Phytantriol cubosomes flexibility and malleability evidenced by extrusion: a new method for drug encapsulation

Barbara Malheiros¹, Raphael Dias de Castro¹,², Mayra C. Lotierzo¹, Bruna R. Casadei² and Leandro R. S. Barbosa¹,²*
¹Department of Biochemical and Pharmaceutical Technology, University of São Paulo, São Paulo, Brazil
²University of São Paulo, Physics Institute, Rua do Matão, 1371, 05508-090, São Paulo, SP, Brazil.
bbara.malheiros@alumni.usp.br
* Corresponding author E-mail: lbarbosa@if.usp.br

The use of nanoparticles is intended to improve bioavailability of drugs while decreasing undesired side effects, therefore, nanoparticles offer both a protection for the active molecules and drugs as a carrying vehicle. Cubosomes are capable of storing both hydrophilic, hydrophobic and amphiphilic molecules within its structure[1]. They have approximately 50% hydrophobic area, being able to carry more molecules than other nanoparticles. Particularly, cubosomes are quite easy to produce in which lipids (monolein, phytantriol (PHY), etc) self-assembly in water medium[2]. In the present study, we investigated the malleability of PHY-cubosomes under extrusion, by SAXS, DLS, NTA and electron microscopy. Our observations show that after being extruded the nanoparticles do not lose their morphology and particle size is not affected by the pore size of the extrusion filter. On this ground, cubosomes show a large malleability even when undergoing extrusion in a 50 nm pore size filter, presenting average size of 185±2 nm compared to 237±5 nm of the control sample in ultrapure water, similar results are found for PBS buffer medium. We believe these results open a new way for encapsulating drugs into cubosomes. Polydispersion is slightly decreased. Regarding concentration, for both systems, there is an increase from 4.09±0.66x10¹² particles/mL to 7.88±0.66x10¹² particles/mL in ultrapure water, indicating that larger particles are broken into smaller ones, in a rearranging process.