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Neutron Scattering as a Versatile Tool to Study Structure and Dynamics of Proteins

Thursday 28 March 2019 14:30 (30 minutes)

The ability to respond to various environmental stimuli is a crucial ability of biological organisms. Light signal sensation and transduction, for instance, are important biological processes that allow organisms to respond to external stimuli. In recent work we have investigated structural and dynamical changes of a light-sensitive photoreceptor protein in response to light-illumination (1,2). In my presentation, I will present recent neutron spectroscopy and small-angle scattering experiments, and I will demonstrate how molecular dynamics and protein flexibility are required for light signal transduction of that photoreceptor. In particular, we could demonstrate that end regions of the photoreceptor protein change flexibility as response to light illumination. Hence, changes of protein flexibility are needed for light signal transduction of a biotechnologically relevant class of proteins. Neutron spectroscopy proved to be an excellent tool for that purpose.

In the second part of my talk, I will present recent small-angle neutron scattering and reflectometry results from the field of biology and biophysics. A particular strength of neutron scattering is the concept of neutron contrast variation using a mixture of D2O/ H2O to render parts of the sample invisible to the neutron beam. This is a highly useful tool to selectively focus on specific structural aspects of a protein complex, to investigate crowding effects or highlight the specific interaction of proteins with biological membranes.

In the last part of my talk I will speak about polymer-like properties of intrinsically disordered and unfolded proteins (3,4,5). By using neutron spin-echo spectroscopy combined with small-angle neutron scattering, we were able to study those flexible proteins. Polymer-like properties of those systems have been observed both in their structure as well as in their dynamics.

Presenter: STADLER, Andreas (FZ Jülich)