

TEM evidence for lead transport by bacteria in atmospheric deposition

N. PERDRIAL¹, F. ELSASS^{1,2} AND N. LIEWIG³

¹Centre de Géochimie de la Surface, CNRS-ULP, Strasbourg, France (perdrial@illite.u-strasbg.fr)

²PESSAC, INRA, Versailles, France (elsass@versailles.inra.fr)

³IPHC, Ecologie Physiologie Ethologie, CNRS-ULP, Strasbourg, France (Nicole.Liewig@c-strasbourg.fr)

Particulate matter (PM < 5) present in atmospheric deposition and subsurface soil water has been monitored during one year in two different, polluted and non polluted environments located in France. One site is a vineyard and the other one is a forest considered as an unpolluted reference site. Coupling TEM and EDX permits single-particle characterization (composition, structure, size and morphology).

PM in rainfall, leachate and soil solution show similar characteristics for both sampling sites: among more than 10000 characterized particles, 10 to 20% of the relative surface area is of biological type. Different morphotypes of bacteria and associated amorphous organic matter are regularly and significantly concentrated in lead. Lead is always associated with phosphor forming one or several granules confined inside the bacteria cell (Figure 1).

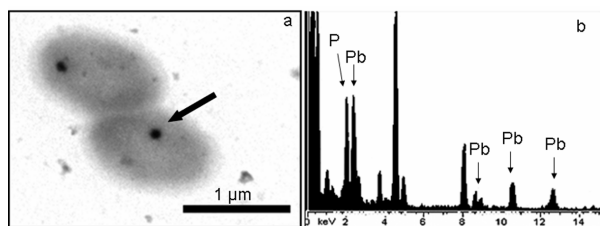


Figure 1. a) Bacteria with internal granules (arrow). b) EDX spectrum corresponding to arrow in figure 1.a)

Such lead enrichments inside internal granules have been previously shown (Roane, 1999; Suh *et al.*, 1999) in laboratory experiments. Our study proves for the first time such an occurrence in natural environments. The presence of bacteria in both rain water and soil water suggest an ubiquitous behaviour of microorganisms and an atmospheric origin for the lead. Even if the source of lead is not known, our result furnishes evidence for a microbial airborne lead transport.

References

- Roane T.M. (1999), *Microb. Ecol.*, **37**, 218-224.
 Suh J.H., Yun J.W., Kim D.S. and Song S.K. (1999), *J. Biosci. Bioeng.*, **87** (1), 112-115.

Estimating geochemical impacts of uranium mining exploitation: The evaluation of the natural background in the Beiras metalogenetic province (Central Portugal)

A.J.S.C. PEREIRA¹, L.J.P.F. NEVES¹ AND J.M.M. DIAS²

¹IMAR, Department of Earth Sciences, University of Coimbra (apereira@dct.uc.pt)

²Department of Earth Sciences, University of Coimbra (jmatosdias@mail.telepac.pt)

The evaluation of the geochemical and radiological impacts associated with uranium mining activities requires a comparison, for each environmental compartment, of data taken before and after the end of mining works. With a few exceptions, no environmental data is known for Portuguese old uranium mines regarding the natural background before exploitation. A possible way to overtake this limitation is to obtain data from areas which constitute a natural analog of those that were mined for uranium ores, but where exploitation did not occur. The Oliveira do Hospital area, located in Central Portugal, fulfil such requirements; here, late-tectonic Hercynian granites and pre-ordovician metasedimentary rocks dominate. 24 samples of surficial and groundwaters were collected in the region, as well as 14 samples of soil and 5 of stream sediments. These samples were analysed for more than 40 chemical elements, using several analytical techniques. The results obtained allowed to establish reference values for the geochemical background, taking into consideration central tendency and variability parameters. An important conclusion is that several elements are frequently concentrated by natural processes above the limits referred in the literature and/or legislation as indicating anthropogenic contamination (*e.g.* Ba, As, P and Be in soils, ²²⁶Ra in waters), which reinforces the interest of the evaluation of the local geochemical background, as an alternative to the use of global reference values.