Encapsulation of two model proteins by fluorinated ionic liquids: Their potential as drug delivery system

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A diversity of proteins, e.g. insulin, coagulation factors, interferons and antibodies are currently available for pharmaceutical use to treat a wide range of diseases, such as diabetes, hemophilia, multiple sclerosis and cancers. However, problems such as dosage, protein instability and degradation still need to be fully addressed. The development of biocompatible drug delivery systems (DDS) capable of overcoming these issues is very promising and can improve not only the effectivity of the therapy but patient compliance as well.

Ionic liquids (ILs) are salts/fluids composed of ions which present low melting points. The possibility of tuning IL ions to reach the desired properties and interactions represents a major advantage compared to surfactants and other artificial membrane-mimetic solvents. Ionic liquids spontaneously self-assembly above critical aggregation concentration (CAC) [1]. Our aim is to investigate the potential use of fluorinated ionic liquids (FILs) as drug delivery systems for therapeutic proteins.

This work evaluates the effect of FILs on the stability, function, structure and aggregation state of hen egg white lysozyme (HEWL) [2] and bovine serum albumin (BSA). Different techniques were used for this purpose, such as differential scanning fluorimetry (DSF), spectrophotometric assays, circular dichroism (CD), dynamic light scattering (DLS), isothermal titration calorimetry (ITC) and small angle X-ray scattering (SAXS).

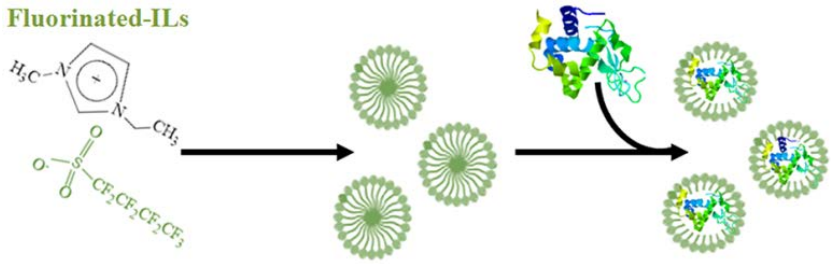

Figure 1: Mechanism of encapsulation of proteins by the FIL.

References

[1] - A.B. Pereiro et al., 2015. Aggregation Behavior and Total Miscibility of Fluorinated Ionic Liquids in Water. Langmuir 31, 1283-1295.

[2] - M. Alves, N.S.M. Vieira, L.P.N. Rebelo, J.M.M. Araújo, A.B. Pereiro, Archer, M., 2017. Fluorinated ionic liquids for protein drug delivery systems: investigating their impact on the structure and function of lysozyme. Int J Pharm 526, 309-320.