

Bacteria as transporters of phosphorus through soil - DTU Orbit (08/11/2017)

Bacteria as transporters of phosphorus through soil

The transport of phosphorus (P) from agricultural land has led to the eutrophication of surface waters worldwide, especially in areas with intensive animal production. In this research, we investigated the role of bacteria in the leaching of P through three agricultural soils with different textures, before and after the surface application of dairy slurry manure (*Bos taurus* L.). Leachates of intact soil columns (diameter 20 cm, height 20 cm) of loamy sand, sandy loam and loam were analysed for total bacterial cells measured by universal 16S rRNA genes, and compared with the P content of leachates. The number of 16S rRNA genes per bacterial cell was validated by real-time polymerase chain reaction (PCR) with a universal 16S rRNA gene primer set. Enumeration of bacterial cells by DAPI staining of cells extracted by density gradient centrifugation of the sandy loam estimated 4.6×10^5 16S rRNA genes cell⁻¹. Leaching of bacteria was in the range of $2.5\text{--}4.5 \times 10^5$ cells ml⁻¹ prior to application of slurry to the three soil textures. After slurry application, leaching increased to 1.1×10^6 cells ml⁻¹ in the loamy sand, 4.9×10^6 cells ml⁻¹ in the sandy loam and 5.0×10^6 cells ml⁻¹ in the loam. Based on the reported P content of soil bacteria, 0.3–1.8% of the total P leached was present in the bacterial biomass when no slurry was applied, whereas slurry application increased the leaching of P from the bacterial biomass to 3–7.9% of total P leached. Bacterial leaching was related to the particulate P fraction of leachates of the loamy sand and sandy loam, but was also related to both dissolved and particulate leachate fractions of the loam. These results indicate that bacterial transport might play a role in the leaching of P from soil where manure has been applied, but this mechanism of transport is generally not addressed when considering the leaching of P.

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