Spontaneous self-assembly of SC3 hydrophobins into nanorods in aqueous solution

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Résumé en anglais	Hydrophobins are small surface active proteins secreted by filamentous fungi. Because of their ability to self-assemble at hydrophilic–hydrophobic interfaces, hydrophobins play a key role in fungal growth and development. In the present work, the organization in aqueous solution of SC3 hydrophobins from the fungus Schizophyllum commune was assessed using Dynamic Light Scattering, Atomic Force Microscopy and fluorescence spectroscopy. These complementary approaches have demonstrated that SC3 hydrophobins are able not only to spontaneously self-assemble at the air–water interface but also in pure water. AFM experiments evidenced that hydrophobins self-assemble in solution into nanorods. Fluorescence assays with thioflavin T allowed establishing that the mechanism governing SC3 hydrophobin self-assembly into nanorods involves β-sheet stacking. SC3 assembly was shown to be strongly influenced by ionic strength and solution pH. The presence of a very low ionic strength significantly favoured the protein self-assembly but a further increase of ions in solution disrupted the protein assembly. It was assessed that solution pH had a significant effect on the SC3 hydrophobins organization. In peculiar, the self-assembly process was considerably reduced at acidic pH. Our findings demonstrate that the self-assembly of SC3 hydrophobins into nanorods of well-defined length can be directly controlled in solution. Such control allows opening the way for the development of new smart self-assembled structures for targeted applications.
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