

P013 What Controls Reaction Specificity in Oxalate Decarboxylase?
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Bacillus subtilis oxalate decarboxylase catalyses the conversion of oxalate to formate and carbon dioxide. We have shown it to be up-regulated in an acid pH stress response. The catalytic reaction requires dioxygen as a cofactor despite there being no net redox change. Oxalate decarboxylase shares many properties with oxalate oxidases, which are involved in plant disease resistance and the degradation of lignin by fungi. We have shown that both oxalate decarboxylases and oxidases require dioxygen and utilise a Mn cofactor. In the oxidase reaction, however, dioxygen is a substrate rather than a cofactor in the conversion of oxalate to hydrogen peroxide and carbon dioxide. We have proposed divergent catalytic cycles for the two enzyme activities. The cloning and sequencing of oxalate oxidase isoforms from *Ceriporiopsis subvermispora* have revealed that the active sites of these fungal oxidases differ from that of oxalate decarboxylase only in an active site lid. We are currently determining which amino acids within the lid are responsible for reaction specificity and why. This is revealing the atomic details of how one enzyme has evolved into another to fulfil a different physiological purpose.