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## Role of microorganisms in mural paintings decay

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**ABSTRACT:** In this study we focus on three different cases of mural paintings alteration due to the presence of microbial communities. The formation of oxalates, lead pigments oxidation and carotenoids development noticeably contribute to murals and mortars alteration, and are correlated in this study with the presence of biodeteriorative microorganisms. These alterations, attributed to metabolic activity of microorganisms, promote polychromy degradation of specific pigments, efflorescence's appearance and biofilms formation, culminating in some cases, in structural damage affecting mortars integrity.

The study of the mechanisms underlying the microbiological attack of mural paintings has been explored to understand as much as possible the proliferative ability and biodeteriorative capacity of microorganisms.

The biodeterioration/biodegradation of these mural paintings is an important issue for the conservation of cultural heritage that needs urgent answers to their rehabilitation.

### 1 INTRODUCTION

Chromatic alterations, stains appearance, biofilms formation, cracks and detachment of some fragments are the main damages that occur in mural paintings. These alterations promote serious aesthetic and structural problems that need to be signalised and characterised to fully understand the deterioration process (Capodicasa et al. 2010, Pepe et al. 2011). In this way, the present work focus on the role of microorganisms in surfaces alteration.

Filamentous fungi, yeasts, bacteria, algae and lichens constitute the commonly microbiological agents present in artworks, whose development is supported by favourable temperature, relative humidity conditions and nutrients availability (Borrego et al. 2010, Nugari et al. 1993). Thus, to give an overview about the microflora involved in the biodeterioration/biodegradation processes, it is necessary to use different approaches in order to characterise the coloniser population, to assess their physiological/biological potential and to identify the alterations caused in the materials. In this way, culture dependent methods and DNA based approaches provide useful information about the microbial population present. However it is also important to understand if the microorganisms are metabolically active, and for this purpose viability assays must be considered as an accurate measure of the microbial oxidative activity (Stege et al. 2009, Taylor et al. 2002). This information together with the alteration products characterisation could be a good indicative to identify the biodeteriogenic agents responsible for the decay of these artworks.

Therefore, the aim of this study is to understand the influence of microbial communities on the alterations/degradation of the mural paintings.