholipids promoting the penetration in the deeper layers. Our study is focused on ufasomes because of lower cost than other nanocarriers (such as liposomes, transferosomes and ethosomes).

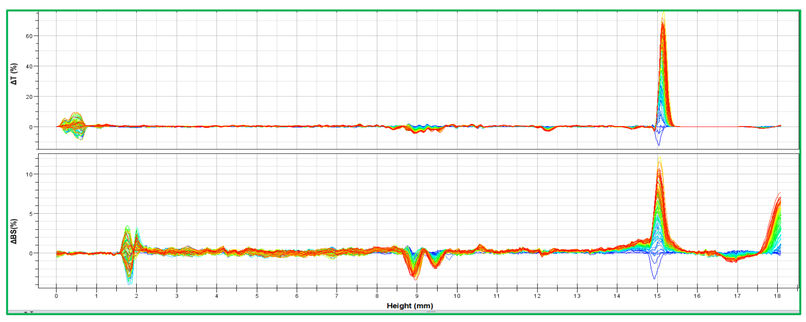


Physico-chemical characterization and stability studies

Formulations	Mean size	PdI	z-Potential
Liposomes	113.5 ± 0.4	0.119 ± 0.017	-3.2 ± 1.7
Transfersomes 1	151.4 ± 0.8	0.206 ± 0.020	-40.7 ± 0.5
Transfersomes 2	123.9 ± 1.0	0.148 ± 0.008	-17.0 ± 0.5
Ethosomes 1	169.5 ± 2.2	0.242 ± 0.006	-32.1 ± 1.0
Ethosomes 2	153.5 ± 1.5	0.153 ± 0.009	-26.9 ± 1.4
Ethosomes 3	120.4 ± 1.2	0.178 ± 0.020	- 24.4 ± 0.3
Ufasomes 1	152.7 ± 2.4	0.123 ± 0.020	-26.2 ± 2.4
Ufasomes 2	136.3 ± 5.9	0.240 ± 0.007	-18.9 ± 1.4

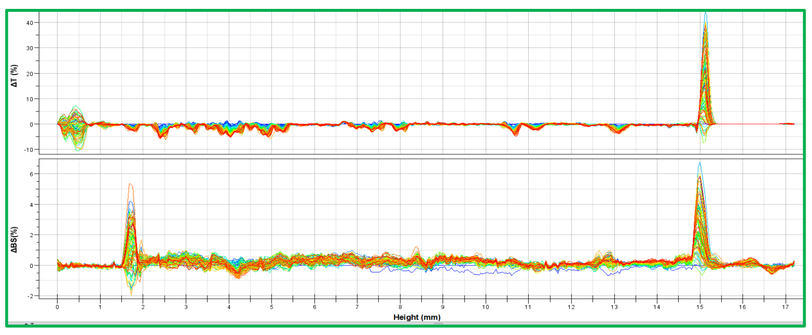
The physico-chemical characterization of nanocarriers was evaluated through Dynamic Light Scattering (DLS) tool and all formulations had an average size of about 150 nm, with a polydispersion index close to zero and good systems homogeneity as well. The zeta potential values prevents particles instability such as aggregation and flocculation.

Ufasomes OA:LA



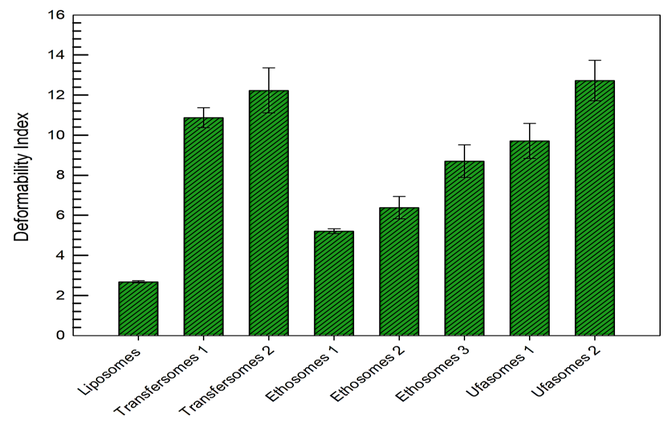
Long-term stability studies were carried out at room temperature, using the Turbiscan Lab Expert® tool.
The two graphs above show the delta transmittance (ΔT) and delta back scattering (ΔBS) remained constant throughout all analysis duration within a *range* of -1 % to + 1 %, *optimum* range of system stability.

Ufasomes OA:LA: PL90G



Deformability test

NANOCARRIERS	DEFORMABILITY INDEX*
LIPOSOMES	2.68 ± 0.06
TRANSFERSOMES 1 **(with sodium deoxycholate)**	10.87 ± 0.50
TRANSFERSOMES 2 **(with sodium cholate)**	12.23 ± 1.12
ETHOSOMES 1 **(20 % (w/w) of Ethanol)**	5.21 ± 0.12
ETHOSOMES 2 **(25 % (w/w) of Ethanol)**	6.38 ± 0.56
ETHOSOMES 3 **(30 % (w/w) of Ethanol)**	8.70 ± 0.81
UFASOMES 1 **(OA:LA:PL90G)**	9.71 ± 0.87
UFASOMES 2 **(OA:LA)**	12.73 ± 1.01



The deformability test has been carried out according to van der Berg et al. formula and by using Lipid Extruder® tool. The test was performed by inserting a ml of each formulation into the extrusion chamber and maintaining a constant pressure of 2.5 bar for 10 minutes. In the graph, you can see that ufasomes 2, composed by oleic acid and linoleic acid, have the highest deformability index than others nanocarriers. It is likely the presence of oleic acid in combination with linoleic acid allows a certain elasticity to vesicles exceeding pores one third of the average size of nanocarriers. Therefore, this study need further analyzed in order to understand how vesicles cross the pores.

References

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