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Identification by EFTEM of phosphate granules in microorganisms localized in the *Riftia pachyptila* tube

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The hydrothermal vent fluids from the East Pacific Rise (13˚ N) are known to contain high metal concentrations comparatively to the environmental sea water. Among the hydrothermal vent animal communities the tube worm *Riftia pachyptila* has been studied for its symbiotic metabolism, for the bioaccumulation of several metals by detoxication processes and for the morphogenesis of its tube. Some microrganisms were observed embedded in the Riftia tube wall and preliminary results showed that these microorganisms were quite different from the filamentous bacteria at the surface of the tube. Unlike the latter, the main characteristic of these microorganisms was the presence of an intracellular electron dense granule. Intracellular granules are often present in prokaryotic organisms and the presence of polyphosphate has been reported in more than 100 different species of bacteria. A variety of microorganisms accumulate large reserves of inorganic phosphate granules that are classified as amorphous minerals, considering the lack of cristalline. Inorganic polyphosphates (poly P) are found in volcanic condensates and deep-oceanic vents. Poly P are excellent ligands for certain cations. Intracellular poly P must therefore vary somewhat in elemental composition, depending on the cations that are bound to the poly P.

The aim of this work was to study the morphology and the distribution of these microorganisms inside the exoskeleton of *Riftia pachyptila*, the aspect and the location of the granules in the intracellular compartment and to identify the elemental composition of the granules using different approaches : EDX and EFTEM microanalysis.

The elemental composition in the microorganism granules obtained by EFTEM

(PEELS and ESI) microanalysis confirms the presence of the elements P, O and Fe detected by X-ray microanalysis . The ESI method precises that these elements are homogeneously distributed in the granules. These results with the fact that we observed nonmembrane-enclosed granules suggest that these granules are probably iron polyphosphate granules. The processes of iron deposition in Riftia granules, and wether these granules are involved in detoxication, accumulation of iron or if iron could further be used in metabolism remain to be determined.

Lechaire J-P., Shillito B., Frébourg G. and Gaill F. Elemental characterization of microorganism granules by EFTEM in the tube wall of a deep-sea vent invertebrate. Biol Cell, 2002, 243-249.