Biodegradation (2006) 17: 103–104
DOI 10.1007/s10532-006-9046-x

Preface

One of the major hazards humanity is facing is existing and new environmental pollution of our foundations and primary resources of life – air, water and soil – by (eco) toxic chemicals. There is now overwhelming evidence that human health is directly dependent on the state of our environment. Chemical pollutants from the environment, apart from having other effects, are the cause of or provoke many human diseases. Consequently, we need a better balance between disease-centred (therapy) and environment-centred (prevention) research. Of particular concern is the pollution of the aqueous environment with, e.g., carcinogens, hormones or hormone-like substances, pesticides, and antibiotics. This is a major contribution to the increasing loss of the already inadequate supply of safe drinking water in most countries and results – at the best, for those who can pay – in the necessity of expensive treatment. We can never approach sustainable development, a goal constantly reiterated by almost all governments, if we do not find ways and means of eliminating existing toxic chemicals from the environment and also prevent new chemicals entering it and control their use at the source.

Environmental Biotechnology, which was restricted in the early eighties to the traditional biological wastewater treatment processes, has experienced a tremendous development in the last two decades. Impressive progress was made particularly in biodegradation and bioremediation research. In many cases it was shown that this technology is able to permanently eliminate pollutants inexpensively, especially the highly problematic pollutants present in low but toxicologically relevant concentrations. Probably the best example for this is the striking commercial success of air and off-gas cleaning by biological filters, a field in which many companies have established and the technology has proven to be cheap and reliable when compared to the alternative incineration technology. Many other bioremediation processes are now at the level of scaling up and Nature Biotechnology has published in 2003 that bioremediation is the fastest growing sector in the hazardous waste industry in the US (a 7–8 billion $ turnover annually).

However, the problems are still numerous, the challenges of the technologies are still considerable and this requires a sustained effort and support. We urgently need a range of new technologies that deal with both existing and new chronic and acute pollution and this requires inevitably the support of the research that will produce and back-up such technologies. For this we have to continue to develop a much larger knowledge base for realizing the full potential of the microorganisms as an instrument for environmental management. It has now been shown repeatedly that at the low pollutant concentrations usually experienced in the environment only cleaning-up processes based on biological principles are working efficiently and cheaply. Also promising appear the diagnostic tools based on biochip technology for quickly and selectively monitoring the presence and concentrations of pollutants and the state of health of ecosystems. These tools will probably revolutionize environmental monitoring and risk assessment, and will help to ensure enforcement of environmental goals set in the legislation.

To contribute to growth and employment we have to focus on topics that are essential for public health, the health and proper functioning of ecosystems, and on finding and agree on a way to a sustainable society. Prime examples are advanced water treatment and reuse, abatement of air pollution (including CO_2 sequestration), renewable energy (e.g., via agriculture), diagnostic tools for environmental monitoring (see the rapidly developing biochip technology). Continuous and consequent support for environmentally friendly and resource-protecting technologies will inevitably ensure a leading market position.

It is common knowledge that environmental protection is simply and purely legislation driven. Ergo, the main barriers for development, acceptance and penetration of existing and new technologies are the lack of appropriate environmental legislation. Establishing and enforcing appropriate

environmental legislation, together with a good strategy for financial incentives for start-up activities, would provide the economic basis for such technology, and hence, would also create jobs in this area. If there is no legislation, the environment is 'exploited' and used in a non-sustainable way. An important aspect of this legislation would include an internalisation of environmental costs in prices of goods produced and, consequently, also the taxing of (produced and imported) products in which these costs are not included.

Policy should at this moment draw the attention of the public to the dangers of having insufficient environmental technologies. For instances, we seem to have no answer to the increase of CO_2, to the presence of endocrine disrupters at ng/l everywhere in the environment, and so on. Hence, we need to continue our search so that we in the future have tools to deal with these environmental challenges also. One of the most pressing areas to support sustainable development is the generation and use of renewable energy from solar, wind or wave energy, an area linked tightly with global warming and CO_2 sequestration. Several of the existing or prospective technologies involve biotechnology, e.g., microbial fuel cells, biogas or biohydrogen production from (waste) biomass. Focussed support of these technologies will link the rapidly developing biotechnology R&D to the conservative transport and energy sector.

As one little puzzle stone on this long way to a healthy environment the *European Symposium on Environmental Biotechnology ESEB 2004* was held at Oostende, Belgium, during April 25–28, 2004. It was organised by Prof. W. Verstraete and his team from Gent University, with the support of the Section on Environment (Genootschap Milieutechnologie) of the Technological Institute of the Royal Flemish Society of Engineers (K VIV–TI) and the Section Environmental Biotechnology of the European Society for Biotechnology (EFB). The symposium attracted over 200 scientists from all over the world and all of them went away extremely satisfied because they were offered a good mixture of high quality review lectures from international top scientists and cutting edge science. From the lectures and presentations given, a number of papers have been peer-reviewed and selected for publication in this Special Issue of Biodegradation.

Piet Lens
Environmental Technology
Wageningen University
Wageningen, The Netherlands

Thomas Egli
EAWAG
Dübendorf, Switzerland