Interfacial assembly of Class II hydrophobin HFBI

Arja Paananen[1], Michael Lienemann[1], and Markus Linder[2]

[1] VTT Technical Research Centre of Finland, Tietotie 2, FI-02150 Espoo, Finland
[2] School of Chemical Technology, Aalto University, Kemistintie 1, FI-02150 Espoo, Finland

Hydrophobins are small surface active proteins produced by filamentous fungi[1]. They have many roles in fungal development such as lowering the surface tension of surrounding water for hyphal penetration, adhesion to surfaces, and making coatings. These proteins have an unique amphiphilic structure. They tend to associate with each other and assemble at the air-water interface into highly ordered monolayers that are strong and elastic[2]. Recently the structure-function relationships of Class II hydrophobin HFBI has been investigated by means of site-directed mutagenesis to gain an understanding of the role of charged amino acids in the structure of hydrophobins[3]. The relation of structural details to the film forming characteristics has recently also been reported[4]. In this work we've studied the self-assembly processes and interfacial rheology properties of wild type HFBI and HFBI variants. The results give new insight into the structure-function relationship[5].

REFERENCES

1. Linder, M.B. (2009), "Hydrophobins: proteins that self assemble at interfaces", *Curr. Opin. Colloid Interface Sci.,* **14**, 356–363.

2. Szilvay, G.R., Paananen, A., Laurikainen,

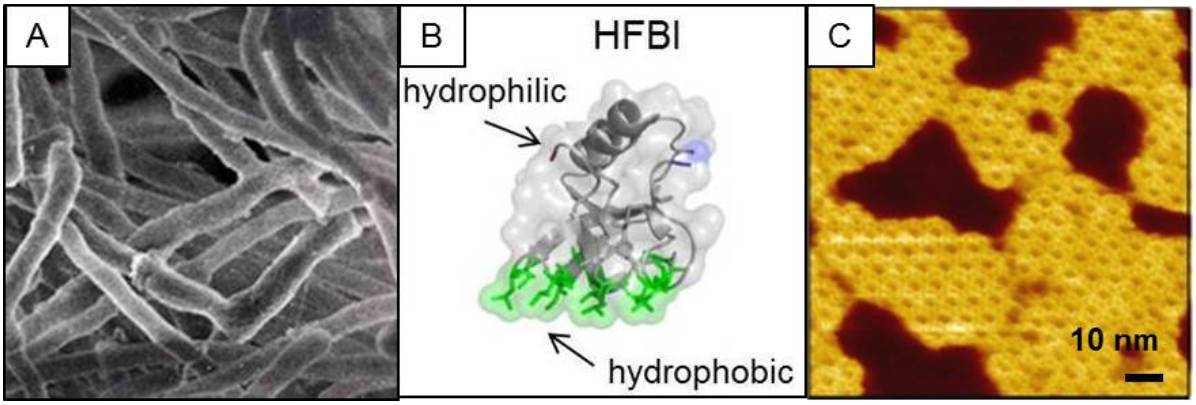

Figure 1. Filamentous fungi like Trichoderma reesei (A) produces hydrophobins that are small amphiphilic proteins (B) having a distinct hydrophobic patch in their structure. Hydrophobins lower the surface tension of water and form strong and elastic films at the air-water interface. The strength originates from the orders protein structure (C, AFM image).

K., Vuorimaa, E., Lemmetyinen, H., Peltonen, J., Linder, M.B. (2013), "Self-Assembled Hydrophobin Protein Films at the Air−Water Interface: Structural Analysis and Molecular Engineering", *Angew. Chem. Int. Ed.,* **46**, 2345–2354.

3. Lienemann, M., Gandier, J.-A., Joensuu, J.J., Iwanaga, A., Takatsuji, Y., Haruyama, T., Master, E., Tenkanen, M., Linder, M.B. (2013), "Structure-Function Relationships in Hydrophobins: Probing the Role of Charged Side Chains", *Appl. Environ. Microbiol.,* **79**, 5533–5538.

4. Magarkar, A., Mele, N., Abdel-Rahman, N., Butcher, S., Torkkeli, M., Serimaa, R., Paananen, A., Linder, M.B, Bunker, A. (2014), "Hydrophobin Film Structure for HFBI and HFBII and Mechanism for Accelerated Film Formation", *PLoS Comput. Biol.,* **10**, e1003745.

5. Lienemann, M., Grunér, M.S., Paananen, A., Siika-aho, M., Linder, M.B. (2015), "Charge-Based Engineering of Hydrophobin HFBI: Effect on Interfacial Assembly and Interactions", *Biomacromolecules,* **16**, 1283–1292.