

# Microorganisms: Their benefits and beyond



*Ipek Kurtböke*

Faculty of Science, Health,  
Education and Engineering,  
University of the Sunshine Coast,  
Maroochydore DC, Qld 4558  
Australia  
Email [ikurtbok@usc.edu.au](mailto:ikurtbok@usc.edu.au)



*Ian Macreadie*

RMIT University, Bundoora,  
Victoria 3083  
Email [ian.macreadie@rmit.edu.au](mailto:ian.macreadie@rmit.edu.au)

**Most microorganisms may be associated with disease and destruction for outsiders but for us microbiologists not all microorganisms are considered “Bad Guys” and their beneficial activities by far outnumber their detrimental aspects. In this issue of *Microbiology Australia*, we target those microorganisms which have served mankind with their beneficial properties either as themselves such as probiotics or through their products such as antibiotics.**

Microbial activities are vital in the environment as they contribute towards many different processes such as carbon and nitrogen cycles. Beneficial microorganisms are also vital in plant growth and disease protection and Vadakattu Gupta's article covers the contributions of microorganisms to providing sustainable agriculture.

Australia's biggest industry, mining, also exploits microorganisms for the recovery of precious metals, saving huge costs in energy. The article by Udeshika Wijewardena, Ian Macreadie and Anna Kaksonen provides illustrative examples of microorganisms that perform metabolic activities under extremely harsh conditions.

Microorganisms can help in the clean-up of environmental pollutants such as accumulated waste and toxic compounds. Examples of such applications are found in the article co-authored by Andrew Ball and Krishna Kadali. These microbial solutions combine engineering skills of microbiologists and metabolic products of microorganisms to deliver environmentally friendly solutions.

Microorganisms are also currently being investigated for their ability to produce biofuels such as the use of algal cells for conversion of solar energy into molecular hydrogen. Aidyn Mouradov and Trevor Stevenson review the benefits of algae in this context.

Advances in microbial biotechnology have allowed us to incorporate microbial capabilities to obtain many “everyday products” such as microbial enzymes in detergents or bio-stone washing of denims in textile industry, and antibiotics. Margaret Britz and Arnold Demain review the industrial revolution brought about by microorganisms. Antibiotics have been in the service of mankind over the last 50 years, curing the incurable. Ipek Kurtböke provides information on the contribution of actinomycetes

to antibiotic discovery since the discovery of Actinomycin in the 1940s. She also invites contributions from Australia to the first special issue titled Biodiscovery of the new *International Journal of Microbiology and Microbial Biotechnology* [http://www.intechopen.com/journals/show/international\\_journal\\_of\\_microbiology\\_and\\_microbial\\_biotechnology](http://www.intechopen.com/journals/show/international_journal_of_microbiology_and_microbial_biotechnology).

The September issue of the MA also covers some of the great contributions of probiotics for human health, in particular the gut, with an article by Michael Conlon, Anthony Bird and Claus Christophersen, and the oral cavity with an article by John Tagg, John Hale and Philip Wescombe.

Microbes contribute much to vaccines and were extensively covered in last September's issue of *Microbiology Australia*. In this issue, Youssef Abs EL-Osta and Rima Youil cover innovative microbial vaccines for the livestock industry.

Microbes are now being used as "vehicles" for delivery of engineered genes and also provide alternative treatments for difficult to treat diseases such as antibiotic-resistant bacterial infections. Marilyn Roossinck provides an insight into beneficial viruses and novel medical advances through their use.

Bacteriophages are also a "friendly" means of biocontrol and their application is gaining momentum in the West after long years of successful applications in the former East. For insights on the latest advances the reader is referred to the new book <http://www.intechopen.com/books/bacteriophages> edited by Ipek Kurtböke.

Microbes also serve as models for important human diseases, simplifying our understanding of these diseases and allowing major advances that are very cost-effective. Paul Fisher reviews these millennium bugs and demonstrates a strong case for increased support for research involving microbial models through a quantitative review of the returns they provide.

Due to their ease in laboratory-scale handling, microorganisms are used extensively in scientific research in genetics and molecular biology. The benefits of microorganisms are enormous and a single special issue is not enough to cover all of the applications. It is our hope that the examples we display here will be supplemented with many more in the future issues of *Microbiology Australia*, in particular those benefits that are likely to derive from applications of advancing microbial biotechnologies.