

## Renewables

# Flexible feedstock venture

Cynthia Challener

Will biomass feedstocks serve as a significant alternative source for production of key chemicals? Verdezyne and OPX Biotechnologies (OPXBIO) hope so. Both companies last month announced progress in the development of bioprocesses for adipic and acrylic acid, respectively.

Verdezyne's feedstock flexible single step fermentation process for adipic acid was developed using combinatorial pathway engineering. The company introduces multiple gene specific mutations in each step of the metabolic pathway and then employs a combinatorial approach to create enzyme diversity. The combinations are tested in industrial yeast organisms and evaluated to identify the optimum pathway. Verdezyne has shown proof of concept for adipic acid and plans to move to the pilot scale within the next year. It is also exploring possible partnerships for scale-up and commercialisation.

In addition to at least a 20% cost advantage, the process is claimed to have a smaller carbon footprint and reduced emissions and waste generation.



Cutting EDGE: for bioacrylic acid

In six months of pilot scale operations, OPXBIO reduced its production costs for bioacrylic acid by 85% using its Efficiency Directed Genome Engineering (EDGE) technology. The EDGE approach uses massively parallel genetic changes, quantitative experimental performance evaluation and high resolution analytical processing to develop a comprehensive, rational strategy for microbial re-engineering, according to president and ceo

Charles Eggert. The company plans a demonstration facility in 2011 and its first commercial plant in 2013 with a joint venture partner.

OPXBIO ultimately expects to be cost competitive with petrochemically derived acrylic acid. 'While there is a growing demand for greener materials, consumers and the chemical industry are not willing to pay a premium,' Eggert observes. 'For this emerging sector to be successful, participants must consider the entire process from raw material supply to final product delivery. It is not enough to be able to produce materials biochemically; demonstration of delivered cost competitiveness is imperative.'

Global revenues for biorenewable chemicals including succinic acid, lactic acid, 1,3-propanediol, glycerol, starch-based polymers and the polyhydroxyalkanoates will grow at a CAGR of 17% from \$1.63bn in 2008 to \$5.01bn in 2015, according to market analysts Frost & Sullivan. Derivatives of these chemicals and other biorenewables, while not included in this analysis, are also expected to experience strong growth.

## Science in brief

**Anglo-Indian drug discovery services provider Oxygen Healthcare (O2h) has signed an agreement to supply multi-full time equivalent (FTE)-synthetic chemistry services to drug discovery programmes at Medical Research Council Technology (MRCT) Centre for Therapeutics Discovery. The MRCT is the commercialisation arm of the UK Medical Research Council.**

**US biopharmaceutical services provider Paraxel International has formed an alliance with UK protein biomarker discovery, validation and assay development services provider Proteome Sciences designed to enhance Paraxel's biomarker capabilities for early phase clinical development.**

**French RNA splicing technology specialist ExonHit Therapeutics has been chosen to participate in the European Innovative Medicines Initiative (IMI) consortium (PharmaCog) focused on identifying biomarkers for Alzheimer's disease. PharmaCog, coordinated by GlaxoSmithKline R&D and the Université de la Méditerranée in Marseille, France, focuses on translational science and the harmonisation of research tools to accelerate approvals of new medicines.**

**A simple and low cost way to stabilise vaccines – even at tropical temperatures – has been proven to work by scientists at Oxford University, UK. Nova Bio-Pharma's patented HydRIS technology, which creates thermally stable, injectable drug formats. Oxford researchers showed it was possible to store two different virus-based vaccines on sugar-stabilised membranes for 4–6 months at 45°C without any degradation.**

**The US government definition of human embryonic stem cells has been changed to include earlier stage embryos along with blastocyst cells.**

## Biofuels

## 'Better' biofuels made from butene

Andrew Turley

The energy in waste and non-crop plant material, so-called second generation biomass, could be accessed by making butene, researchers have found.

Second generation biomass is an attractive energy candidate that promises relatively low impact on the environment and global food prices. But no processing method has yet won broad appeal at commercial scale.

Researchers at the University of Wisconsin-Madison, US, may have found a more efficient route to utilise biomass by converting  $\gamma$ -valerolactone (GVL) – available from agricultural waste – into butene

at high pressure using a silica-alumina catalyst (*Science* 2010, **327**, 1110). They then used a standard petrochemical processing technique to link the butene molecules into large alkane chains.

This route has three key advantages, the authors say. The final product has a high energy density making it useful for transport applications; the CO<sub>2</sub> produced during the process can be easily extracted and sequestered; and no external source of hydrogen is needed.

Scientists have explored various methods of producing biofuels from waste and non-crop plant material. But biomass pyrolysis leads to low

quality fuel, a mixture of small hydrocarbons that contains a lot of water, while cellulosic ethanol has a low energy density.

'This is the first report of the production of butene and carbon dioxide from GVL,' says James Dumesic, a chemical and biological engineering professor at the University of Wisconsin, US. 'A process for the production of levulinic acid has been established at a pilot scale and we hope that the introduction of a new efficient strategy for the utilisation of GVL will motivate larger scale production of levulinic acid to ultimately make GVL a more economical feedstock.'