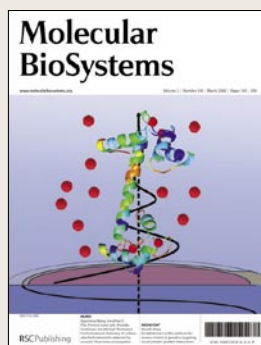


# Chemical Biology

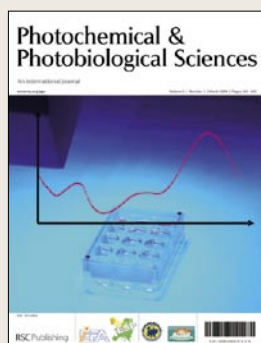
## From DNA to drug discovery



Testing small molecule libraries for biological interactions with disease-related protein segments could speed up drug discovery.

H Koga  
*Mol. BioSyst.*, 2006, **2**, 159

## UV light shed on the future of skincare



Skin ageing caused by sun damage could be the result of only certain UV wavelengths, report chemists in Germany.

G Vielhaber *et al*  
*Photochem. Photobiol. Sci.*, 2006, **5**, 275

## Vitamin's role in enzyme activity



Researchers are on track to understanding how a vitamin B<sub>12</sub> derivative is activated in living organisms, according to a US scientist.


K L Brown  
*Dalton Trans.*, 2006, 1123

## Cellular imaging



Fluorescent imaging methods have transformed understanding of biological processes within living cells.

Y Shav-Tal  
*Soft Matter*, 2006 (DOI: 10.1039/b600234j)

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

# Research highlights

## Sugar derivatives of gadolinium point to new possibilities for MRI contrast agents Dendrimer technology for lasting images

European researchers have developed derivatives of gadolinium complexes that are promising candidates for contrast agents in magnetic resonance imaging (MRI).

In MRI scans, contrast agents enhance the differences between signals from various tissues, resulting in clearer images. The latest clinical MRI instruments work in the field range of 3 Tesla and David Parker at the University of Durham, UK and colleagues are designing new complexes with the right properties for these high magnetic fields.

Gadolinium (Gd) complexes have commonly been used as contrast agents since the late 1980s. Parker and colleagues from the UK, Italy and France made a number of Gd



complexes and discovered one that gave longer-lasting enhancements to MRI signals than commercial contrast agents. Parker's team used

**Gd complex gives longer enhancements for scans**

dendrimer technology to couple a Gd complex to sugar-containing groups. 'Preliminary imaging experiments reveal that the complex is about four times more effective than ProHance, a contrast agent already used in clinical practice,' said Parker.

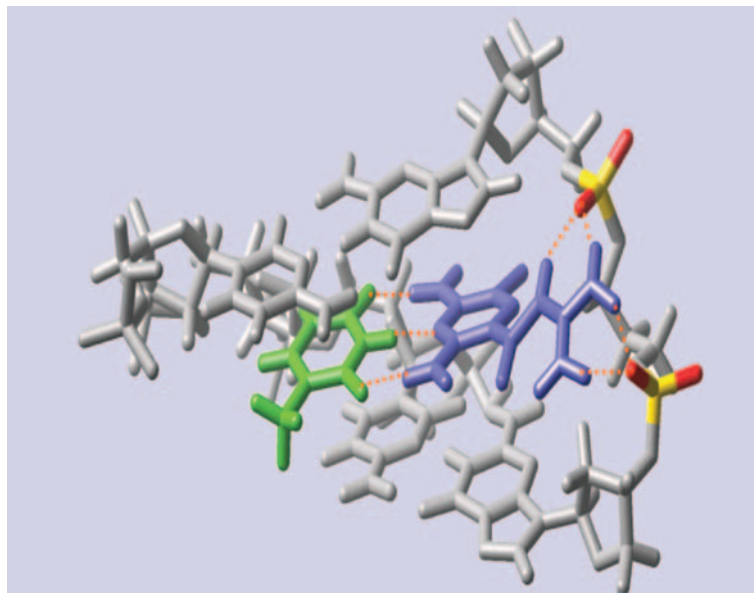
Parker suggested that the systems will be suitable for use in vivo; his experiments revealed that the complex is cleared from the blood through the kidneys. Future work will focus on developing analogues in related systems, he said.

*Rebecca Lavender*

### Reference

D A Fulton *et al*, *Chem. Commun.*, 2006, 1064

## Hydrogen bonding ligand can detect sites of DNA damage A binding agreement



DNA-binding ligands could be useful for detecting small genetic variations, say researchers in Japan.

Norio Teramae and colleagues at Tohoku University, have identified a class of ligands that can recognise a common result of DNA damage called an AP site.

An AP site arises when a nucleotide base is lost from DNA, by either spontaneous or enzymatic breakage of the bond connecting it to the DNA backbone. Teramae's group investigated the binding of amiloride, a diuretic containing a pyrazine ring and a guanidinium

**Drug identifies base thymine opposite missing nucleotides**

group, to DNA containing AP sites. The ligand has two groups of hydrogen bond-forming sites capable of binding to both a target nucleotide and an AP site on the opposite strand of the DNA duplex.

Teramae's team discovered that amiloride displayed reduced fluorescence in the presence of DNA duplexes containing AP sites opposite thymine nucleotides. In contrast there was almost no change in fluorescence response using normal duplexes without AP sites. On further investigation the researchers showed that amiloride strongly and selectively binds the nucleotide thymine with an affinity an order of magnitude greater than for the other three nucleotide bases; adenine, cytosine and guanine.

Amiloride has a striking ability to recognise thymine in duplexes containing an AP site, said Teramae. The results may 'provide a rational basis for the development of single nucleotide polymorphism detection chemistry based on DNA-binding small molecules,' he said.  
*Kathryn Lees*

### Reference

C Zhao *et al*, *Chem. Commun.*, 2006, 1185

Coordination complexes could offer approach to help target infection

## Zinc recognises bacterial cells

Scientists in the US have used zinc coordination compounds to recognise pathogenic bacteria.

Bradley Smith at the University of Notre Dame and colleagues investigated a series of low molecular weight zinc(II) complexes. Two of the complexes could be used to discriminate between common pathogenic bacteria, such as *Escherichia coli* and *Staphylococcus aureus*, and mammalian cells.

The team produced images of bacteria, bound by the complexes, using fluorescence microscopy. The complexes show an affinity for the anionic surfaces of the bacteria, Smith suggested. The compounds could offer a new avenue for drug targeting and imaging for bacterial sites of infection, he said.



Zinc complexes were used to stain *Escherichia coli* cells

Zinc(II) coordination complexes can be easily manipulated and modified, according to Smith. In particular, they can be attached to magnetic nanoparticles or immobilised filters and can be used to remove bacteria from blood.

The team are now working on improving the stability of the zinc(II) complexes so that they can be employed in living systems. 'Our primary concern is maintaining the integrity of our coordination complexes in the blood, which contains serum and cleaning agents,' said Smith.

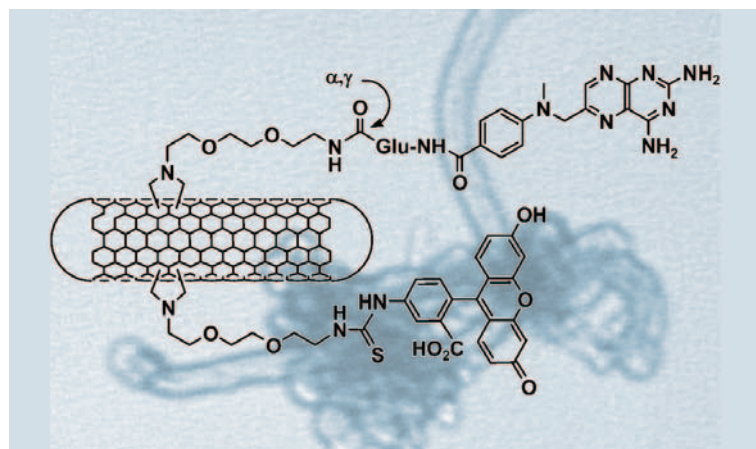
Jenna Wilson

### Reference

W M Leevy *et al*, *Chem. Commun.*, 2006 (DOI: 10.1039/b517519d)

Uptake of carbon nanotubes in cancer cells monitored using fluorescent probes

## Nanoscale transport for drug delivery



The therapeutic agent and probe are carried by a multiwalled nanotube

the uptake of the nanotubes in human cancer cells *in vitro*. They found that the fluorescent signal from the cells was proportional to the nanotube dose.

Successful treatment of cancer relies on good bioavailability and delivery of an effective dose to the target organ, said Bianco. MTX is widely used against cancer but suffers from low cellular uptake, he added. The team are now studying the cytotoxicity of MTX connected to the modified nanotubes.

Bianco says that the next stage will be to modify the carbon nanotubes with a molecule that can selectively recognise a target, for example cancer cells. 'The challenge now is to demonstrate the real efficiency of the system using functionalised carbon nanotubes in an *in vivo* cancer model,' he said.

Janet Crombie

European researchers have used carbon nanotubes to deliver an anticancer drug to human cancer cells.

Alberto Bianco at the Centre National de la Recherche Scientifique at Strasbourg, France, and colleagues in Italy and the UK investigated carbon nanotubes as potential carriers for small drugs. Bianco

was following up the idea that nanotubes offer a unique opportunity for targeted drug delivery because they can penetrate cell membranes.

Bianco and colleagues attached molecules of both the anticancer drug methotrexate (MTX), and a fluorescent probe to multiwalled carbon nanotubes. The fluorescent probes allowed the team to monitor

### Reference

G Pastorin *et al*, *Chem. Commun.*, 2006, 1182

## Free RSC archive for developing countries

The RSC is to provide free access to its journals back-catalogue in over 50 developing countries, it has been announced, making it the first learned society to make such a gesture.

The launch of the programme Archives for Africa in London, UK, in February was preceded by an announcement by RSC president Simon Campbell at the inaugural meeting of the Federations of African Societies of Chemistry in Addis Ababa, Ethiopia.

The RSC archive contains every paper published in its journals in over 160 years – from 1841 to 2004. The programme for the enhancement of research information (PERI) is helping host the archive. The archive is also available to a number of developing countries outside Africa.

PERI asks that developing



nations make a contribution for materials they receive. For a nominal fee, the latest three years of RSC content can be bought. 'In any initiative there has to be an African pull as well as Western push,' said Campbell who went on to describe how

the RSC is building on the UK government's stated intention to build science and technology capacity in Africa, following the publication of the Commission for Africa's report on 11 March 2005.

'It was really hard in Addis

for me to get hold of the right papers,' said Hareg Tadesse, a PhD student from Addis Ababa University, Ethiopia, 'this is where the archives are going to be so useful. Now students like me in Addis can get the RSC Archives straight away, when we need them. On behalf of all my fellow students in Ethiopia, I would like to congratulate the RSC on such a gesture.'

To find out more and to register, visit: [www.rsc.org/archivedc](http://www.rsc.org/archivedc)

## And finally.....

*Fundamental Toxicology* – a new textbook published by the RSC – gathers together the most up to the minute developments in toxicology.

Based on the highly successful *Fundamental Toxicology for Chemists*, it has been expanded and updated to include the very latest in this exciting area of science. It covers well established areas of toxicology as well as rapidly developing topics such as toxicogenomics, reproductive toxicology, behavioural toxicology and ecotoxicology.

Complete with a suggested curriculum, an extensive glossary and recommended further reading this definitive resource is essential reading for students, teachers and lecturer alike. A must for anyone interested in toxicology!

To find out more visit: [www.rsc.org/books](http://www.rsc.org/books)

## Growth and great science for *CrystEngComm*

*CrystEngComm*, a pioneering crystal engineering e-journal, is now published in monthly issues. Editor, Jamie Humphrey explains, 'This development to monthly issues is possible thanks to the continued growth in high quality submissions, and reinforces the RSC's commitment to the development of the journal.'

Each monthly issue of *CrystEngComm* features stunning artwork illustrating an article in that issue and contains a dynamic mix of

communications, full papers and highlights. Taking full advantage of the electronic environment, publication in *CrystEngComm* is exceptionally fast - typically 65 days from receipt for full papers and just 40 days for urgent communications.

But it's not just fast publication times that get *CrystEngComm* noticed. It's official: the science is hot. A *CrystEngComm* article has just been highlighted as a Fast Breaking Paper by Essential Science Indicators<sup>SM</sup> from

Thomson Scientific. Fast Breaking Papers are highly cited papers that are attracting the attention of the scientific community; they show the largest recent percentage increase in citations.

The article by Proserpio and co-workers presents an algorithm enabling crystal engineers to discover new properties, like interpenetration, in substances (see Blatov *et al*, *CrystEngComm*, 2004, 6, 378).

To find out more, visit: [www.crystengcomm.org](http://www.crystengcomm.org)

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