

Poster Presentations

[MS5-P49] **Protein Export in Cyanobacteria - A Model for Organelle Protein Transport.** Ivo Tews,^{ab} Patrick Koenig,^b Irmgard Sinning,^b Johanna Tripp,^c Oliver Mirus,^c Enrico Schleiff,^c

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The insertion of proteins into and the transport across outer membranes in cyanobacteria has a strong semblance to protein import into eukaryotic organelles, with a swap in directionality [1]. Specific transporters mediate the transfer across and the insertion into bio-membranes. We focus on the study of beta-barrel proteins that reside in the outer membranes and periplasmic factors that mediate protein recognition and transport. The beta barrel proteins have a varying number of so-called POTRA domains (POLypeptide-TRansport-Associated), with inherent flexibility between individual POTRA domains [2]. These recognise target proteins and facilitate protein transport through the beta barrel [2], [3]. Chaperones similar to protobacterial SurA and Skp/DegP assist cyanobacterial protein transport through the periplasm. The 3D structure of the cyanobacterial chaperone Tic22 has a "butterfly" shape revealing a repeat likely caused by gene duplication [4], [5]. Four helices point orthogonal at each other, adding up their dipole moments in a central cavity. The surface of the structure is dotted with hydrophobic pockets in which we identified bound solvent molecules. These likely represent binding

sites for protein substrates. We demonstrate that Tic22 is present in the cyanobacterial periplasm as well as in thylakoids, and it can be functionally replaced by knock-in of a plant orthologue [4]. In the apicoplast organelle of unicellular parasites such as *Plasmodium* and *Toxoplasma*, Tic22 is essential for parasite survival and protein import into the apicoplast stroma [5]. The structural clues together with the functional data suggest that Tic22 can have a function in both, protein import or protein insertion, depending on the organism where it is found. The protein is conserved in bacteria, plants, and unicellular organisms and links these protein transporters to a common ancestry.

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