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# The Contribution of Microbiological Research in the Field of Book, Paper and Parchment Conservation

## Abstract

Paper is an organic substrate that provides a good medium for the growth of certain fungi, and bacteria, especially cellulolytic strains. The infection and colonisation of paper by fungal spores and propagules take place mainly through air-dispersion, although direct inoculation of both fungi and bacteria by human handling or by insects and mites, as vectors, can occur. Fungal and microbial development start when there is water available in paper, although the amount of water needed for spore germination and mycelium growth varies according to the fungal and bacterial species involved. In addition, each strain can cause different kinds of degradation phenomena, and particular grades of paper can interact differently with the structures and pigments produced by biological agents. In this contribution, some modern and innovative methods applied to microbiological research for book and paper conservation are presented and discussed. In particular, molecular biology techniques, enzymatic methods and variable-pressure scanning electron microscopy and microanalysis are addressed to case studies of historical value. The application of molecular biology techniques on cultural heritage environments has shown that new spoiling taxa and unsuspected microbial consortia are involved in the discolouration and biodeterioration of books and paper-supported works of art. Moreover, the investigation by means of enzymatic and microscopy techniques of the interaction between the microbial flora, responsible for damage, and the organic and inorganic structural elements in paper proved to be fundamental, in order to understand the mechanisms at play and the degree of alteration found in materials of cultural value.

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