Hydrophobins: Model proteins and building blocks for lipid-free membranes and vesicles

Hendrik Hähl[1] and Karin Jacobs[1]

[1]*Center for Biophysics, Saarland University, Saarbrücken, Germany*

Hydrophobins are small proteins whose unique feature is a pronounced amphiphilicity rendering them naturally occurring Janus particles. This feature allows them to cover rapidly any hydrophilic-hydrophobic interface. One class of hydrophobins produced by filamentous fungi builds interfacial monolayers that exhibit a highly ordered two-dimensional structure as well as very high lateral cohesion. Moreover, these proteins possess an extremely stable conformation making them ideal candidates also for theoretical investigations.
Studying the temporal evolution of hydrophobin films from the fungus *Trichoderma reesei* revealed an unusual assembly behavior which was shown experimentally and in simulation to be caused by crystallization at the interface and the interplay of protein-protein interactions [1]. In an attempt to measure the interactions between the proteins directly in a microfluidic setup, stable pure protein bilayers have been created, either between two aqueous or two oily phases. Studying the properties of these artificial membranes led then also to the production of vesicles made from these membranes [2]. These vesicles are the first example of liposomes with a membrane composed solely of natural proteins.

[1] Hähl, H. *et al.,* Langmuir 35**,** 9202 (2019).
[2] Hähl, H. *et al.,* Adv Mater 29**,** 1602888 (2017).