Contribution ID: **58** Type: **Poster**

Membrane-water partitioning to screen drug candidates: towards a high-throughput microfluidic platform

Friday 24 September 2021 13:30 (1h 30m)

In a rational drug design, the modulation of the chemical structure based on drug's pharmacokinetic profile can be the solution to improve drug development efficiency. Significant correlations between lipophilicity and membrane permeation have been established [1]. Further, anisotropic membrane-like systems, such as membranes/water (M/W) partitioning systems, are described as a more accurate alternative to octanol/water for the estimation of pharmacokinetic behavior [2]. In the present study, derivative spectroscopy was used to calculate M/W partition coefficient of two model drugs and to predict several parameters of their pharmacokinetic profile using lipid nanosystems of different constitution as biomembrane mimetic models (Fig. 1A) [3,4]. The obtained results highlight the relevance of using biomimetic models to determine the logM/W to obtain reliable information in the early stages of drug development. Notwithstanding, this methodology is being restricted mainly to the academic research. Their large-scale use at industrial level has been hindered mostly by its low throughput. The work presented here also considers the development of a microfluidic platform in which microchannels are coated with supported lipid bilayers that enable the assessment of the logM/W partitioning of drugs (Fig. 1B). This microfluidic platform constitutes a promising high-throughput technology to screen drug candidates at a large scale fulfilling the requirements from pharmaceutical and cosmetic industries.

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Session Classification: Materials and technologies for Health and Environment (Posters)

Track Classification: Materials and Technologies for Health and Environment