MARINE ENZYMES WITH APPLICATIONS IN BIOCATALYSIS

Jennifer Littlechild[1], Halina Novak[1], Christopher Sayer[1], Andrew Mearns Spragg[2] and Misha Isupov[1]

[1] The Henry Wellcome Building for Biocatalysis, University of Exeter, UK
E-mail: J.A.Littlechild@exeter.ac.uk

[2] Aquapharm Biodiscovery Ltd, European Centre for Marine Biotechnology, Dunstaffnage, Oban, Argyll, PA37 1QA, UK

Enzymes isolated from marine archaea, bacteria and algae offer potential for use in industrial biocatalysis. At the Exeter Biocatalysis Centre, we have studied several such enzymes including vanadium haloperoxidases from marine algae, dehalogenases from several marine bacterial species in collaboration with Aquapharm, UK, L aminoacylase, alcohol dehydrogenase and lysophosholipase from marine isolated thermophilic archaea and marine viral proteins.

These activities have application for the synthesis of pharmaceutical intermediates. Many of the enzymes have novel properties from their counterparts isolated from other environments.
The presentation will include details on enzyme discovery, cloning, characterisation including X-ray structural determination and molecular modelling.

We are also part of a large EU grant 'Hotzyme' where we will also be including discovery of hydrolase enzymes from marine environments.

References

Guy J.E., M.N. Isupov and J.A. Littlechild. 2003. The structure of an alcohol dehydrogenase from the hyperthermophilic archaeon *Aeropyrum pernix*. J. Mol. Biol. 331:1041-1051.

Isupov M.N., A.R. Dalby, A.A. Brindley, Y. Izumi, T. Tanabe, G.N. Murshudov and J. Littlechild. 2000. Crystal structure of dodecameric vanadium dependent bromoperoxidase from the red algae *Corallina officinalis*. J. Mol. Biol. 299:1035-1049.

Littlechild, J., E. Garcia Rodriguez and M. Isupov. 2009. Vanadium containing bromoperoxidase – Insights into the enzymatic mechanism using X-ray crystallography. Journal of Inorganic Biochemistry 103:617-621.

Novak H.R., C. Sayer, M.N. Isupov, K. Paszkiewicz, D. Gotz, A. Mearns Spragg and J.A. Littlechild. 2013. Marine *Rhodobacteraceae* L-haloacid dehalogenase contains a novel His/Glu dyad which could activate the catalytic water. Febs J. in press.

Toogood,H.S., E.J. Hollingsworth, R.C. Brown, I.N. Taylor, S.J.C. Taylor, R. McCague and J.A. Littlechild. 2002. A thermostable L-aminoacylase from *Thermococcus litoralis*: cloning, overexpression, characterization, and applications in biotransformations. Extremophiles 6:111-122.