Virus-like particle distribution and abundance in sediments and overlying waters along eutrophication gradients in two subtropical estuaries

Hewson, Ian, Judith M. O'Neil, Jed A. Fuhrman, William C. Dennison

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ABSTRACT: Viruses are recognized as ubiquitous components of marine ecosystems; however, there has been limited study of viral abundance and its ecological role in sediments. Viral abundance was determined in both the water column and sediments of a eutrophic (Brisbane River/Moreton Bay; 27° 25'S, 153° 5'E) and oligotrophic (Noosa River; 26° 15'S, 153° 0'E) estuary in subtropical Queensland, Australia. Viruses, bacteria, and microalgae from both water column and extracted sediment samples were enumerated using SYBR Green I staining and epifluorescence microscopy. Sediment viral abundance ranged from 10^7 to 10^9 particles cm^{-3} of sediment, bacterial abundance ranged from 10^7 to 10^8 cells cm^{-3} of sediment, and microalgal abundance ranged from 10^4 to 10^5 cells cm^{-3} sediment. Pelagic abundances for all microorganisms were 10-1,000-fold lower than sediment abundances. Correlations between viral abundances and suspended solids suggest that viruses sorbed to suspended material in the water column may settle out and contribute to the benthic viral population. Virus production was measured by a time course increase of viral abundance in seawater using a dilution technique. Virus production was highest in eutrophic waters of the Brisbane River, and addition of inorganic nutrients (NO_3^- + NH_4^+ + PO_4^{3-} + SiO_3) stimulated viral production rates at all stations by 14-52% above ambient, suggesting that inorganic nutrient availability may play a key role in aquatic viral abundance.