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# ENZYMATIC MONITORIZATION OF MURAL PAINTINGS BIODETERIORATION

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***Abstract***

*Biodeterioration of mural paintings by microorganisms is an important research field that needs novel approaches to fully understand the mechanisms and effects. In this work, the presence of microorganisms and their biological activity were investigated by extra and intracellular enzymatic monitorization. The enzymes arylsulphatase, β-glucosidase, dehydrogenase and phosphatase were used as biomarkers of the microbial metabolic activity, and the viability cellular assays revealed a relationship with the degradation levels of the paintings. In this way, the metabolic activity of the microbial population can be correlated with the contamination levels detected and with biodeterioration status of the paintings.*
*Therefore, enzymatic approaches constitute good biomarkers to be applied in this research field and are useful to detect biodeteriogenic agents.*

***Keywords:*** *mural paintings; biodeterioration; enzymatic monitorization; viability assays*

## Introduction

Mural painting is not only a form of art but also a way to learn more about our ancestral traditions. Biodeterioration is a serious risk to Cultural Heritage, which needs the application of effective and fast methods in order to identify the microorganisms involved in this process and to assess their biodeterioration ability [1]. The term biodeterioration is defined as unwanted alteration in a material caused by the activity of biological agents. Biodeteriogenic organisms have the ability to use a substrate to sustain their growth and reproduction, producing alterations [2]. Several microorganisms can grow on various materials, causing their biodeterioration. In fact it is a complex process that illustrates the interaction of living microorganisms with its substratum and environment [3]. Some microorganisms have the capacity to degrade mural paintings and its biodeteriogenic ability in synergy with other physical and chemical agents may increase the damages [4,5].
The microbial flora present in artworks, like mural paintings, may result from the successive colonisations by different microorganisms. Their biological attack occurs at favourable temperature

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