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LIBRO degli ABSTRACT

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Blue Biotechnology and Cultural Heritage: case studies

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In order to promote innovative methodologies for conservation and restoration of historic-artistic manufacts, the efforts are focalized on the development of "*sustainable*" applications as alternatives to traditional restoration procedures, which can sometimes be detrimental for the artworks, humans and environment [1]. The role of Biotechnology in this field showed very useful applications for diagnosis of bio-deterioration of cultural assets, by an integrated methodology based on molecular and microbiological skills, and in bio-cleaning/bio-removing of organic/inorganic layers from artwork surfaces by enzymes or viable bacteria cells [2, 3]. In this work, bioactive molecules isolated from marine organisms were utilized for enzymatic removal of aged/degraded layers (waxes, re-paintings, glued paper, protective layers, consolidating products) both from laboratory specimens or artworks surfaces (paintings, mosaics, wax statues). Particularly, biocleaning protocols were carried out using bioactive molecules with Protease and Esterase activity. The enzymes were utilized in water solutions gelled by Klucel-G or Carboxymethyl-cellulose gelling–agents, guaranteeing a controlled and selective action. These novel enzymes showed important advantages: they are active at temperature lower than 30°C, they need a reduced time of application (10-20 minutes), are safety for both operators and environment [4]. In our hypothesis, these molecules provide an important contribution to the development of sustainable innovative protocols.

[1] Tomei F, Baccolo TP, Papaleo B, Biagi M, Signorini S, Persechino B, Rosati MV (1996). Effects of Low-Dose Solvents on Blood of Art Restorers. Journal of Occupational Health, 38: 190-195.
[2]Palla F (2013). Bioactive molecules: innovative contributions of biotechnology to the restoration of Cultural Heritage. Conservation Science in Cultural Heritage, 13, 369-378.
[3] Ranalli, G., et al. (2005). Biotechnology applied to cultural heritage: biorestoration of frescoes using viable bacterial cells and enzymes. Journal of applied microbiology 98, 73-83.
[4] Barresi G, Di Carlo E, Trapani MR, Parisi MG, Chillè C, Mulè MF, Cammarata M, Palla F (2015). Marine organisms as source of bioactive molecules applied in restoration projects. Heritage Science, 3 (3), 17-20.

Bioremediation of oil-contaminated water using scaffold-bacterial biofilm systems

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Bioremediation is a promising non-invasive and cost-effective technology that uses (micro)organisms to degrade or remove hazardous environmental pollutants. New methods are needed to enhance and optimize natural biodegradation, such as the use of carrier materials that could improve survival and catalytic activity of the biodegraders. In this study, we developed a bioremediation system based on a new 3D polycaprolactone-based scaffold and hydrocarbon(HC)-degrading bacteria to clean (sea)water contaminated by crude oil and its derivatives. Scaffold biopolymers are biodegradable, produced in the melt, i.e. at low cost and without the use of toxic solvents. They can be available in large quantities and are endowed with a marked lipophilicity[1]. The bioremediation efficiency of our system was tested on crude oil and *n*-alkanes using two highly performant HC-degrading bacterial strains: the marine hydrocarbonoclastic model strain *Alcanivorax borkumensis* SK2 and the soil long-chain *n*-alkane degrader *Nocardia* sp. SoB. A high capacity of adhesion and proliferation of bacterial cells within the whole three-dimensional structure was observed using scanning electron microscopy. The bacterial degradation ability of HC-embedded scaffold was