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Complex Liposomes for Phototherapy: development and optimization

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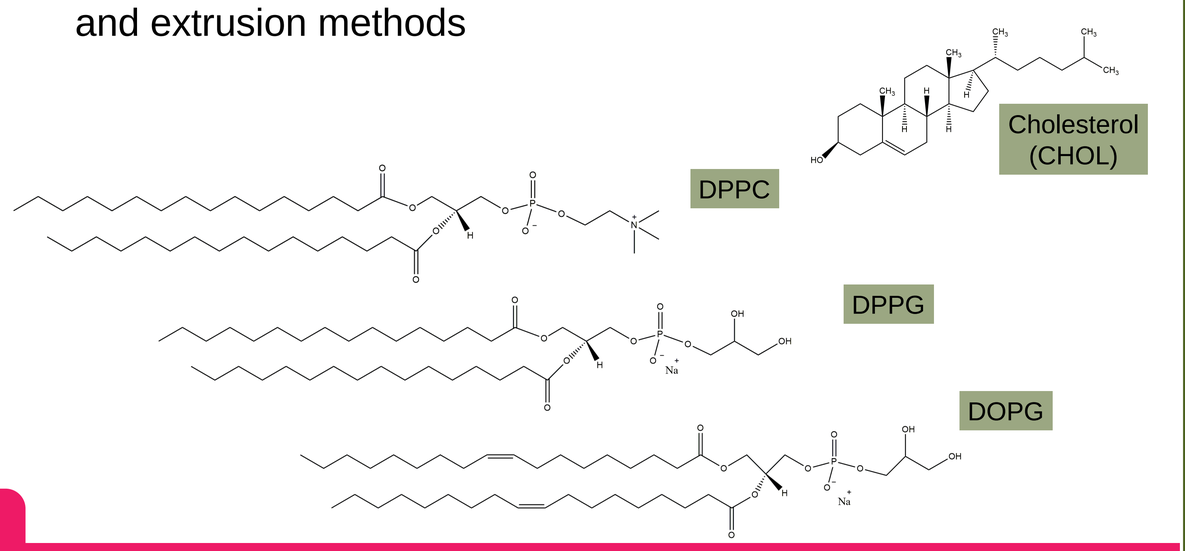
Introduction

Photodynamic Therapy (PDT) is currently a promising treatment methodology for several types of cancers [1]. Three main components are necessary for PDT: a light source, a photosensitizing molecule and oxygen [2]. Under these conditions, PDT leads to oxidative stress and, as consequence, cell death. However, drug solubility and its delivery to the target tissue are factors that can affect the treatment efficacy. To overpass these situations, it is possible to use nanocarriers such as liposomes. These lipid carriers are able to encapsulate both hydrophobic and hydrophilic molecules and are suitable for photodynamic applications [3].

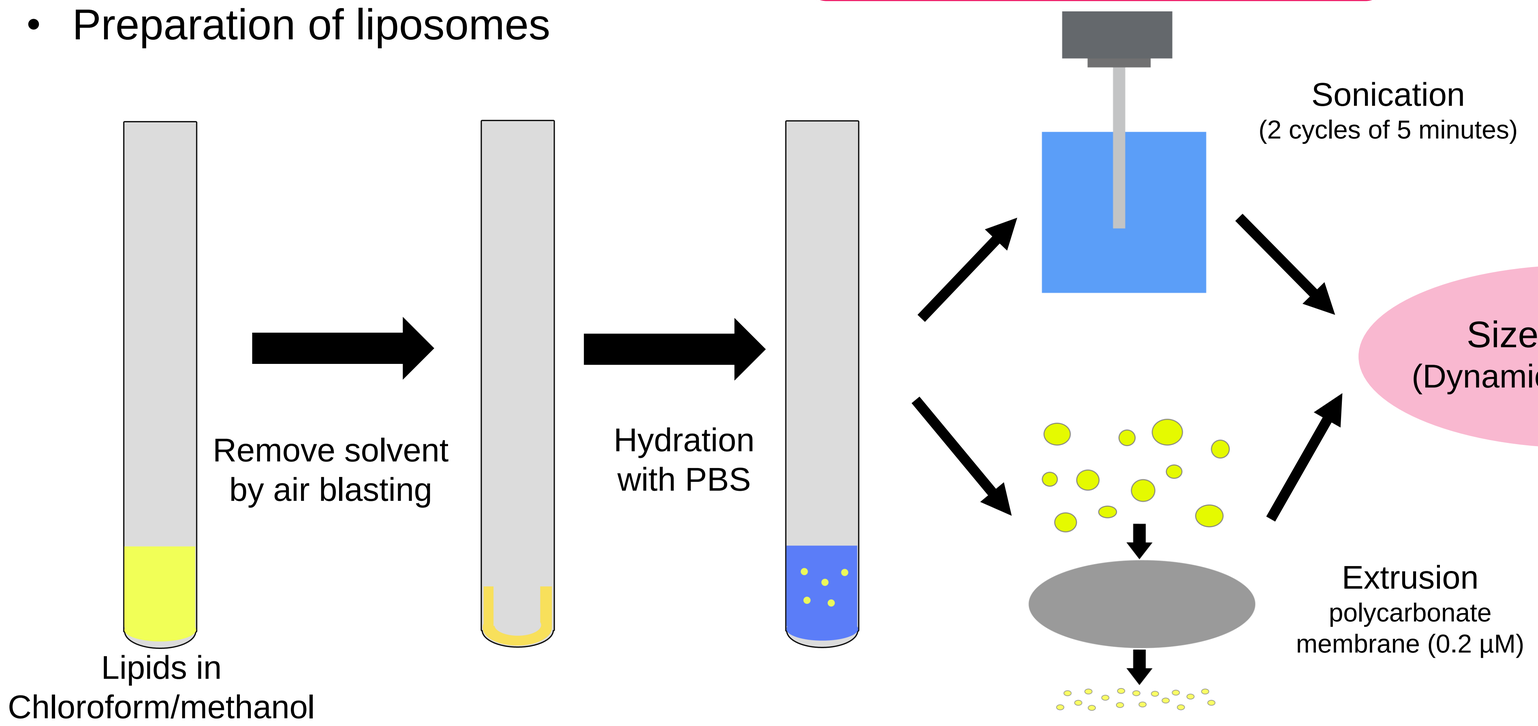
Aims

This work focuses on the development and optimization of complex liposomes for drug delivery produced by sonication and extrusion methods



Methodology

- Preparation of liposomes



Different lipid compositions were tested

- C1: DPPC+DPPG
- C2: DPPC+DPPG+DOPG
- C3: DPPC+DPPG+CHOL

Results

- Liposomes C2 and C3 produced by sonication showed sizes around 150 nm, the ones prepared by extrusion presented smaller sizes.
- Liposomes with C1 composition prepared through sonication presented more than 1000 nm while through extrusion diameter was around 120 nm.
- Regarding polydispersity index (PdI) there was a major difference between the methods that was PdI above 0.3 and below 0.2 for sonication and extrusion, respectively.

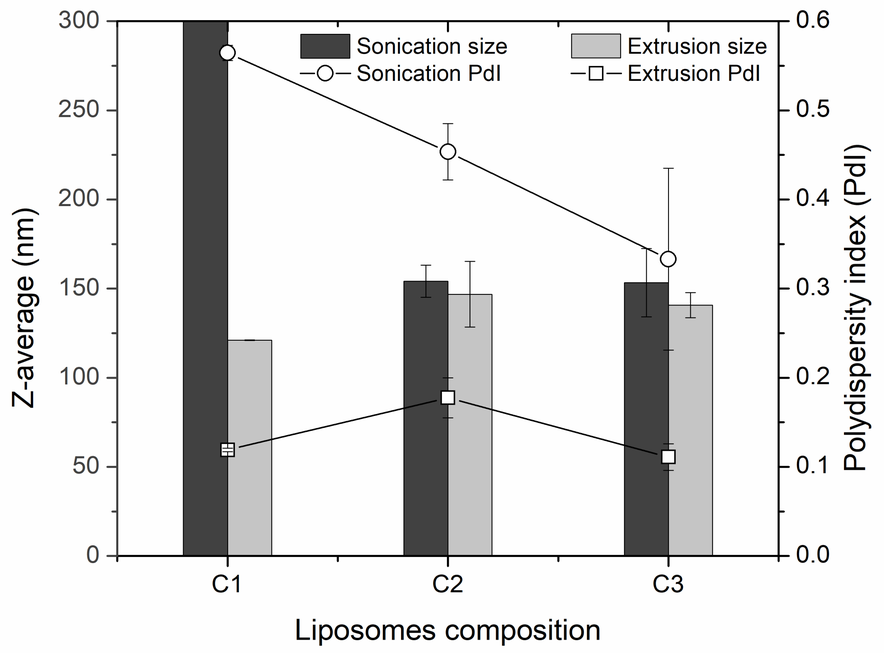


Figure 1: Comparison of size and polydispersity index (PdI) for different liposomes compositions produced through extrusion and sonication methods.

Conclusions

Not all formulations produced by sonication method resulted in small liposomes. Extrusion through a 200 nm membrane enabled the downsizing of all liposomes formulations, achieving a more homogeneous population of particles, which makes extrusion the selected method for further studies with the encapsulation of photosensitizer molecules in liposomes.

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The authors acknowledge the Portuguese National Funding Agency FCT-MCTES through grant PD/BD/142829/2018. This work was also supported by Radiation Biology and Biophysics Doctoral Training Programme (RaBBiT, PD/00193/2012); UID/FIS/00068/2019 (CEFITEC); UID/Multi/04378/2013 (UCIBIO).

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