PRECIPITATION OF STRUVITE BY SOIL BACTERIA AND ITS POSSIBLE IMPLICATIONS IN HUMAN HEALTH

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Struvite ($NH_4MgPO_4 \times 6H_2O$) is biomineralized by soil bacteria in cultures *in vitro* but this mineral has rarely been described in natural soils. Struvite is abundant in materials from animal excrements (guano, animal manure, "ornithogenic soils" of the Antarctic tundra etc.). It also precipitates in waste-water treatment plants, where it causes problems by obstructing piping and conduits. The discharge of purified residual waters, which are often rich in N and P, constitutes an environmental problem in that it brings about the eutrophication of rivers, lakes and reservoirs. Thus considerable research has been conducted into the possibility of increasing the precipitation of struvite in residual waters. Furthermore, nitrogen in the form of NO^{3-} in drinking waters is a threat to human health because of its possible relationship with infantile methaemoglobinaemia and stomach cancer.

In this study we investigated the formation of struvite by soil bacteria from the A and C horizons of two Spanish saline soils. These bacteria were cultivated *in vitro* in culture media deriving from 1:1 extracts of the horizons and artificial saline solutions. In all culture media sufficient quantities of crystals appeared to be isolated and analysed by means of XRD and SEM-EDX. The crystals were mainly of aragonite, magnesium-calcite, and struvite. Nevertheless, neither in the fine-earth fraction (<2 mm) of the horizons nor in the accumulations of secondary soil carbonates (nodules and carbonate crusts) were any phosphates detected. Thus we may hypothesize that struvite is a metastable soil mineral, forming possibly in micro-sites and in seasonal periods with high bacterial activity and is subsequently dissolved by biological or inorganic mechanisms and thus becomes available as a nutrients source for the plants and/or microorganisms.

Metastable soil struvite has a buffering effect and would prevent the leaching of nitrogen to water, either on the surface or at depth. In addition to nitrogen, struvite contains phosphorus and magnesium and therefore it connects the biogeochemical cycles of all these elements and has the same buffering effect for P and Mg.

This study was supported by project CGL2008-04456/BTE of the Spanish Ministry for Education and Science.

Keywords: struvite