PROPOSAL FOR A PhD POSITION

Protein adsorption and denaturation in injectable devices for pharmaceutical applications.
Aptar Pharma is the world-leading supplier of proprietary innovative non-invasive drug delivery devices to the Pharmaceutical industry.
Our main focus is on metering valves for pressurized metered dose inhalers, and dry powder inhalers; and multidose pumps, single dose devices and metering valves for nasal and sub-lingual drug delivery. We offer a full set of associated services to support customer speed-to-market.
We provide global support to branded and generic customers in all geographies and in both developed and emerging markets.

Prefilled syringes (PFS) are widely used in pharmaceutical field to store biologics. The major requirement of these devices is the long term storage of active biomolecule in the container. As proteins are always used in the formulation, one major issue is the binding and consequently the denaturation of protein in contact with surfaces (glass, plastics and elastomers) leading to a loss of active compound or a loss of biological activity. For example, a loss of 52% of insulin is observed in glass bottles after 5min.
The main goals of this PhD project are:

- to understand the behavior of several model protein (sorted by specific properties like rigid, flexible, small, large, etc...) in contact with surface like glass, plastics or elastomers. All these surfaces can be in contact with active biological compounds in PFS containers.
- to determine critical parameters to qualify the surface of components in medical devices.
- to propose surface and/or formulation modifications to improve the long term stability.

The PhD student will be responsible for choosing a set of proteins, representative of different behaviors in contact with surfaces or representative of the final products stored in the PFS. He(she) will develop quantification methods based on liquid chromatography and physical surface characterisation techniques like X-Ray Photoelectron Spectroscopy, Fourier Transform Infrared Spectroscopy and Raman spectroscopy. These techniques are suitable to characterize surface properties of the substrate, follow chemical modification as well as unravel interactions between biomolecules and the surface.

At last, the PhD student will propose a test protocol, that can be transferred and used in an industrial environment, to qualify contact materials and components, reflecting the long term stability of proteins.

The PhD student will be part of the team working on the project within Aptar Pharma, in an international environment. He(she) will thus present his(her) work during specific meetings, and will share his(her) vision on the short and long-term activities related to the project.
Supervisor: Dr. K. Anselme (IS2M)

This work will be co-supervised by Dr A. Ponche (Assistant Professor) and S. Sarailh (Laboratory Leader, Prescription Division)

The candidate will be recruited by APTAR Pharma (27100 Le Vaudreuil, France) but the major part of the work will be made in Institut de Science des matériaux de Mulhouse (IS2M, 68057 Mulhouse, France)

The candidate should have a background in material chemistry and good skills in surface science. A strong interest in multidisciplinary approaches (Material science, biochemistry, surface spectroscopy and pharmacology), autonomy and good experimental skills are highly recommended.

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