biocontrol activated-sludge filamentous bacteria overgrowth

Bacteriophages have potential to control foaming caused by Rhodococcus erythropolis in WWTP

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Activated-sludge is the most widely used biological process to remove pollutants from wastewater worldwide, mainly due to its economic advantages. Bacteria sum up around 95 % of the total microbial community of the activated-sludge, being responsible for most of the water depuration. Filamentous bacteria are normal components of these artificial ecosystems but their excessive growth leads to potential problems, mainly on the sludge settling (filamentous bulking) or on the formation of scums (filamentous foaming), dramatically reducing the efficiency of the wastewater treatment plants (WWTP). *Rhodococcus erythropolis* is a gram-positive filamentous bacterium previously identified as one of the sources of foams in activated-sludge.

The present work aimed at isolating and characterizing phages infecting R. erythropolis, using sewage water and mixed liquor from an urban WWTP as phage source.

Two phages were isolated (one from mixed liquor and the other from sewage) and further characterized genetically and biologically. The TEM analysis revealed that both phages belong to the siphovirus morphotype but with different sizes. The one step growth curve, carried at 28 °C in LB medium, revealed that the *Rhodococcus* phage isolated from mixed liquor and the one isolated from sewage have significant differences with latent periods of 110 min and 35 min, respectively, and burst sizes of 5 PFU/infected and 106 PFU/infected cell, respectively. Both phages were stable between 4 and 28 °C and between pH values from 7 to 10, which suggests good stability in the WWTP environment. Moreover, phages were able to maintain a *R. erytropolis* suspension at low levels for up to 30 h post-infection, using MOIs of 0.1, 0.5, and 1. Infection with the mixed liquor phage, maintained the bacterial reduction for 48 h in all MOIs tested. These results demonstrate the potential of using phages to control the problem of bacterial foaming in WWTP.