

Stable Isotopic Indicators of Nutrient Cycling in a Temperate North Pacific Estuary, OR, USA

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The distributions of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in suspended particles were examined monthly over a two year period at ten stations along a 60 km transect of the Yaquina River and Estuary, Oregon. The objective of this work is to define annual dissolved nutrient budgets for an estuary in the northwestern part of the U.S. under various scenarios for watershed rainfall/runoff conditions. Organic material in estuaries is a mixture of land-derived and oceanic carbon and nitrogen. In addition, *in situ* biological processes both produce and consume organic components. In the Yaquina estuary both $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in planktonic material increased from the freshwater terrestrial region of the river downstream to the Pacific Ocean. Isotopic carbon increased from -27.7 ± 1.4 to -22.1 ± 1.5 per mil $\delta^{13}\text{C}$ between the freshwater terrestrial region of the river to the Pacific Ocean. Particulate nitrogen increased from 2.6 ± 1.0 per mil $\delta^{15}\text{N}$ in the freshwater region to 7.2 ± 1.4 per mil $\delta^{15}\text{N}$ at the ocean. Relative to salinity, the isotopic increases were linear during winter and early spring indicating that simple mixing of the two end members was occurring. During summer, the isotopic increases were increasingly non-linear, indicating that processes in addition to simple mixing of the two end members were occurring. Isotopic data suggest that river outflow provided a source of nutrients in the freshwater portion of the estuary, whereas heterotrophic remineralization and nutrient recycling were important in the tidal regions of the estuary in the summer.

Biosynthesis of chloroaryl propane diols in the basidiomycete *Bjerkandera adusta*

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The basidiomycete *Bjerkandera adusta* biosynthesizes aryl propane-1,2-diols, including their chloroanalogues, as secondary metabolites from L-phenylalanine (Lapadatescu et al., 2000; Silk et al., 2001). This occurs by a catabolic process to benzoic acid/benzaldehyde (C7-unit) followed by a stereoselective C2-unit addition to form ???-ketols and then asymmetric reduction (Hage et al., 2001) to predominantly erythro (1R,2S) 1-aryl propane-1,2-diols (Silk and Macaulay, 2002).

The metabolic pathways involving diol production have been investigated using isotopically labelled precursors (Silk and Macaulay, 2002; Silk et al., 2001; Lapadatescu et al., 2001). From these studies, benzaldehyde has emerged as a likely common biosynthetic intermediate (C7-unit) to the aryl propane diols, but the identity of the C2-unit has remained obscure.

We now report a series of stable isotope labelling experiments (^{13}C , ^2H) that have been carried out to investigate the biosynthesis of aryl propane diols and ???-ketols, including their chloroanalogues, with the view of identifying the C2-unit. These experiments involve the GC/MS analyses of extracts of static liquid cultures of *B. adusta* incubated with L-alanine, L-serine, glycine, acetate, ethanol, pyruvate and acetaldehyde, together with benzaldehyde. Acetate, ethanol and possibly acetaldehyde emerge as common intermediates, combining with benzaldehyde, apparently acting with thiamine diphosphate (TDP) as co-factor, to stereoselectively produce labelled ethanoyl benzyl alcohols, and benzoyl ethanols (???-ketols), and, following asymmetric reduction, the 1-aryl propane-1,2-diols. The possible mechanisms of formation of these compounds is discussed.

References

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