

MARINE ORGANISMS AS SOURCE OF BIOACTIVE MOLECULES APPLIED IN RESTORATION PROJECTS

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Polypeptides isolated from marine invertebrate organisms (Cnidaria) were tested as bioactive molecules (BM) in order to remove (hydrolytic-peptides) protein/oily layers or to control (antimicrobial-peptides) the microbial colonization onto artifacts surfaces. Particularly a protease activity (BMP molecules) was revealed, showing a very good hydrolytic activity against animal-glue, in a range of temperatures of 19-26°C, corresponding to temperature of laboratory environments where the bio-cleaning tests were performed.

Tab 1. Bio-cleaning tests by experimental and commercial protease and lipase.

<i>Hydrolase Activity</i>	<i>Layers</i>	<i>Molecules</i>	<i>Removal efficiency</i>		<i>Control</i>
			<i>5 min</i>	<i>10 min</i>	
<i>Protease</i>	<i>Rabbit skin glue</i>	<i>BMP</i>	+++	++++	-
		<i>Protease Type XIX</i>	++	++++	-
<i>Lipase</i>	<i>Flax oil</i>	<i>BML</i>	+	++	-
		<i>Lipase Type VII</i>	+	++	-

Lipase activity (BML molecules) was assayed on aged oily layers, performing the cleaning test in the same environmental condition above described. These tests were carried out without heating the surface and by a controlled procedure avoiding damages to the constitutive materials (criteria required for a correct conservative-restoration procedure). In parallel, enzymatic cleaning test by commercial Protease (Type XIX) and Lipase (Type VII) was performed following the conditions indicated by the company (Sigma).

Cleaning results by experimental (BMP, BML) and commercial (*Protease Type XIX* and *Lipase Type VII*) enzymes are summarized in Table 1; a control reaction (mixture without enzyme) was performed in each experiment.

Antimicrobial activity of bioactive molecules (BM1, BM2) was revealed against fungi (*Aspergillus* and *Penicillium* spp.) and bacteria (*Bacillus* and *Micrococcus* spp.) colonies, identifying the Minimal Bactericide/Fungicide Concentration (MBC/MFC), Table 2.

Tab 2. MBC/MBF concentrations of bioactive (BM1, BM2) molecules. The commercial Nipagine (Methylparaben) was utilized as control.

Bioactive Molecules	[mg/ml]	<i>Antimicrobial activity</i>			
		<i>Bacillus</i> sp	<i>Micrococcus</i> sp	<i>Aspergillus</i> sp	<i>Penicillium</i> sp
BM 1	2,8	+	+	+	+
BM 2	0,4	-	-	-	+
Nipagine	2,5	-	-	+	+

We hypothesize that the use of these molecules will give an important contribution to the development of innovative and efficient technologies, concerning bio-cleaning and antimicrobial growth protocols, according to conservative restoration procedures.

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References

Bertuzzi, F., Cuttita, A. Mazzola, S., Salamone, M., Seidita, G., Ghersi, G., 2009, Enzimi proteolitici, strumenti potenzialmente utili per la pulitura di manufatti. In: *Convegno Nazionale AIAR - Sistemi Biologici e Beni Culturali, Area Tematica Biologia e Biotecnologie*, Ed. Palla, F., Assessorato dei Beni Culturali, Ambientali e della Identità siciliana, Palermo, 265-277.

Cremonesi, P., 1999,. *L'uso degli enzimi nella pulitura di opere policrome*, Editrice il Prato, Padova.

Palla, F., Cammarata, M., Trapani MR., Billeci, N., Sebastianelli, M., Salamone, M., Ghersi, G., 2013. Novel proteases from marine organisms with potential interest in restoration procedure. In: *Science and Technology for the Conservation of Cultural Heritage*, Eds Rogerio-Candelera, MA., Lazzari, M., Cano, E., CRC Press - Taylor & Francis Group, London, 279-282.

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Palla, F., Cammarata, M., Trapani MR., Salamone, M., Gherzi, G., Sebastianelli, M., 2012. Removal of old protein layers from surfaces of works of art by new enzymes. In: *International Symposium on the Conservation and Restoration of Cultural Property*. National Research Institute for Cultural Properties, Tokyo, 79.

Palla, F., Cammarata, M., Salamone, M., Sebastianelli, M., Cuttitta, A., Tutino, L., Parisi MG., Billeci, N., Gherzi, G., 2012. Bio-pulitura: proteasi da organismi marini. In: VII Convegno Nazionale AIAR, 22-24 Febbraio, Modena, 312-320.