

Editorial preface

The international symposium on '**Microbial resource management (MRM) in biotechnology: Concepts & applications**' has been organized for the first time on 30 June and 1 July 2011 in Ghent, Belgium. The aim of the first MRM symposium was to discuss about the latest breakthroughs on more fundamental concepts of microbial communities and on their applications in environmental technologies and nutritional/biomedical sciences. A microbial community consists of a multitude of functional biological entities, each with unique metabolic capacities. When properly organized, the assemblage of these biological entities represents a powerful resource. Especially for engineered systems, MRM is the ultimate objective, yet remains very challenging. Well-documented MRM concepts and tools should allow to steer complex microbial communities, leading to stable and reliable biotechnological processes. This first edition therefore focused on the introduction of these MRM concepts and tools to both academic and industrial researchers around the topic of microbial ecology and technology. Four central themes were discussed in the oral and poster presentations.

The conference started with the theme '**Managing bacteria-host interactions**'. Evolution of higher organisms has taken place in a world where microbes are omnipresent. The massive colonization of host surfaces (skin, gut, . . .) by microorganisms has forced the host to develop strategies that allow a peaceful coexistence with their microbial inhabitants. Not only does the host need to distinguish benign from detrimental microbes, he also needs an adequate response to opportunistic pathogens. Understanding the fundamental processes behind the delicate balance in host–microbe interactions can result in a more accurate management of the host microbial community. This may pave the way for new applications in the medical field as well as the pharmaceutical and food/feed industry. Keynote contributions by **Ruth Ley** and **Nathalie Delzenne** were inspirational for in-depth discussions.

The second set of talks was about '**Exploiting the water-energy nexus**'. Current conventional wastewater treatment is based on the energy-demanding and dissipative treatment of low pollutant concentrations. However, projections of the growing global population, increasing urbanization and higher water stress force us to look for a completely different and more sustainable approach, recovering energy, valuable products and safe water. Key biotechnological applications for this approach include

anaerobic digestion, highly loaded activated sludge, bio-electrochemical systems, low temperature bioprocesses and bio-based disinfection and removal of recalcitrant chemicals. Furthermore, emission of greenhouse gases should be minimal. In this session, not only single technologies but also novel treatment schemes will be brought forward, making way for future sustainable reuse of the resources in wastewater. **Cees Buisman** and **Lars Angenent** presented highly appreciated keynote presentations.

In the third theme, the focus was on '**Microbial Resource Analysis**'. In order to manage microbial communities, we need to understand their social behaviour and community composition. Molecular microbiology and all the 'omics' are used to correlate biodiversity (community richness and evenness) with functional stability, allowing to compare with well-known ecological theories. Translating this basic research to applications remains the biggest challenge for the future. Eye-opening keynote talks were delivered by **Tom Curtis** and **Jeroen Raes**.

The fourth theme focused on '**Nutrients in wastewater: balancing between removal and recovery**'. All over the world, nitrogen and phosphorus concentrations are increasing in surface waters, leading to eutrophication and its many adverse affects. Furthermore, the steep increase of fertilizer requirements, energy prices and P-resource shortage stimulates nutrient recovery from wastewater. Facing these facts, nutrient management in wastewater has to focus on low nutrient levels in the effluent, through a sustainable and cost-effective combination of removal and recovery technologies. Several recent discoveries in the microbial nitrogen cycle resulted in a spectrum of energy-friendly opportunities with low direct greenhouse gas emissions. Furthermore, an assortment of bio-processes can contribute to a more desirable quality of P-containing sludge, enabling to replace artificial fertilizer in a direct or indirect way. Especially source-separated and (pre)concentrated streams offer excellent recovery possibilities. This session will not only provide floor to applications of microbial-assisted nutrient conversions, but also to their mind-shifting discoveries. **Mark van Loosdrecht** and **Marc Strous** left the audience stimulated with their keynote contributions.

The first MRM conference was closed by **Willy Verstraete**, challenging all keynote speakers as well as the audience with his proposed '**Perspectives for microbial biotechnology**'. Microbial biotechnology depends on soft genes and hard technology. Breakthroughs in both

domains are plentiful and their combinations allow generating a multitude of 'publishable' possibilities. Yet, to detect effective niches of implementation is the super challenge every scientist faces. The fact that we have entered a phase of transition towards a non-fossil fuel based economy offers a unique set of powerful potentials.

The symposium had no less than **160 registered participants**, originating from all over the world, including Australia, Russia, Canada and the USA, which was remarkable since the major focus of the announcement lied within Europe and since it was quite a short conference. The fact that participants were originating from all over the world emphasizes the fascination of several research groups to MRM. Apart from the scientific representation on the symposium, there was also **industrial interest** in the conference subjects, which was reflected by the active and passive participation of several industrial contestants in the conference by oral or poster presentation. Fifteen companies supported part of the

conference financially and exhibited their industrial activities. The financial contributions by Bio-Rad, VWR, OWS, Colson, ProDigest, Avecom, Chrisal, Waterleau, Global Water Engineering, Essencia, Austep, Oxoid & Remel Products, Nutrient Recovery Systems, Accuri Cytometers and Janssen Pharmaceutica were highly appreciated. At the end of the symposium, among the 80 presented posters, prizes were granted for **eight excellent posters**: Amandine Everart and Charlotte Grootaert (theme 1), David van der Ha and Amit Kumar (theme 2), Katarzyna Bialek and Micol Bellucci (theme 3), and Francis Meerburg and Samik Bagchi (theme 4).

The symposium left the audience confident and inspired that in the next decade, new insights will generate new tools to implement MRM, which will be vital for a better environment, a more performing biotechnology, and a better human health and well-being at large.

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