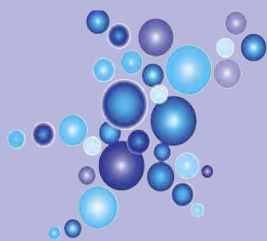


Enviro Biotext

News from the Environmental Biotechnology CRC



Dr. Keith Steele
EBCRC Deputy Director

This issue:

Getting ahead with a firm commercialisation plan

Biotechnology helping to prevent algal blooms

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*Biotechnology
benefiting the
environment*

Getting Ahead with Commercialisation

As a condition of the Commonwealth grant, CRCs are required to prepare a Commercialisation and Utilisation Plan.

This outlines the planned use and commercialisation strategy (path to adoption) for IP resulting from the operations of the Environmental Biotechnology CRC (EBCRC).

It is required to demonstrate how the EBCRC will maximise benefits to Australia from the Commonwealth investment. EBCRC submitted its Commercialisation and Utilisation Plan earlier this year and was recently advised of its acceptance.

Since then we have gone back to basics and undertaken an in-depth analysis of markets, technologies, products, competitors, and commercial opportunities.

The EBCRC Board has this year requested an acceleration in Commercialisation. So how can we increase and accelerate commercially beneficial outcomes?

Four areas have been identified that provide opportunities for commercial outcomes which will be the focus for EBCRC commercialisation endeavours:

1. *Biosensors* : Expertise and research activity in the monitoring and detection of environmental pathogens is being further expanded to the development of real-time biosensors. This is a difficult task and not currently addressed by any existing sensing technologies.

2. *Bioproducts* : The opportunity is to improve biofuel production efficiency and to minimise waste products. Four areas of opportunity are being further investigated (Biodiesel, Biogas, Bioethanol and Bio-Hydrogen). In addition, we are continuing to investigate commercial opportunities for other bioproducts such as for the aquaculture industry. These opportunities build on EBCRC's outstanding knowledge of microbial population dynamics.

3. *Biofilms* : This is focused on the utilisation, control and removal of biofilms utilising environmentally appropriate biotechnological solutions. We have made a good start in this area with a provisional patent and with more in the pipeline.

4. *Bioremediation* : We are developing a suite of "generic" remedial organisms and environmentally appropriate chemicals that may be applied to contaminated sites. We are focusing on significant common contaminants that affect land and water globally.

We are only in a position to move forward in the above areas because of the success of the EBCRC research program. We are also encouraged by the high level of interest from potential investors in what we are doing.

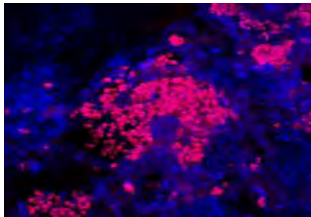
A prerequisite for all of our commercial activities is a market need, a well-defined product and a clear route to market.



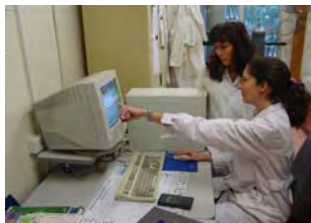


Biotechnology helping to prevent Algal Blooms

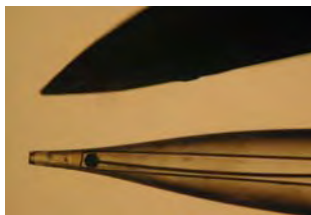
Reliable biological phosphorus removal from high-strength wastewater is the focus of EBCRC's nutrient removal project



Phosphorus-accumulating organisms are highlighted in pink



New online control systems being developed for biological nutrient removal



Microsensor for nitrogen (below) shown with an ordinary pin point (above)

The discharge of the high loads of nutrients (carbon, nitrogen and phosphorus) in wastewater into sensitive water-bodies has emerged as a major problem.

Eutrophication in waterways due to the presence of nutrients is a well-recognised environmental problem in Australia and worldwide.

Shallow, enclosed bays, delicate river systems such as the Murray Darling, and Reef systems such as the Great Barrier Reef are particularly sensitive to changes in nutrient levels.

Dugongs can also be affected, as they are reliant on sea grasses, which are susceptible to changes in nutrient levels

Wastewater from agricultural sources – particularly the meat processing industry – has up to 10 times higher concentration of nutrients than domestic wastewater.

Reliable biological removal systems for organic carbon and nitrogen had been successfully applied to wastewater treatment.

However, phosphorus removal continues to be achieved primarily through chemical precipitation, despite biological removal being a cheaper and more environmentally sustainable option.

In Australia, wastewater is passed initially through a number of anaerobic ponds in series to achieve substantial organic carbon removal followed by an aerated pond system.

These large pond systems achieve good organic carbon removal but limited nitrogen removal and almost no phosphorus removal.

This is the first time such high concentrations of nutrients have been successfully and reliably removed without the use of chemicals

Phosphorus removal from high-strength wastewaters is currently done with chemicals, which can cost a large plant up to \$3000 per week.

Chemical precipitation of phosphorus permits very low levels to be achieved and is widely used in the US, Europe and Scandinavia.

Environmental Biotechnology CRC research has enabled the understanding of natural bacterial processes to increase the efficiency and effectiveness of nutrient removal.

Existing methods involve microorganisms controlled to work in a collaborative manner to take out the nutrients from the wastewater.

However they are not regarded as being reliable enough to dispense with chemical back up.

High degrees of nutrient removal from wastewaters containing high concentrations of nutrients are particularly challenging.

Sequencing batch reactor (SBR) technology offers a great deal of flexibility and is a promising vehicle for achieving high levels of nitrogen and phosphorus removal from high-strength wastewater.

Biological treatment is by far the cheapest and most environmentally friendly way of removing nutrients from wastewaters.

The technology has been around for a few decades and EBCRC researchers from the University of QLD are pioneers in using SBRs for nutrient removal from wastewater

The EBCRC is improving and optimising the techniques in two ways:

1. Development of online control systems to achieve cheaper and better nutrient removal

The control system relies on on-line sensors to monitor conditions such as pH, oxygen and nutrient levels so that the process operation can be adjusted continuously to achieve optimal efficiency.

2. Understanding the microbial transformations to achieve more reliable biological Phosphorus removal

Phosphorus is a component of all living cells but certain bacteria are able to store phosphorus in cells at a high level and thus achieve phosphorus removal from wastewater. We are trying to provide the optimal conditions for these phosphorus-removing bacteria within the microbial community.

Through this process, EBCRC scientists have been able to remove 95% of the total organic carbon, 98% of the total Nitrogen and 99% of the phosphorus from wastewater.

This work can be applied around the world and has widespread application potential in many industries. We expect to be able to demonstrate this technology at pilot or full-scale plants in the next few months.

The Biological Nutrient Removal project is led by Prof. Zhiguo Yuan. Also on the team are Drs. Gulsum Yilmaz and Maite Pijuan Vilalta, PhD students Luke Burow, Romain Lemaire and Chrystal Zhou, and Honours student Emma Gagen.





Four International Awards recognise our scientists

EBCRC researchers are taking out Australian and International awards for their high standard of research

Australian and International Awards presented to our researchers is an indication of the very high level of research that is being carried out at the Environmental Biotechnology CRC.

The EBCRC aims to become a major international centre for Environmental Biotechnology research and the backbone of this centre will be our internationally recognised researchers.

PhD Student wins prestigious American award

EBCRC's Brisbane-based team has picked up a prestigious award right out from under the noses of the Americans.

This is the first time in its 17-year history that a non-American Uni has won this prestigious award.

Adrian Oehmen, along with his PhD Thesis supervisors from the University of QLD, has been selected by the Association of Environmental Engineering and Science Professors to receive this year's CH2M-Hill Award.

This award is conferred for completing one of the two best 2004 dissertations in the field of environmental science and engineering.

EBCRC Research Director recognised for contributions to wastewater management

Professor Linda Blackall, EBCRC's Research Director, has won an international award for outstanding contributions to activated sludge population dynamics in the field of wastewater treatment.

The 2nd Ardern Lockett Award was presented at a Gold Coast-based specialist conference on Biological Wastewater Treatment, organised by the International Water Association (IWA).

Linda is a pioneer in applying advances in biotechnology to environmental management. She completed her PhD in the field of wastewater microbiology in 1987.

This award recognises the enormous contribution Linda has made to wastewater management technologies in Australia and overseas.

Murdoch researcher wins award for excellence

The World Association for the Advancement of Veterinary Parasitology has selected Prof. RC Andrew Thompson to receive the 2005 WAAVP – Bayer Health Care Award for Excellence in Research.

The Award honors contributions to outstanding and significant research for the advancement of knowledge in veterinary parasitology and the control of parasitic diseases.

Andy Thompson is an internationally renowned scientist with three decades of dedicated research in veterinary parasitology with an emphasis on parasite zoonoses.

He has made major contributions to the understanding of the biology, life cycles and epidemiology of parasite zoonoses like echinococcosis, giardiasis and cryptosporidiosis.

Andy is involved in EBCRC's Pathogen Detection project.

EBCRC Researcher a tall poppy in NSW

Finally, EBCRC project leader, Dr. Mike Manefield from the University of NSW, has won a NSW Tall Poppy award, which was created by the Australian Institute of Political Science.

The Tall Poppy Campaign celebrates Australian scientific excellence and encourages younger Australians to become outstanding achievers.

This award recognises Mike's work in developing technologies to harness bacteria that could clean up polluted land and water environments.

Mike explains that the world is teeming with microscopic organisms that can degrade nearly all known chemical compounds.

His work in environmental biotechnology is based on the idea that, whilst every polluted environment would end up clean if left for long enough, we can accelerate the natural decontamination process with a better understanding of microbial processes.



Adrian Oehman at work on his PhD Thesis



Linda Blackall with Jurg Keller and EBCRC Industry partner Therese Flapper from Ecowise

ANNUAL REPORT NOW PUBLISHED

The Annual Report for 2004-2005 has been published. If you would like a printed copy or a CD, please get in touch with Pepita Maiden on 02 9209 4969. Alternatively, you can download a PDF version from our website: www.ebcrc.com.au





Upcoming Events

Our website is kept updated with details of all EBCRC-related events

You can still register for our Showcase!

The Showcase program will help delegates to learn more about Environmental Biotechnologies and research in Australia and overseas, and meet those involved in the sector in Australia

Environmental Biotechnology: from microscope to market



RESEARCH SHOWCASE

Chifley at Lennons, Brisbane
30 November 2005

The free event is the highlight of our calendar year and an opportunity for you to learn more about Environmental Biotechnology and the CRC's research. We will also present further details about our Commercialisation programme and new research directions.

You can still register for this event. For more information and to obtain a registration form, please contact Anjelita Malik on 02 9209 4968.

Contact and Publication Details

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