2014•中国•敦煌

文物的生物退化与防护国际学术研讨会

日期： 2014 年 8 月 20 日（周三）~ 8 月 22 日（周五）

会场： 敦煌研究院 保护研究所 学术报告厅

主办： 敦煌研究院

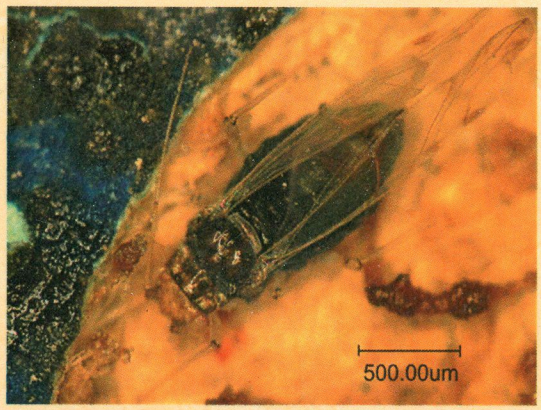
兰州大学

国际生物腐蚀与生物降解学会

国家古代壁画与土遗址保护工程技术研究中心

承办： 敦煌研究院 保护研究所

兰州大学 生命科学学院



International Symposium on Biodeterioration and Protection of Cultural Heritage

Dunhuang. China. 2014

Dates: August 20 (Wed.) – 22 (Fri.), 2014

Venue: Academic Hall, Conservation Institute, Dunhuang Academy

Organizers: Dunhuang Academy

Lanzhou University

International Biodeterioration & Biodegradation Society

National Research Center for Conservation of Ancient Wall Paintings and Earthen Ruins

Undertakers: Conservation Institute, Dunhuang Academy

School of Life Sciences, Lanzhou University

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大会报告摘要

Conference Reports Abstracts

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Invited report 5:

Biotechnology: Innovative Contributions to the Conservation and Restoration of Cultural Heritage

Franco Palla

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Abstract: As exhaustively showed during the conference "Molecular Biology and Cultural Heritage", held in Seville in 2003, molecular biology represents an important source of insight for the development of innovative protocols for the detection and characterization of microbial consortia colonizing historic-artistic manufacts. In particular, fungi and bacteria (frequently associated with green algae, cyanobacteria, lichens, etc), wide-spread in biosphere environments, are the main biological systems related to deterioration of cultural asset. Moreover in the aerosol of indoor environments, whre the manufacts are exposed or stored, complex microbial communities may release some molecules with human (visitors, professionals) health damaging properties, that may persist during the time. In order to identify the biological systems on artworks surface and/or dispersed in the aerosol, an integrated morphological-molecular protocol based on microscopy (OM, SEM, CLSM), *in vitro* culture (colonies isolation) and amplification of DNA target sequences (PCR, sequencing, sequence-comparison) have been applied. Non invasive samplings were performed by sterile swab, adhesive tape or Nylon H+ membrane (Amersham) on work of art surfaces, while aerosol sampling by portable AirPort MD8 sampler (Sartorius), equipped with disposable gelatine filters.

Recently, in our laboratory, new bioactive molecules (BMs) extracted from marine invertebrates organisms have been characterized and tested in order to remove protein layers (bio-cleaning by Proteolytic-peptides = BMP) or to control the bacteria and/or fungi colonization onto artifacts (Antimicrobial-peptide = BMA).

The action of cleaning represents one of the most important step in restoration projects, such as take out organic layers (animal glue or other protein mixtures, frequently deteriored) stratified onto the manufact surface. Cleaning must be selectively performed, making distinction between different areas, removing the deposits without acting directly to original materials of the manufact.

Particularly interesting is that the Proteolytic-peptides (BMP) start to act from 4°C up to 37°C. We tested the BMP molecules on different substrates and temperatures, between 19-26°C. The related commercial enzymes, actually used in bio-cleaning procedures, work at specific range of temperature $\geq$ 37°C; temperature value represents a limit in the use of these enzymes, since the heating of manufact surface is usually not available. The opportunity to apply BMP molecule on several substrates, both organic and inorganic (canvas, wooden, ceroplastics, mosaic, frescos), without heating (surface or enzyme solution), improve the efficiency of bio-cleaning protocols, according to the conservative-restoration procedure.

Concerning BMA peptides, their Antimicrobial (biostatic-biocide) activity was in laboratory preliminary assessed; particularly against *Bacillus* / *Micrococcus* and *Aspergillus* / *Penicillium* colonies. We focalized the attention on the painting lining process, usually performed by new canvas (natural or synthetic) layers glued by rabbit- skin or others animal adhesives to the *verso* of degraded paintings; generally, this procedure is performed by using a heat source (iron). This heating-treatment and the presence of organic compounds (glue) can induce microbial colonization.

Since these methodologies are totally safe for the operators and environment, are low

time-consuming, they can be considered as a sustainable alternative to the traditional procedures.

Report 1:

Advancement and Prospect of Biodeterioration and Protection of Cultural Heritage in China

Wang Wanfu

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Abstract: Biodeterioration and biodegradation are widely existed problems in cultural heritage conservation and protection, the structure of precious cultural relics like ancient wall paintings will be destroyed by the growth and metabolism activities of organism, the aesthetic value of these cultural relics will be impaired, the permanent conservation and inheritance of cultural relics and heritage will be seriously threatened. Therefore, we had lots of in-depth study at home and aboard in the field of disease-caused organism and the biodeterioration mechanism that have threatened cultural heritage, and we made important progress in this field. However, how do we build a integrated conservation and control system for organism diseases that can work efficiently, environmentally beneficial and sustainable is still one of the key technique problems that needs us to solve. Firstly, this study depicted the current situation of different kinds of biodeterioration of cultural heritage in China; the statistics analyzed the most important fields we worked on that related to biodeterioration of cultural heritage, the category of research achievements and achievement quantity in China in recent 20 years. Secondly, we summarized the main achievements and big progress in the study of cultural heritage biodeterioration mechanism of our project team and other research teams in China. Thirdly, it indicated the main problems we have on domestic cultural heritage conservation agencies, scientific and technological talents, technology systems, current research situation, funding support and so on. Finally, it brought up our conception to build a subject system of Cultural Heritage Conservation Biology, emphasised the extremely importance of the construction of talents groups and gave an outlook for the possible development directions, and the research in the key fields of biodeterioration and conservation of cultural heritage.

Key words: Cultural heritage; Biodeterioration; China; Research status; Prospect; Biodeterioration and Biodegradation

Report 2:

Microbial Diversity in Wall Paintings of Mogao Grottoes and Xu's Tomb

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Abstract: In this study, we aimed to detect seasonal dynamics of airborne microbes, and microbial diversity on the surface of Dunhuang paintings. We also want to find origins of microorganisms associated with biodeterioration of paintings. The aerosols and painting samples were also analyzed to find distribution patterns of microbial communities inside Xu Xianxiu Tomb, and the relationship between painting microbial community and air circulation was also concerned. Samples from murals were carefully collected by sterile scalpel and sealed in eppendorf tubes.