Bioavailability of DON from natural and anthropogenic sources to estuarine plankton

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ABSTRACT: Utilization of dissolved organic nitrogen (DON) from natural (forests) and anthropogenic (animal pastures, urban/suburban storm water runoff) sources (three sites per source) by estuarine plankton communities was examined in spring, summer, and fall. The proportion of DON utilized ranged from 0 to 73%. Overall, urban/suburban storm water runoff had a higher proportion of bioavailable DON (59% ± 11) compared to agricultural pastures (30% ± 14) and forests (23% ± 19). DON bioavailability varied seasonally; however, the seasonal pattern differed for the three sources. Bacterial production increased linearly with the amount of DON utilized across all sources and seasons; the rate of increase was approximately five times greater per micromole of N as DON used relative to dissolved inorganic N (DIN) used. Although phytoplankton production generally increased with DON addition, the increased production was not correlated with the amount of DON utilized, suggesting that a variable portion of dissolved organic matter (DOM)-N was directly or indirectly available to the phytoplankton. This indicates that phytoplankton production is not a good measure of the amount of bioavailable DON, and measurements of the amount of bioavailable DON based on bacterial responses alone might not reflect N available to phytoplankton. Preliminary seasonal budgets of bioavailable N (DIN plus bioavailable DON) as a function of land use suggest that ~80% of the total dissolved N (TDN) from urban/suburban runoff is bioavailable, whereas a lower proportion (20- 60%) of TDN is bioavailable from forests and pastures. N budgets for aquatic ecosystems based on only DIN loading underestimate bioavailable N loading, whereas total N or TDN budgets overestimate bioavailable N inputs.

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