Combining small-angle scattering of neutrons and X-rays to determine the low-resolution structure of membrane Proteins

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Membrane proteins are vital for the regulation of biological cell-function as well as in the communication between cells and about 25% of the proteins coded by the human genome are membrane proteins. Consequently, this class of proteins is also the central target in the pharmaceutical industry. Unfortunately, very little is known about the structure of membrane proteins. This significantly limits structurally rationalised approaches to drug development. During the last few years, the central research activity of my group at University of Copenhagen has been to develop a general platform for determining the low-resolution structure of membrane proteins based on combined Small-Angle Neutron Scattering (SANS) and Small-Angle X-ray Scattering (SAXS).

We have shown that by using the so-called Nanodisc-system as a nanoscale sample holder for the individual membrane proteins and by combining SAXS and contrast variation SANS, the structure of a general membrane protein as well as the surrounding lipid membrane environment may be determined. Advanced deuteration-approaches are presently being investigated to obtain an even more generally applicable method.