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Eawag Seminar Invitation

Metalloproteomics: Promises, Approaches, and Some Stumbling Blocks

Speaker **Dr. Claudia A. Blindauer**
Department of Chemistry, University of Warwick, Coventry, UK

When **October 30, 11.00 – 12.00 a.m.**

Where **Forum Chriesbach C20, Eawag Dübendorf**

Abstract

It is now well-established that a large proportion of the proteomes of all organisms is constituted by metalloproteins: At least a third of all proteins, and around half of all enzymes have been estimated to require an essential metal cofactor for function. However, the prediction of metal cofactors is not straightforward; indeed, a seminal paper has suggested that “microbial metalloproteomes are largely uncharacterized” [1]. Furthermore, there is not only a need to establish interactions between essential metal ions and proteins on a large scale, but we would also like to better understand the effects of toxic metal ions, by identifying their most important in vivo protein targets. A further important area concerns microbial resistance mechanisms, in particular within the field of bioremediation. These are just a few fundamental areas where metalloproteomics approaches are needed.

Metalloproteomics can be considered as a sub-field of “Metallomics” – a research area at the interface between Analytical Chemistry and Inorganic Biochemistry. Typically, metalloproteomics approaches are aimed at identifying (and quantifying) metal-protein associations, ideally for entire proteomes. Recent advances of both inorganic and molecular mass spectrometry have been instrumental in the launch of this field, whilst the necessary separation prior to mass spectrometric analysis has remained a major bottleneck. Difficulties during separation arise from the predominant lability of metal-protein associations, together with the large range of concentrations of individual proteins. The talk will present some recent examples from the literature as well as from our own lab [2], with the aim of highlighting both successful applications and major pitfalls.

[1] Microbial metalloproteomes are largely uncharacterized, A. Cvetkovic, A. L. Menon, M. P. Thorgersen, J. W. Scott, F. L. Poole, F. E. Jenney, W. A. Lancaster, J. L. Praissman, S. Shanmukh, B. J. Vaccaro, S. A. Trauger, E. Kalisiak, J. V. Apon, G. Siuzdak, S. M. Yannone, J. A. Tainer and M. W. W. Adams, Nature, 2010, 466, 779-782.
[2] Identification of major zinc-binding proteins from a marine cyanobacterium: insight into metal uptake in oligotrophic environments, J. P. Barnett, D. J. Scanlan and C. A. Blindauer, Metallomics, 2014, 6, 1254 - 1268.