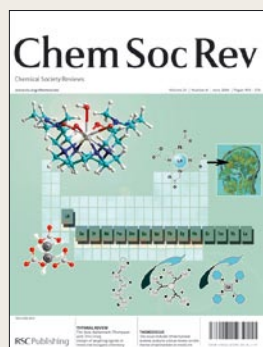


# Chemical Biology

## Rare earth medicine



A lanthanide-based drug for the treatment of high blood phosphate levels is offering relief for dialysis patients.

S P Fricker  
*Chem. Soc. Rev.*, 2006, **35**, 524

## Amino acid as protein probe



Swedish scientists have demonstrated how tryptophan residues can be used to study protein structure.

M Olofsson *et al*  
*Phys. Chem. Chem. Phys.*, 2006 (DOI: 10.1039/b601313a)

## Cell patterning the easy way?



A method to pattern hydrogel surfaces for cell microarrays could find application in stem cell research, say scientists in Austria.


T Peterbauer *et al*  
*Lab Chip*, 2006 (DOI: 10.1039/b601803c)

## The twists and turns of peptides



Chains of amino acid analogues that fold into well-defined structures could aid the search for new medicines.

X Li and D Yang  
*Chem. Commun.*, 2006 (DOI: 10.1039/b602230h)

 See [www.rsc.org/chembiology/](http://www.rsc.org/chembiology/) for full versions of these articles

# Research highlights

Compound protects cells against category A protein with no known antidote

## Inhibiting the threat from bioterrorists

Scientists in the US have found a potential drug to treat botulism, a deadly form of food poisoning and possible bioterrorism weapon.

Kim Janda and colleagues at the Scripps Research Institute, California, have discovered an inhibitor of the toxic protein botulinum neurotoxin A (BoNT/A) – a protein responsible for botulism.

The team tested the inhibitor in a cell-based assay, where it proved effective against BoNT/A. The inhibitor works by preventing the cleavage of SNAP-25, a protein involved in synapse function, Janda said. It is the cleavage of this protein which can be fatal for humans – causing the paralysis of the diaphragm and intercostal muscles, said Janda.

Although there are only a few hundred cases of botulism



reported in the US each year, there is growing concern that botulinum neurotoxins could be used as biological warfare agents, Janda

**Botulinum neurotoxin A causes food poisoning and muscle paralysis**

said. The proteins are 'considered category A agents by the US centers for disease control and prevention and are thus a top terrorist threat,' he explained. 'There are no antidotes; the only 'cure' is to be put on a respirator and it takes weeks before recovery.'

In the future, the inhibitor will be investigated *in vivo* and, if successful, in clinical trials, said Janda. Also, a potential binding pocket of the inhibitor has been identified in a modelling study and this could be used as the basis of designing other inhibitors, Janda explained.

Alison Stoddart

### Reference

G E Boldt *et al*, *Chem. Commun.*, 2006 (DOI: 10.1039/b603099h)

Creation of artificial liver lobules could lead to synthetic tissue on demand

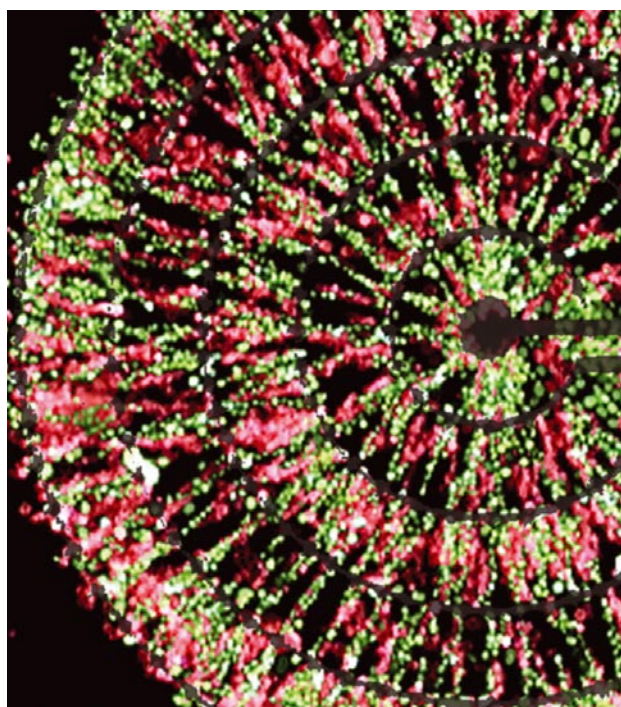
## Liver on a chip

Taiwanese researchers have created artificial liver tissue that could offer hope for transplant patients.

The team, led by Cheng-Hsien Liu at National Tsing Hua University, made a chip that can organise several thousands of cells into complex tissue structures. The chip applies a non-uniform electric field to the cells, which polarises them and causes them to move.

The researchers created artificial liver tissue, using the chip to arrange specialised liver cells (hepatocytes) into chains radiating from a central point. They then added endothelial cells, cells that line blood vessels in the body, which filled the gaps between the hepatocyte chains.

Liu's artificial tissue mimics the structure of real liver, which is made up of hexagonal units called lobules containing radial hepatocyte chains linked by regions of endothelial cells. Hepatocytes are responsible for many different jobs in the liver, including detoxifying drugs and



**Liver cells arrange into chains in a polarising electric field**

metabolising cholesterol and fat. The radial structure of lobules is essential for ensuring that blood reaches the hepatocytes and that the liver functions normally. Liu suggests the artificial tissue could eventually be used in transplants and drug testing.

Future challenges facing the group include three-dimensional cell patterning and 'the rebuilding of other complicated living cell blocks of bone, vessel and nerve tissue,' said Liu.

Shady Gawad, a researcher in cell manipulation from the University of Southampton, UK, said, 'the proposed approach for generating cell patterning on a surface seems very promising.' Gawad suggests it could eventually allow scientists to build 'a programmable system to generate different types of tissue geometries' on demand.

Clare Boothby

### Reference

C-T Ho *et al*, *Lab Chip*, 2006, **6**, 724

Dendrimers deliver RNA into cells to prevent gene expression

## Supramolecular chemistry to silence genes

Dendrimers can be used to switch off specific genes, say chemists in France and China.

Genes can be switched off (silenced) using short interfering RNA (siRNA), double strands of RNA which target a particular gene and prevent its expression. Now, Ling Peng of the Centre National de la Recherche Scientifique in Marseille, France, and colleagues have shown that dendrimers offer a way to deliver siRNA into cells for potent gene silencing.

PAMAM dendrimers, highly branched polymers with amine groups covering their surface, are known to bind DNA. Peng showed that these dendrimers also strongly bind siRNA. The resulting spherical nanoparticles are able to deliver the siRNA into cells effectively, while protecting it from



RNA-digesting enzymes, Peng said.

The researchers used their system to silence a target gene in human lung cancer cells. The siRNA is released slowly by the dendrimer, giving long-term gene silencing that remained 50% effective even after 72 hours, said Peng.

Being able to down-regulate, or silence, genes is an effective

**Dendrimers form nanoparticles with RNA strands, protecting them from enzyme attack**

tool for investigating what a particular gene does, said Peng. The same procedure could be used in future medicines, switching off genes associated with disease, Peng said.

The team now plans to fine-tune the dendrimer properties to improve its siRNA delivery and reduce its toxicity. Andrew Marsh, a supramolecular chemist at the University of Warwick, UK, sees this as a key challenge for the team. 'The impact synthetic chemists can make to optimise the dendrimers for delivery to particular cell lines will be crucial in the further development of this exciting work,' said Marsh.

*James Mitchell Crow*

### Reference

J Zhou *et al.*, *Chem. Commun.*, 2006, 2362

How cells cope with oxidising molecules could explain heart disease link

## Red blood cells complicate diabetes

Red blood cells are much more than just transporters of oxygen, according to US chemists.

Dana Spence and colleagues from Wayne State University have discovered that red blood cells (RBCs) play an important role in the onset of complications associated with diabetes. People with diabetes can develop conditions such as heart disease and strokes. There is a need to find out what causes these complications, said Spence.

The RBCs of diabetics are known to have a weakened defence mechanism against oxidising molecules. In addition, RBCs can be deformed as they flow through blood vessels and RBCs in diabetics are known to be less deformable than those in healthy individuals.

In the light of this, Spence's group investigated how oxidants affect the release of adenosine triphosphate (ATP) from RBCs. RBCs release ATP when they are deformed. ATP triggers nitric oxide production which causes blood vessel widening



and inhibits platelet aggregation. When RBCs stiffen, nitric oxide production is disrupted and this can cause vascular problems.

The team used an oxidant to stiffen RBCs and measured the amount of ATP they released as they travelled through channels resembling blood vessels, in a microchip device. The group found

**Cells deform as they flow through blood vessels**

that ATP levels dropped initially but returned to normal as the RBCs recovered from the oxidant attack.

One of the main ways cells recover from oxidant attack is by producing reducing molecules. Spence showed that when an enzyme key to this process was inhibited, the ATP levels dropped but did not recover. This enzyme has a lower activity in diabetics than in non-diabetics, said Spence.

Spence also found that the amount of ATP released from the RBCs of people with diabetes was half that of non-diabetic people. Spence suggested that how well an RBC can fight off oxidant attack is key to its ability to release ATP.

The aim now is to locate RBC deformation and develop treatments to return deformed cells back to normal, said Spence.

*Sarah Corcoran*

### Reference

J Carroll *et al.*, *Mol. BioSyst.*, 2006, 2, 305

## 250 good reasons to keep on reading

*Journal of Materials Chemistry* celebrates its 250th issue later this month. The issue, due to be published on 20th July 2006, sees this class-leading journal reach yet another noteworthy milestone. During its 16 years of publication there have been many exciting developments in the field of materials chemistry, with three Nobel Prizes awarded to pioneers in the field, and the emergence of new areas of research such as biomaterials and nanotechnology.

The journal has continually changed with the times and responded to the needs of the community; last year it became the first weekly journal dedicated to materials



chemistry bringing you the latest research faster than ever before. The quality and scope of the journal have also made quite an impact. A future issue on molecular magnetic materials, builds upon the journal's highly regarded selection of highly

focussed theme issues; the first, looking at computer modelling, was published in 1994 and was guest edited by Richard Catlow of the Royal Institution, London. *Journal of Materials Chemistry* has also been warmly supported by the materials community and

enjoyed particularly close links with the Materials Discussions and Materials Chemistry conferences.

'We would like to thank our readers, referees and authors for their instrumental part in making each of these 250 issues' say chair of the editorial board, Maurizio Prato, and editor, Carol Stanier, in the 250th issue editorial, 'to celebrate this great achievement and to thank our readership for their support, we are delighted to be making the 250th free to access for all, until 31st August 2006.'

To read this issue or to find out more about *Journal of Materials Chemistry*, please visit: [www.rsc.org/materials](http://www.rsc.org/materials)

## PCCP—going weekly, thinking nano

Delegates at the Bunsentagung 2006 meeting held in Erlangen on May 25-27 joined the editorial staff and Editorial Board of *PCCP* in celebrating weekly publication of *PCCP*. Professor Dr Jürgen Troe, Past Chairman of the *PCCP* Editorial Board, reviewed the remarkable growth of the journal since its start in 1999 and toasted the journal's future success.

Over the coming months *PCCP* will publish a timely series of themed issues on nanoscience and nanotechnology.

Nanotechnologies are widely seen as having huge potential in diverse areas from healthcare to energy storage, with



### Celebrations at Bunsentagung

experimental developments being driven by pressing demands for new technological applications. In this special *PCCP* series Guest Editors Phil Bartlett (Southampton, UK), Tim Jones (Imperial, UK) and

Paul Mulvaney (Melbourne, Australia) deliver a superb mix of urgent communications, full research papers and key reviews focusing on the physico-chemical aspects of nanoscience. Published in selected printed issues of *PCCP* (starting this month) and collected together on a dedicated webpage, explore the exciting and expanding world of nanoscience and nanotechnology with *PCCP*.

Visit the website to read the latest contributions and to sign up for RSS feeds – the best way to get the latest research news delivered directly to your PC.

Full details are at [www.rsc.org/pccpnano](http://www.rsc.org/pccpnano)

## And finally....

Downloadable ChemDraw files and links to databases including PubChem are among the additional online features on offer to authors and readers of *Molecular BioSystems*.

The journal, which publishes at the interface between chemistry and biology, has recently celebrated a successful first year of publication.

It also boasts rapid publication times, RSS feeds, graphical abstracts for Advance Articles and Table of Contents lists as well as other features and benefits associated with RSC journals.

Full details are at [www.molecularbiosystems.org](http://www.molecularbiosystems.org)

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