Insulin on surfaces – surfaces of insulin

Heike Arnolds

Department of Chemistry, University of Liverpool, Crown Street, Liverpool L69 7ZD

Heike.Arnolds@liverpool.ac.uk

Human Insulin is a relatively small peptide (51 amino acids) which plays a major role in controlling glycemia in the human body. It is also a model protein for understanding protein unfolding and aggregation into fibril-like structures called amyloid which are the hallmark of many degenerative diseases such as diabetes, Alzheimer's and Parkinson's, but which can also occur during purification, storage and delivery of protein-based drugs.

In this talk I will show how linear and non-linear vibrational spectroscopy can help us to understand how interfaces, such as air-water, lipid-water and solid-water interfaces, accelerate amyloid formation of native insulin. I will then discuss adsorption of amyloid fibrils on mica or carbon-coated grids, important in routine biophysical studies of amyloid aggregation using atomic force microscopy (AFM) or transmission electron microscopy (TEM). I show that such imaging is likely biased due to preferential adsorption and structure changes of amyloid fibrils during adsorption. To make sense of these findings I switch perspective and consider the insulin fibril itself to possess a surface which is different from the native insulin surface.

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