

Poster Presentations

[MS7-P04]

Membrane proteins are integral parts of the cell membranes where they have diverse functions ranging from signalling processes and ion-transport to cell adhesion. X-ray crystallography has the recent years been of great success with regard to membrane protein structure determination, but the interplay between the lipid environment and the protein itself is still an area where many questions need to be answered. In this context the visualisation of the lipid features in protein crystal structures would greatly help to understand the – often functionally important – interactions between the protein and the surrounding lipid environment. Lipids in a crystal surrounding the transmembrane parts of a membrane protein only show semi-ordered features in the crystal packing resulting in low-resolution X-ray diffraction. Careful treatment of these data enables visualisation of the lipid features and thereby helps to describe the interplay between the integral membrane protein and the lipid environment [1].

The lipid phosphate head-groups and the aliphatic lipid chains have different scattering properties, thereby enabling the visualisation of the membranous regions in the crystal due to the type 1 crystal packing of the membrane proteins in the unit cell. The electron rich head-groups give rise to positive electron densities in a difference electron density map ($F_{\text{obs}} - F_{\text{calc}}$), while the electron poor aliphatic lipid tails give rise to negative electron densities.

We set out to describe the interplay between the membrane and an integral membrane protein, the sarco(endo)plasmic reticulum Ca^{2+} ATPase (SERCA). The P-type ATPase transports Ca^{2+} ions from the cytoplasm into the sarcoplasmic reticulum (SR) store to terminate muscle contraction. Crystal structures of the Ca^{2+} translocating enzyme in the presence of different lipids with different sizes and saturation are presented with the focus on the lipid features from the crystal structures.

1. Sonntag, Y., Musgaard, M., Olesen, C., Schiott, B., Moller, J. V., Nissen, P. & Thogersen, L. (2011). Mutual adaptation of a membrane protein and its lipid bilayer during conformational changes. *Nat Commun* 2, 304.