

IBBS World



Newsletter of the International Biodeterioration and Biodegradation Society



The IBBS, in conjunction with BACS, is pleased to be organising their major conference "Disinfection and Decontamination in Hospitals and Healthcare". This meeting is being held in conjunction with the forthcoming publication of a reference book of the same title and the main speakers are some of those who have made contributions to this book. The keynote speaker is Prof Brian Duerden who has recently retired as the inspector for microbiology at the UK Department of health and who in this role was responsible for the introduction of current hospital disinfection and decontamination regimes. The registration deadline is fast approaching so if you are interested in attending or want further details please see the following website address: <http://www.ibbsonline.org/disinfection/>

Winchester Meeting 2012: Best Poster Report

Bioinspired Synthetic Seaweed: Stolen Solutions as Antifouling Materials.
James Chapman, City University, Dublin.

In this work we aimed at stealing an antifouling solution straight from nature, known more formally as "bioinspiration". In particular, 4 brown seaweeds native to the UK and Ireland were chosen as examples in producing their antifouling defence mechanisms. It has already been reported abundantly that seaweeds produce their own chemical defence mechanisms, and so we wanted to probe whether any other features in the seaweed also invoked this antifouling property. In this paper we challenge the possibility that surface topography and surface roughness as well as the combinatory effect of chemical defence also contributed to the antifouling property of the specific macroalgae. In short, seaweed surface's were artificially replicated through a series of moulds and templates using a low surface energy polymer poly dimethylsiloxane (PDMS) creating a topographically active replicate. Additionally, in order to investigate the chemical activity also produced by seaweeds, we doped a brominated furanone extracted previously by Hellio and Co-workers into the PDMS matrix – this investigating and comparing combinatory bioinspired antifouling defence mechanisms taken from nature. The materials were then tested in the lab and field, where it was found that combinatory chemical and topographically active seaweed replicates showed far superior antifouling properties to single approaches.



Editor's Notes

This is my first opportunity to be your guest editor and write this column since I was IBBS President way back in the mists of time. My only memory of that particular issue was that the then secretary, Sue Surman, surreptitiously inserted a picture of myself asleep on a train following a highly successful IBBS disinfection meeting in Wageningen, The Netherlands. Coincidentally next month the IBBS is holding another disinfection meeting (see information opposite) in Manchester on another aspect of disinfection i.e. hospital and healthcare disinfection also including decontamination. I shall not be travelling by train and look forward to seeing many of you there.

Malcolm Greenhalgh

If you have any news, meetings etc. you would like us to publicise, please contact us at secretary@ibbsonline.org

Student Bursaries

The IBBS Council invites applications for small bursaries (£250) to help undergraduate microbiology student projects. Applications must be made on behalf of named students by IBBS members in higher education or research institutes. The research project must be on a biodeterioration or biodegradation topic. The closing date for 2013 applications is 31st October 2013 with April 1st 2014 being the next date. For further details and an application form please contact the IBBS secretary at: secretary@ibbsonline.org

Conference Report “Biodeterioration of Wood and Wood Products” BWWP 2013

The Second International Conference “Biodeterioration of Wood and Wood Products” BWWP 2013 was held in Tartu, Estonia, from 24th to 27th of April, 2013. The meeting was organized by: IBBS, Estonian Mycology Research Centre, Latvian State Institute of Wood, Estonian University of Life Sciences and Tallinn University of Technology. Ninety-three delegates from Brazil, Denmark, Estonia, Finland, Germany, Hungary, Italy, Latvia, Lithuania, Netherlands, New Zealand, Norway, Poland, Portugal, Republic of Korea, Russia, Slovenia, Spain, Sweden, Switzerland, and United Kingdom were offered fascinating mix of presentations in three parallel sessions and five topics.

At the opening session after the opening words by the Tartu City Council chairman and Vice-Rector of Studies of Estonian University of Life Sciences, FEMS delegate introduced FEMS, its activities and forthcoming conferences. The topic “Biodeterioration of wood by fungi” attracted more speakers than any other conference topic. There were four sessions. Due to the high number of presentation there were a variety of subjects discussed – microscopy, soft rot, moulds, different laboratory and field testing, fungi and bamboo, etc.

There were two sessions in the topic “Biodeterioration of wood by wood boring insects”. In the first session Uwe Noldt gave an overview of different studies of the last two decades about the topic as a keynote lecture. The second session was about termites, the damage they cause and their resistance to different wood modification treatments.

The topic “Waterlogged wood” had also two sessions with two very interesting keynote lectures. Rene Klaassen was talking about wooden pile foundations research in the Netherlands and Yoon Soo Kim about rare research about waterlogged archaeological bamboos excavated from a shipwreck which were more than 800 years old. There were also two presentations about chemical analyses of the archaeological waterlogged wood in Italy and one about the research made in New Zealand about the effectiveness of on-site remediation treatment for framing timber.

The topic “Condition assessment of wood biodeterioration with non-destructive methods” was carried through by two sessions with keynote speakers of Peter Niemz, Joseph Creemers and Ferenc Divos. Generally speaking there has been a quite large development – expanded in scale of possible non-destructive methods and devices to assess timber structures damaged by biodeterioration in situ. This gives us better opportunities to evaluate the serviceability of buildings and structures, extend its service life, and also to preserve as much as possible.

Johan Mattsson was the invited speaker for the topic “Wood conservation (incl. cultural heritage)”. Having wide range of experience in the field he introduced the development of protecting wood against the decay to conserve heritage wood. Most of the presentations in this topic introduced the studies of deteriorated heritage objects or buildings.

There were very high quality posters in every topic and organizers announced a poster prize in the end of the conference. After long discussions the Scientific Committee members decided to give it to Magdalena Zborowska et al. for a poster entitled “The examination of dynamics of wood degradation process in the wet peat and lake conditions” because of its good structure for a poster which made it easy to follow and its scientific content – methodology and data that was used, and new knowledge and ideas presented.

Due to the three parallel sessions it was very important to have a conclusive session. All presenters gave a thorough overview of what was talked about and what new approaches were found in the specific topic. As a feedback from participants the conference was very interesting and significant for sharing the new research results and discussing the ideas with the colleagues from so many different countries.

Kalle Pilt & Kristel Pau

FEMS Congress (July 21st-25th 2013)



Leipzig Convention Centre was the venue for the fifth FEMS Congress. Over 2,300 delegates from all over the world descended on the site in the sun to hear presentations on a variety of topics. It is always fun to ‘lucky dip’ at such large conferences, listening to topics that are not directly relevant to one’s research. I learnt a lot about emerging viruses from some excellent speakers who conveyed difficult science in a really accessible way. In addition to the more traditional scientific presentations, there were several special events, one of which was a call

for interest in microbiology education. Over 50 delegates listened to speakers from across Europe describe the issues which face them: the need for dissemination and sharing of information and resources, translation of key materials, opportunities for collaboration were amongst the points raised. In another session, Anne Glover, Scientific Advisor to the EU (and a microbiologist) noted the need for a unified voice of microbiology in Europe and emphasised that scientists need to communicate their evidence to appropriate audiences as part of their job. It was a very useful conference: FEMS offers bursaries to young scientists, and I recommend this opportunity to anyone eligible.

I represent IBBS on FEMS Council, and I also presented a poster describing the production of our forthcoming publication ‘An Atlas of Biodeterioration’, developed from our series of education leaflets. Perhaps in future we can get some lectures on our research at FEMS as well!

Joanna Verran



8th Latin American Biodeterioration and Biodegradation Symposium - 8 LABS Hotel Continental, Porto Alegre, Brazil. 7th – 10th April, 2013

8 LABS took place in a beautifully sunny Porto Alegre in April this year. It was attended by 137 delegates from Argentina, Brazil, Canada, Germany, Mexico, Serbia, United Kingdom, USA. Dr Fatima Bento, the President of the Symposium, was ably assisted during the event by students and staff from the Federal University of Rio Grande do Sul (UFRGS). In addition to oral presentations by invited keynote speakers (including our President, Geoff Robson) and selected offered papers, 50 posters were presented. The Symposium was funded by the Brazilian national funding agencies, CNPq and CAPES, the United States Office of Naval Research Global, and the industries Actoil and Ipiranga Petrochemicals. IBBS and UFRGS were the sponsoring organizations. The opening ceremony was followed by a cocktail session in the beautiful enclosed terrace of the Hotel Continental. Both were accompanied by music from a string quartet and a singer who managed to make the Brazilian national anthem sound like an opera piece. On the final day, a round table was held with all the keynote speakers remaining. The conclusions of those discussion are included in the following brief summary.



Symposium President Dr Fatima Bento

Biodeterioration

It seems that the mechanisms of biodeterioration of materials are broadly understood, but complex interactions between microorganisms and processes, together with the kinetics of the processes, are still important areas of research. Syntropy between aerobes and anaerobes, exemplified by Brenda Little's talk on biodeterioration in alternative fuels, could be an interesting aspect. In the area of museums and cultural property in general, however, biodeterioration is little understood or even, sometimes, acknowledged by workers in the fields. Christine Gaylarde's talk on biodeterioration of historic buildings showed that much is known about the organisms, but not necessarily the processes, involved.

There is a need for new and environmentally acceptable control methods. Two keynote speakers, Carol Clausen and Helmut Schmid, spoke of nanotechnology for protection of surfaces. The development of microbial resistance, or tolerance, to such materials is still to be investigated. Blanca Rosales' presentation showed that the development of surface biofilms on metals depends more on the material than on the presence of the inhibitor arsenic (found in Argentinian water distribution systems), but bacteria with high resistance to As were detected in the biofilms. Biocontrol, at present in its infancy, should be a growing area. Future developments could also include the design of "smart" materials based, for example, on naturally resistant surfaces. There must be new ways of thinking on new materials. The development of new building materials, or new ways to treat old materials to increase their resistance to biodeterioration, was considered by Vanderley John. The importance of climate and climate change must also be taken into account, as exemplified in Marcia Shirakawa's presentation on biodeterioration of building materials.

There will always be a need for new methods to detect and quantify deteriogenic organisms and risk factors. Fred Passman's keynote presentation, made via Skype, pointed out the importance of asking the right questions and sampling from the right areas. Iwona Beech's talk gave an insight into the use of innovative techniques for the detection of biodeterioration processes. The interpretation of results from such new methods is still a challenge, but this type of research could lead to the development of new sensors to assess biodeterioration risk and degree.



Biodegradation and Bioremediation

The use of natural degradation to remove wastes was included in the Geoff Robson's presentation on plastics. The energetics of the processes involved must be studied. How are the processes driven? Important areas of research, covered in the Symposium by Vivian Pellizari, Joe Suflita and Charles Greer, include metagenomics, metabolomics, proteomics and transcriptomics. Mathematical modelling could be an important tool for manipulating biodegradation processes.

Importance in Brazil

As a country with tropical and sub-tropical climates, Brazil has immense problems with biodeterioration of materials, and, as a country much aware of ecological issues, needs to develop and employ more natural processes of biodegradation and bioremediation for the treatment of wastes and pollution. There is a fundamental need for training in these areas, all of which are multidisciplinary subjects that require collaboration between specialists. The Brazilian government has made available a number of grants which could be used to allow such training and collaboration with other countries and some of the foreign invited speakers offered their laboratories as potential receiving institutions. The great importance of funding to further increase the scientific efforts of Brazilian researchers, especially outside the relatively well-funded South-Eastern area, was emphasized during the round table.

Finally, it was reported that the 9th Latin American Biodeterioration and Biodegradation Symposium is likely to take place in Chile.



Christine Gaylarde

The Symposium Dinner

Student Bursary Report

The award provided an important contribution to a project to examine the biodeterioration of ancient parchments at the ICRCPAL - Istituto Centrale per il Restauro e la Conservazione del Patrimonio Archivistico e Librario in Rome, Italy, by Flavia Pinzari, with the collaboration of Prof. Anna Rosa Sprocati (ENEA, Italy). Parchment was for many centuries the most common writing material. It is derived from untanned animal skins derived mainly from sheep and was usually prepared using alkaline salts such as lime and sodium chloride. The biodeterioration of parchment results in different kinds of damage, depending on the microorganism responsible.

This study began with the examination of biological attack on a XVII Century document (an Italian Notary deed from Siena, Italy) (Fig. 1a), and the effects of bacterial and fungal activity on material's components. A preliminary surface study using Scanning Electron Microscopy (SEM) showed the presence of both fungi and bacteria as well as needle-like crystals associated with bacterial spores (Fig. 1b).

A number of the bacterial and fungal species were isolated and identified, with the ability of some bacterial strains to precipitate salts and minerals being observed (Fig. 1c). Those bacteria responsible for bio-mineralisation were identified as different morphotypes of a species of *Virgibacillus*. EDS analysis showed crystals from parchment and in vitro to be composed of Na, Cl, P, Mg and K (Fig 1d). The *Virgibacillus* strains (one species, two different morphotypes) were proteolytic, moderately halophilic and showing an ability to produce struvite crystals. Several fungal species were isolated, particularly, *Acrostalagmus luteoalbus* (Link : Fr.) Zare, W. Gams & Schroers which was identified through both molecular techniques and SEM imaging. Other fungal strains found within the purple stains of the parchment were *Penicillium chrysogenum*, *Cladosporium cladosporioides*, *Eurotium amstelodami*, *Chrysosporium submersum*. The purple spots on the parchment were heavily colonised with both bacterial and fungal species (Fig 2). This indicated the need to investigate the metabolic role of each isolate so as to assess any potential interspecies interactions which could increase the biodeterioration of the material.

A Biolog Phenotype Micro Array (PM) technique (Biolog Inc., Hayward, CA) was employed to investigate metabolic properties of the isolates. Pure cultures were inoculated into Biolog FF and GENIII microplates (Fig 3a). The optical density at OD490 (optimum mitochondrial activity) was measured after 24, 48, 72, 96, 168, 192 and 240 h using a microplate reader. The data obtained was used to calculate the percentage overlap of the nutritional properties of the isolates. The percentage overlap is a measure of the "actual area of overlap of the resource utilization curves of two species" (Krebs, 1999). Results are summarised in Fig 3b, where a coloured plot indicates the degree of metabolic overlap between the species co-colonising parchment. In this study were able to examine the interaction between species in the complex phenomenon of parchment biodeterioration.

Livia, Flavia and the ICRCPAL wish to thank the IBBS for their support that allowed us to undertake this work.. A publication is planned.

Fig 1, a) Degraded Parchment showing biological damage **b)** SEM image in high vacuum mode of crystal produced by bacteria on parchment; **c)** SEM-QBSD image of a crystal produced by bacteria in vitro; **d)** EDS spectrum of the biogenic crystal produced by the bacterium.

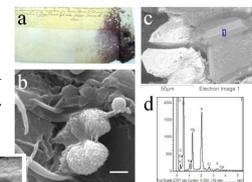


Fig 2. A Scanning Electron Microscope image showing the occurrence on parchment of both fungal and bacterial cells

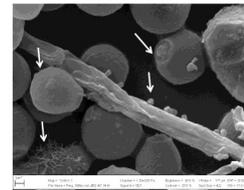
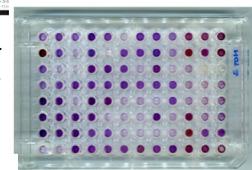


Fig 3, a) A Biolog Phenotype Micro Array GENIII microplate, post inoculation with *Virgibacillus* strains and after mitochondrial activity. Note: the colouring is due to the redox dye present in the wells;



3b) the results of niche overlap index calculations, which measure the degree of metabolic overlap between species co occurring on parchment (NOT1, *Virgibacillus* strain 1, NOT2, *Virgibacillus* strain Al=*Acrostalagmus luteoalbus* Pc=*Penicillium chrysogenum*, Cc=*Cladosporium cladosporioides*, Ea=*Eurotium amstelodami*, Cs=*Chrysosporium submersum*).

	NOT1	NOT2	Pc	Cc	Ea	Al	Cs
NOT1	100.0	84.4	84.4	66.7	80.9	60.5	84.1
NOT2	84.4	100.0	83.7	74.1	77.4	66.8	77.3
Pc	84.4	83.7	100.0	69.8	76.8	64.0	79.3
Cc	66.7	74.1	69.8	100.0	78.4	83.9	71.4
Ea	80.9	77.4	76.8	78.4	100.0	69.5	84.2
Al	60.5	66.8	64.0	83.9	69.5	100.0	61.6
Cs	84.1	77.3	79.3	71.4	84.2	61.6	100.0

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Livia Martinelli & Flavia Pinzari

Future Meetings

Eurobiofilms 2013, The Third European Congress on Microbial Biofilms – Basic and Clinical Aspects, Ghent, Belgium September 9th - 12th 2013 Details at: <http://www.eurobiofilms2013.ics.dk>

International Conference on Advanced Technologies for Management of Ballast Water & Biofouling (MABB 2014) CHENNAI, INDIA 4th -7th March 2014

Details at: <http://www.niot.res.in/m5/mabb/index.html>

IBBS-16, Lodz, Poland September 3rd-5th 2014. Further details posted at: <http://www.ibbsonline.org/meetings.htm>