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Editorial

Energy, heat, flavours and aromas of *Microbial Biotechnology*

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The second issue of *Molecular Biotechnology* offers us a variety of interesting topics ranging from basic science to industrial applications. The current strength of the field and this new journal come into conjunction when we verify how close new genomic tools and commonly used products really are. Indeed, it would not be outrageous to say that we can taste the flavours and sense the aroma of microbial biotechnology while cheering for systems biology.

This new issue opens with a wonderfully tasting review entitled 'Wine genomics' (Siezen, 2008) who takes us from grape diversity to wine bacteria and yeast genomics. The article is a real overview on winemaking in which ancient traditions and modern systems biology walk hand in hand. It might be far too daring to say that all the richness of wine resides in its microbes; we hope that wooden hand-made tonels, the temperature of the caves and other factors will still have a say in maintaining wine diversity, as well as its final flavour, texture and scent, and that *wine metagenomics* will not reveal all the secrets behind a good glass wine. We propose a toast to Roland Siezen's opening genomic update!

Tino Krell introduces us to the field of microcalorimetry, an increasingly demanded technique in biotechnology. Have you ever considered that measuring 'heat' could be at the core of quality control in a pharmaceutical company? This interesting issue and other matters are elegantly tackled by Dr Krell (2008) in the second issue of *Microbial Biotechnology*. The article digs into the potential of monitoring heat changes using a variety of calorimetric techniques. Isothermal titration calorimetry (ITC) is at the heart of precise determinations of interactions of certain proteins with a range of substrates, other proteins or target DNAs (Holdgate, 2001; Lacal *et al*., 2006; Busch *et al*., 2007). Krell discusses how protein stability can hamper the development of a new product and how microcalorimetry can help to identify best excipients or improved proteins upon genetic engineering. Another extremely relevant issue is the use of 'heat' techniques in strategies designed to overcome drug resistance problem or to develop adaptive inhibitors versus HIV protease variants (Ohtaka *et al*., 2002). Differential scanning calorimetry can become a key technique in the establishment of free-drying conditions for chemicals and maybe live cells.

There is an ever-growing interest on the biosynthesis of poly-hydroxyalkanoates (PHAs) because of their potential applications as 'bioplastics'. However, some aspects of their biosynthesis still remain obscure. Systems biology has been used by Arias and colleagues (2008) in their study about the substrate specificity of poly-3-hydroxyalkanoate synthases in *Pseudomonas putida* U. The article has the added-value of being an impeccable study based on mutant phenotypic assays that have allowed the authors to demonstrate that two high-identity PHA polymerases (PhaC1 and PhaC2) work with different substrates in this microbe. The authors present an exhaustive *in silico* analysis of these proteins and postulate that the different catalytic activities could be based on subtle structural/functional differences that may seem of no significance at first glance.

Biosensors are one of the classical tools that have seen the light with the advancement of gene fusion technology. The full potential of biological systems to detect 'signals' is still pending of refinement and further developments. In this issue of *Microbial Biotechnology* there are two fascinating articles dealing with biosensors. The review by Elad and colleagues (2008) presents a futuristic approach to revolutionary whole-cell array technology. The article offers a state-of-the-art vision of the field, including genetic engineering of biological components, technologies for live depositions, cell viability, etc., as well as some of the current transduction methodologies to decipher the mathematical output. And yet, this review goes beyond all of that and identifies the needs of this technique to achieve longer-lasting life for whole cells and chips. No doubt that with the expected scientific

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progress, whole-cell arrays will become essential for all sorts of microbiological studies. One of the authors' key conclusion, which we would like to emphasize, is that testing the activity of the sample by whole cells rather than by its components will provide the kind of responses no other chemical or biological system made up of parts can actually provide.

The second article on sensors deals with the managing of bioassays with bioreporter bacteria, which are genetically modified organisms that produce detectable outputs in response to specific analytes. Wackwitz and colleagues (2008) report that the techniques used for the analysis of target samples need internal calibration as the results of these kinds of assays depend on variables that are often difficult to control. By modifying some of the steps of the detection-signalling chain, sets of *Escherichia coli* bioreporter bacteria, when combined, remove some of the usual restrictions of using a single organism when defining arsenite concentrations in drinking water. This enables to obtain proper results without external calibration. This approach appears to remove most of the technical disadvantages and facilitates the interpretation of results. Easy-to-use portable bioassay kits can be of utmost importance in many parts of the planet where water is polluted with arsenate. The field of biosensors is a hot research area and a full review on microbial reporters is already scheduled in a future issue of the journal (Magrisso *et al*., 2008).

The use of antibiotic markers in living organisms has been particularly controversial. A number of studies both in the USA and in Europe on recombinant microorganisms reported that there were no significant risks in the introduction of an antibiotic-resistance marker in a microbe to be released in the environment other than that of the microbe itself (Ramos *et al*., 1994). Along this line the original article by Burris and colleagues (2008) plunges into the details and neatly demonstrates that an *Arabidopsis thaliana* kanamycin-resistance marker, Atwbc19, does not confer antibiotic resistance in *E. coli*, eliminating the potential risk of gene resistance acquisition by horizontal gene transfer from transgenic plants to soil bacteria. Beyond the actual lab work, the article also invites the reader to make a consideration, i.e. the need to clear any kind of doubt about the security of new technologies for human health and the environment.

Chen and colleagues (2008) on their part describe the construction of a new bacterial surface display system in *Bacillus subtilis*. The system consists on fusion proteins with the three N-terminal motifs of a *B. subtilis* cell-wall protein, LytE, which exhibits high wall-binding ability. β-Lactamase has been the first protein used for the evaluation of the system. The results are successful: high-density fusion molecules, up to 1×10^7, were displayed per individual cell and functional proteins were recovered.

Finally, there are two other articles related to one of the main demands of society today: energy production and sustainable development by white technology. After an original article in the first issue of *Microbial Biotechnology* reporting the construction of *E. coli* mutants that increased hydrogen production (Maeda *et al*., 2008), Thomas Wood's group offers an exhaustive review of the field of hydrogen production based on fermentation (Vardar-Schara *et al*., 2008). The authors highlight that the most abundant and lightest element in the universe bears the secret of future energy. The biological production of this element is catalysed by hydrogenases, a set of complex yet beautiful enzymes that catalyse a simple reaction, i.e. $2H^+ + 2e^- \leftrightarrow H_2$. The authors acknowledge the value of hydrogen production via fermentation and through a photosynthetic pathway. As in all biological systems there are advantages and disadvantages, but what is clear is that biological systems have a great potential for bioenergy production. The energy matter is also part of *Microbial Biotechnology* issue in which an article by Dr Larry Wackett (2008a,b) surprises the readers once again with a series of web alerts on renewable fuels. He cites up to 18 different websites that reflect the enormous interest in new, unlimited sources of energy.

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