



Federation of European Microbiological
Societies



Alma Mater Studiorum
University of Bologna

International Summer School
***“Biomonitoring, bioavailability and microbial
transformation of pollutants in sediments and
approaches to stimulate their biodegradation”***

Magazzini dell'Abbondanza, Genoa, Italy
September 12-14, 2005

Directors: Prof. Fabio Fava, University of Bologna
Prof. Pietro Canepa, University of Genova
& INCA Vice-President

Sponsored by
FEMS, Federation of European Microbiological Societies
Alma Mater Studiorum, University of Bologna

For additional information, please contact:

Prof. Fabio Fava, DICASM, Faculty of Engineering, University of Bologna, Viale
Risorgimento 2, 40136 Bologna, Italy. fabio.fava@unibo.it

Introduction

Several organic contaminants of great environmental concern, such as polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and chlorinated dioxins, along with toxic heavy metals, are progressively accumulating in freshwater, estuarine and marine sediments. These sediment pollutants are able to impair water quality by leaching into overlying water, accumulating in sediment-dwelling organisms and aquatic biota, and transferring through the food web to humans and other animals. Therefore, contaminated sediments comprise one of the most significant environmental problems in the world.

In general, hydrophobic compounds are strongly adsorbed on the sediment organic matter and therefore their bioavailability is limited. As a consequence, the susceptibility of such pollutants to microbial transformation is hindered. Therefore the intrinsic decontamination potential of polluted sediment is strictly correlated to the pollutant bioavailability and the activity and specificity of indigenous microorganisms. Both factors have to be investigated to determine the sediment potential to undergo *ex-situ* bioremediation and/or *in situ* natural attenuation. Information on the extent and microbial features of *in situ* naturally occurring pollutant biotransformation processes in a contaminated site might permit to design and perform site-specific biostimulation operations that, in turn, might allow reducing the extension of the contaminated area to be subjected to dredging operations. This is an important issue, as dredging is a very costly and invasive contaminated sediment management procedure.

Innovative approaches to the biomonitoring and *ex-situ/in situ* biological restoration of contaminated sediments have been very recently developed, and it is of special importance to critically transfer them to young scientists and engineers and consultants involved in the management of contaminated sediments at the University, and private or public research centres. In fact, such new strategies require combination of specific and different aspects of the modern biology, chemistry and engineering sciences which are often not provided by the current European University programs.

The main objective of the school is to provide to 40 selected young European and USA scientists and engineers and to 5 professionals a critical overview on: a) the innovative approaches to the analysis of pollutant bioavailability in sediments, and b) the bio-chemical and molecular microbiology tools that have recently become available to study pollutant biodegradation/biotransformation processes naturally occurring in sediments and to design and develop possible strategies to intensify them under both *ex-situ* and *in situ* conditions.

Preliminary program

Monday September 12, 2005

Introductory remarks

9.00-9.30 Welcome and opening remarks

Prof. Fabio Fava (University of Bologna, Italy),

Prof. Pietro Canepa (Vice-Director of INCA & University of Genoa, Italy),

Dr. R. Novi (Head of the Port Authority, Genoa, Italy)

9.30-10.30 Environmental aspects of ports and harbors managements in Europe.

Dr. Stefano Della Sala – Venice Port Authority, Venice, Italy

10.30-11.00 Coffee break

Biomonitoring of contaminated sediments and pollutant bioavailability

11.00-12.30 Biochemical tools for the detection of organic and inorganic pollutants in sediments

Prof. Aldo Roda, University of Bologna, Italy

12.30-14.00 Lunch

14.00-14.30 Poster viewing

14.30-16.00 Organic pollutant bioavailability and the effect of macrobenthos on contaminated sediments

Prof. Danny Reible, The University of Texas at Austin, TX, USA

16.00-16.30 Coffee break

16.30-18.00 Biogeochemistry and reactive transport of heavy metal contamination in sediments

Prof. Steven A. Banwart, The University of Sheffield, UK

Tuesday September 13, 2005

Fundamentals of microbial transformation of pollutants in sediments

9.00-11.00 Microbial processes associated to biotransformation of hydrocarbons and heavy metals in sediments

Prof. Lily Young, Rutgers University, NJ, USA

11.00-11.30 Coffee break

11.30-13.00 Microbial dehalogenation of organohalide pollutants in marine sediments

Prof. Max Häggblom, Rutgers University, NJ, USA

13.00-14.00 Lunch

14.00-14.30 Poster viewing

Sediment bioremediation and biostimulation ex-situ

14.30-16.00 Chlorinated solvents biodegradation and nickel bioimmobilization in historically-contaminated anaerobic sediments.

Prof. Spyros Agathos, Catholic University of Louvain, Louvain-la-Neuve, Belgium

16.00-16.30 Coffee break

16.30-18.00 Detection and characterization of biological degradation processes in anaerobic sediments of Venice lagoon contaminated by polychlorinated biphenyls (PCBs)

Prof. Fabio Fava, University of Bologna, Italy

Wednesday September 14, 2005

Sediment bioremediation and biostimulation ex-situ (continued)

9.00-10.30 Microbial biodegradation and phytoremediation of contaminated dredged material

Dr. Joop Harmsen, Alterra, The Netherlands

10.30-11.00 Coffee break

11.00-12.30 Bioremediation of aqueous phases resulting from contaminated dredged material

Prof. Piet Lens, Wageningen University, The Netherlands

12.30-13.30 Lunch

Microbial processes and biostimulation in-situ

13.30-15.30 Microbial PCB dechlorination: natural and stimulated activity in situ and sediment-free cultivation to identify the PCB dechlorinators

Prof. Donna Bedard, Rensselaer Polytechnic Institute, Troy, NY

15.30-17.00 In situ biotransformation of chlorinated dioxins in sediments of US rivers and lakes

Prof. Peter Adriaens, University of Michigan, MI, USA

17.00-17.30 Coffee break

17.30-18.30 Degradation and mobilisation or immobilisation of contaminants at the interface in the transfer of groundwater to surface water (hyporeic zone)

Dr. Ludo Diels, VITO, Belgium

Poster session and concluding remarks (coordinators: Prof. Fabio Fava & Prof. Pietro Canepa)

18.30-19.20 Selected poster presentation

19.20-19.30 Concluding remarks .

School venue

All school activities will take place at the Magazzini dell'Abbondanza, via del Molo 65, Genoa, Italy. Coffee-breaks and lunch will be provided by the facilities existing inside the building. The selected participants will be accommodated in hotels located in the old part of Genoa city.

Who can attend the school

Forty young scientists and engineers possessing a PhD, MS or *Laurea* degree and working at Universities, public and private research Centres or private Companies along with 5 professionals can participate in the school. Ten (of the 40) positions will be reserved to scientists and engineers from Eastern and South European Countries. Participants will be selected on the basis of their *Curriculum vitae* and documented experiences in the field objective of the school. Participants are encouraged to present their activities through one or more posters (1 m x 0,70 m) that will be viewed and discussed during the school; a 1-page A4 abstract related to each poster should be submitted by e-mail (along with the *Curriculum vitae* and the application form) at the following addresses: secanepa@chimica.unige.it AND stefania.evangelisti@mail.ing.unibo.it, as they will be published in the final book of the school presentations. The University of Bologna will assign one

European Credit Transfer System (ECTS) to those participants who will submit an abstract and present a poster at the school. The official language of the school is English. Presentations, papers and all the other documents provided will be in English.

Registration

Registration fee is 400 €(+20% VAT) for professionals, 300 € for participant from West European Countries and USA, and 150 € for the 10 selected participants from Eastern and South Europe Countries. The registration fee includes: a copy of the teaching material, a copy of the final book (that will be published within 6 months after the end of the School) along with coffee breaks and lunches from Monday 12 to Wednesday 14, 2005.

Participants interested in participating in the school should send a e-mail with all their data and *Curriculum vitae* to the following addresses: secanepa@chimica.unige.it AND stefania.evangelisti@mail.ing.unibo.it before June 1, 2005. Selected participants will be reached by e-mail by June 15, 2005 and they must pay the registration fee (by transferring the registration fee to the account that will be indicated in the e-mail message) and send their abstracts by July 1, 2005. Cancellation refunds will be made for written cancellations received by the school secretariat prior to July 15, 2005. No refunds will be made for cancellations after this date, but the final summer school book will be mailed.

For additional information, participants should contact Prof. Fabio Fava (fabio.fava@unibo.it; phone: 0039 051 2093212; fax 0039 051 2093220).

Local Organising Committee

Dr. Giulio Zanaroli	giulio.zanaroli@mail.ing.unibo.it
Dr. Giorgia Trussardi	incasisifo@vegapark.ve.it
Miss Deborah Gaggero	secanepa@chimica.unige.it
Miss Sena Culla	secanepa@chimica.unige.it
Secretariat address:	Dipartimento di Chimica e Chimica Industriale Università di Genova Via Dodecaneso 31 16146 Genova

Co-sponsors

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The interuniversity Consortium “Chemistry for the Environment”, Venezia, Italy