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Aging of allochthonous organic carbon regulates bacterial production in unproductive boreal lakes

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ABSTRACT

Allochthonous dissolved organic carbon (DOC) is an important carbon source for bacterial production (BP) in humic lakes. Here we show that BP can be a function of, and decreases with, the aging of allochthonous DOC in the aquatic environment. During a seasonal cycle, bacterial bioassays coupled to calculations of average aquatic DOC age (the time span from soil discharge to observation) were performed with water from the inlets and outlets of two unproductive Swedish lakes. BP and bacterial growth efficiency (BGE) during 7-day bioassays decreased with increasing average aquatic DOC age. Parallel to the declines in BP and BGE there was a rise in specific UV absorbance at the wavelength of 254 nm (SUVA₂₅₄) indicating that decreasing BP and BGE were connected to a shift to a more aromatic and recalcitrant DOC pool. The results suggest that hydrological variability in combination with lake size and temperature have large influence on pelagic BP in lakes with high input of terrigenous DOC.