Cancer

Non-malignant clues to follicular lymphoma

N. Engl. J. Med. **351,** 2159–2169 (2004)

Non-Hodgkin's lymphoma is a group of cancers that affect white blood cells, and the course of disease is notoriously unpredictable. In some cases the cancer attacks the body aggressively; in others it advances more slowly, over several years. So choosing the best treatment for an individual patient remains in part guesswork.

Sandeep S. Dave and colleagues have addressed this problem in the case of follicular lymphoma, a subset of cancers that constitutes about a quarter of non-Hodgkin's lymphomas. They looked at the gene-expression signatures in 191 biopsy samples from patients suffering from untreated follicular lymphoma; on constructing a 'survival predictor' from the data, they found that certain gene activity could be associated with either a good or a poor prognosis.

Unexpectedly, say the authors, the expression signatures that predicted longer patient survival were derived from non-malignant immune cells that had infiltrated the tumours. The results provide further indications of the interplay between a person's immune system and renegade cancer cells, as well as prospects for a diagnostic tool for follicular lymphoma.

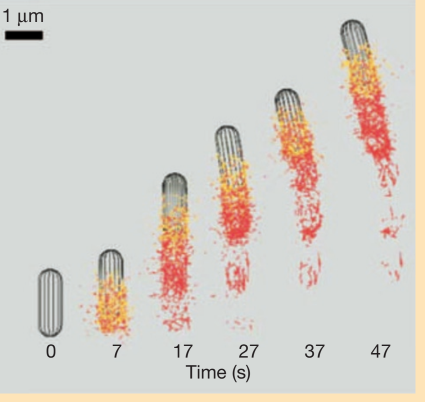
Roxanne Khamsi

Cell biology

Bacteria step out *in silico*

PLoS Biol. **2,** e412 (2004)

Listeria monocytogenes has a bad reputation — it causes food poisoning. But this bacterium is a favourite of cell biologists because it offers so much information about motility driven by the protein actin.



Listeria subverts a host cell's actin system to generate a ram force, produced by an actin 'comet tail', that drives the bacterium within and between cells. Jonathan B. Alberts and Garrett M. Odell have brought together an array of 80 computer processors, their own software and details from a large body of experimental data to model *Listeria* movement. Their aim was to go beyond previous simulations by taking account of more (and more complicated) interactions, both biochemical and mechanical.

This image is a simulation of the molecular processes that produce actin polymerization and motion, and shows one fruit of Alberts and Odell's labours. But the particularly notable feature of their results is the stepwise, nanometre-scale motion of the virtual bacterium, which is an emergent property of the model and is in line with observations. Refined models will help to clarify that behaviour, say the authors. They also hope that their approach will be useful in tackling complex subcellular systems in general.

Tim Lincoln

Organometallic chemistry

Materials from flat carbon

J. Am. Chem. Soc. **126,** 15309–15315 (2004)

Since the work of van't Hoff and Le Bel in the nineteenth century, the fundamental geometry of the carbon atom has been recognized as tetrahedral: the four bonds around a fully saturated carbon atom point more or less towards the corners of a tetrahedron. In diamond, this tetrahedral coordination creates an extended, three-dimensional network of bonds. But, following 30 years of theoretical speculation, it has been suggested that tetracoordinate carbon might, in at least one special circumstance, have instead a planar geometry: two three-membered carbon rings joined end-to-end could form a stable C_5^{2-} ion, shaped like a flat bow-tie.

This molecule — stable in theory if coordinated to metal ions — has not yet been synthesized. But now Pattath D. Pancharatna *et al.* propose that it could be a building block for polymeric networks in one, two and three dimensions. Their quantum-chemical calculations suggest, for example, that bridging metal ions could link the bow-tie molecules into chains, or could join them corner-to-corner in sheets. Zinc or lithium would work for the former, platinum for the latter. Zinc ions could also connect the C_5^{2-} units into three-dimensional networks containing zeolite-like channels — tempting targets indeed for the synthetic chemist.

Philip Ball

Particle physics

Oscillating neutrinos on tap

Preprint at http://arxiv.org/abs/hep-ex/0411038 (2004)

Neutrinos interact only very weakly with matter, which has made it tricky for scientists to find out more about them. Previous experiments have shown that neutrinos can spontaneously flip between three different 'flavours' (electron, muon and tau). Under the standard model of particle physics, this neutrino oscillation is only possible if they have mass.

E. Aliu *et al.* now report results from 'K2K', the first experiment to study oscillating neutrinos deliberately generated in a particle accelerator. A beam of muon neutrinos is generated at KEK, the National Laboratory for High Energy Physics in Tsukuba, Japan. A small neutrino detector checks the particles just 300 metres from the source, before the neutrinos race a further 250 km to the vast Super-Kamiokande neutrino detector at the Kamioka Observatory.

The team saw only 107 muon neutrinos out of the 151 expected at Super-Kamiokande if the neutrinos did not oscillate. This confirms the results of experiments that studied neutrinos coming through our atmosphere from space. The missing particles are thought to have switched flavour to become tau neutrinos.

Having proved that K2K works well, the authors will now press home the advantage of having a controllable, on-demand source of neutrinos to work out how and why they oscillate.

Mark Peplow

Biological techniques

Light engineering

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0407645101 (2004)

The phytochromes found in plants, algae and bacteria are made up of a protein combined with a light-absorbing pigment. When the pigment soaks up light, the associated protein switches from one conformation to another and triggers a change in the cell.

Amanda J. Fischer and J. Clark Lagarias have converted a light-absorbing phytochrome into one that emits light. They introduced random mutations into a bacterial phytochrome and found one that, when illuminated, glowed bright red. The mutation concerned swapped one amino acid (tyrosine) for another (histidine).

Fischer and Lagarias propose that the key tyrosine normally lies in contact with the pigment and, when it absorbs light, it transmits this energy into the conformation change in the protein. The mutated amino acid is unable to do this, so the energy is instead re-released as red light.

Mutant phytochromes could find a use in cellular imaging experiments, the authors say, if they were genetically spliced to a second protein that researchers want to study. The engineered protein could be imaged at a particular time by adding a pigment of any colour, to bind the protein and trigger light emission.

Helen Pearson