Universität Basel
Swiss Nanoscience Institute

SNI SWISS NANOSCIENCE INSTITUTE
EINE INITIATIVE DER UNIVERSITÄT BASEL UND DES KANTONS AARGAU

Transmembrane protein-mediated loading of synthetic compartments

Principle investigators: Cornelia G. Palivan, Department of Chemistry, University of Basel, Richard Kammerer, Paul Scherrer Institute, Villigen and Stephanie Gros, University-Children Hospital Basel

Compartmentalization, a prerequisite for the spatiotemporal control of biochemical pathways in cells, is an emerging concept in the design of new materials for medical and technological applications. Synthetic nano- and micro-compartments (NCs, MCs) with their chemical versatility and superior stability provide the basis for developing catalytic compartments, artificial organelles or cell mimics furnished with specific biomolecules. However, a higher compartment loading efficiency and better permeability of the synthetic membrane remain hurdles that need to be overcome to increase the efficacy of *in situ* reactions.

The aim of this interdisciplinary project is to develop next generation functional synthetic compartments whose composition is controlled by special transmembrane proteins that deliver or selectively let molecules pass to the interior, and to test their activity *in vitro*. By inserting distinct membrane proteins in the synthetic membrane of compartments we plan to deliver proteins to the compartment interior or to allow a specific molecular flow across the membrane (*Fig. 1*).

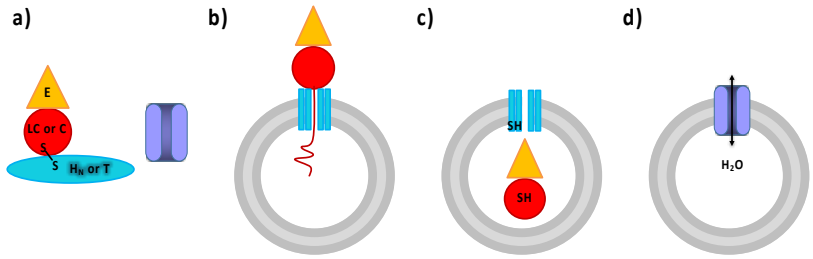

Fig. 1: *Synthetic NCs and MCs equipped with membrane proteins for differentially loading the compartment interior. a) Membrane proteins variants comprising the catalytic domain (red), the translocation domain (light blue) and an enzyme of interest (orange), and a second membrane protein (purple). b) In the artificial membranes (grey), translocation domains change conformation to form a pore. c) Fusion proteins will enter inside the compartment where in the reducing environment, they separate from the translocation domain. d) Membrane protein inserted in synthetic membranes for the exchange of water and small neutral solutes.*

Our study focuses on generating novel functional compartments by a combination of cutting-edge design of nanoscience-based compartments and state-of-the art methods in membrane protein expression and includes an array of methods for the detailed investigation of theses compartments *in vitro*. **Importantly, this study takes advantage of a broad range of expertise and established techniques in the collaborating labs.**

Your profile:

- you have a MSci degree in chemistry, biochemistry or material science
- knowledge of colloidal chemistry and self-assembly of amphiphilic polymers
- basic knowledge of biochemical (e.g. SDS-PAGE, gel filtration) and physical chemistry methods (e.g. NMR, GPC, IR and light scattering)
- basic knowledge in production, purification and characterization of proteins is a bonus
- proficiency in English and ideally in German
- good social and communication skills for integration into an international research team