

Does autochthonous primary production drive variability in bacterial metabolism and growth efficiency in lakes dominated by terrestrial C inputs?

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ABSTRACT: During the past 20 yr, aquatic microbiologists have reported 2 strong patterns which initially appear contradictory. In pelagic systems, bacterial growth and biomass is well correlated with the growth and biomass of primary producers. However, bacterial respiration often exceeds net primary production, which suggests that bacteria are subsidized by external inputs of organic matter. We hypothesize that bacterial growth efficiency (BGE) varies systematically between autochthonous and allochthonous carbon (C) sources and that this variation resolves the above conundrum. To test these ideas, we examined the ecological regulation of bacterial secondary production (BP), bacterial respiration (BR) and BGE in a series of lakes dominated by terrestrial (allochthonous) C inputs. BP was correlated with autochthonous C sources (chlorophyll *a*) even though the lakes were net heterotrophic (i.e. heterotrophic respiration consistently exceeded primary production). The results were simulated by a simple steady-state model of bacterial utilization of autochthonous and allochthonous dissolved organic C. A higher preference and greater growth efficiency of bacteria on autochthonous C may explain why BP is coupled to autochthonous production also in net heterotrophic ecosystems where the use of allochthonous C by bacteria is high. These results suggest that little of the allochthonous C assimilated by bacteria is likely to reach higher consumers.

KEY WORDS: Bacterial growth efficiency · DOC · Allochthonous · Autochthonous · Bacterial production · Models