SYNCHROTRON SEC–SAXS DATA AS EXPERIMENTAL CONSTRAINTS TO MODEL THE DETERGENT CORONA AROUND A MEMBRANE PROTEIN

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The application of small-angle X-ray scattering (SAXS) to structural investigations of transmembrane proteins in detergent solution is hampered by two main inherent hurdles. On the one hand, the formation of a detergent corona around the hydrophobic region of the protein strongly modifies the scattering curve of the protein. On the other hand, free micelles of detergent without a precisely known concentration coexist with the protein–detergent complex in solution, therefore adding an uncontrolled signal. To gain robust structural information on such systems from SAXS data, in previous work, advantage was taken of the online combination of size-exclusion chromatography (SEC) and SAXS, and the detergent corona around Aquaporin-0, a membrane protein of known structure, could be modelled. A precise geometrical model of the corona, shaped as an elliptical torus, was determined [1]. We have recently revisited the geometrical approach by more thoroughly examining the correlations between all fitting parameters, and derive some rules about which strategy to adopt in further studies with different proteins [2]. The program Memprot has been developed to systematize the SAXS calculations from the geometrical models and is accessible to the community [3]. In a subsequent development of our software, for cases in which the protein contour is less isometric than that of AQP-0, we have considered developing a parameterized geometrical model of the detergent corona which adheres more closely to the actual shape of the protein. New applications of this recent strategy will likely be shown.

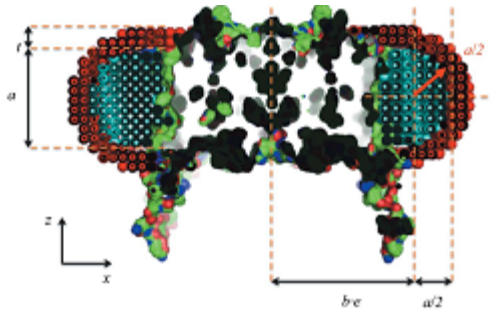

Figure 1: A section of the complex between the full-atom 2b6p structure and its detergent corona optimized from SEC–SAXS experimental data, as modeled in Memprot.

References

[1] Berthaud, A. *et al*, J. Am. Chem. Soc. (2012) **134**, 10080-10088.
[2] Pérez, J. and Koutsioubas, A., Acta Cryst. (2015) **D71**, 86-93.
[3] Memprot is available at http://www.synchrotron-soleil.fr/Recherche/LignesLumiere/SWING