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Espace de l'Europe 11 — CH–2000 Neuchâtel
+41 32 930 19 19 — www.he-arc.ch/cr-rad

UNITÉ DE RECHERCHE DE LA HE-ARC CR

MICMAC

MICrobes for the Archaeological wood Conservation

OBJECTIVES

The MICMAC project focuses on innovative biological methods of extraction for the preservation of archaeological waterlogged wood. This is the first time biotechnology is addressing the issues of salt precipitation and acidification on waterlogged wood. Exploring biomineralizing capacities of bacteria presents an outstanding interest for developing advanced conservation technologies with no side-effect on health and environment compared to the traditional methods.

PROGRAM

Here is proposed an innovative alternative treatment where the extraction of unstable sulfur and iron species can be provided by naturally occurring microorganisms directly on still wet wood. To this purpose, three different metabolic processes either leading to the oxidation of sulfur or the complexation or reduction of iron will be studied : a) Oxidation of sulfur and sulfides by selected chemolithotrophic and phototrophic bacteria, b) Removal of iron(III) species using microbial complexing siderophores and c) Stabilization of the iron parts by precipitation of biomagnetite. The microbial mechanisms involved will first be deeply investigated over sulfur- and iron-rich phases. Then, a synergetic microbial co-culture will be specially designed and applied in accordance to conservation ethics. Hence, an innovative conservation methodology will be developed and finally assessed on model wood samples (artificially degraded or collected from archaeological excavations). Particular attention will be devoted to the efficiency and the impact on wood structure of the proposed treatment.

RESULTS

A completely opposite perspective is affirmed with the MICMAC project: microbes can safeguard heritage. Dealing with chemistry of microorganisms, this project opens new trends in the development of methods and materials for conservation. Hence, the bioremediation of sulfur and iron represents a pioneering and inventive research for the long-term preservation of waterlogged wood. Sustainable and eco-friendly conservation strategies are here initiated and a real progress is expected in terms of stability, effectiveness and decreased toxicity. In the future, the novel treatment could be converted in real praxis and directly employed by conservator-restorers.

FUNDING

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PROJECT LEADER

Edith Joseph
edith.joseph@he-arc.ch

PARTNERS

University of Neuchâtel, Archaeological service of Canton Bern and Swiss National Museum. Collaboration with other international stakeholders such as Univeristy of Basel (CH), Arc'Antique and University of La Rochelle (FR), Mary Rose Trust (UK), CNR-IVALSA (IT), Swedish Maritime Museums and University of Gothenburg (SE).

DURATION

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