Microfluidics technique: an Innovative production of Niosomal Formulations

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In recent years, niosomes acquired growing scientific attention as an alternative potential drug delivery system. These surfactant vesicles have several advantages such as greater stability, thus lesser care in handling and storage and lower cost. In addition, niosomes are able to encapsulate both hydrophilic and lipophilic drugs, minimizing their degradation and inactivation after administration, preventing unwanted side effects, increasing the bioavailability of the drug and targeting it to the disease area. One of the problems preventing innovative formulations from being widely used in therapy lies in the production by conventional methods, which are associated with long production times, high consumption of reagents, difficult industrial scale up and costs. The need to switch to fast, safe and efficient production, has led to the emergence of a new production technique, called microfluidics. This new technology allows many advantages, including: processes reproducibility, speed of execution and elimination of toxic and/or harmful solvents for humans or the environment, ease in industrial scaling up. The main aim of this research project was to design, prepare and characterize a niosomal formulation, consisting of Tween21 and Cholesterol, using two different preparation methods: "Thin layer Evaporation" (TLE) and microfluidic technique (MT) and to investigate how these two methods could influence the chemical-physical characteristics of the same nanocarrier. Firstly, a deep characterization of the prepared niosomes was carried out evaluating size, ζ-potential, polydispersity index. Furthermore, to have information about the niosomal bilayer and to verify the influence of the different preparation methods, different lipophilic probes (pyrene and DPH) were used, to evaluate bilayer fluidity, polarity and microviscosity. Finally, two probes, Calcein and Nile Red, were used to evaluate the entrapment efficiency (E.E.) of niosomes and their release capability.