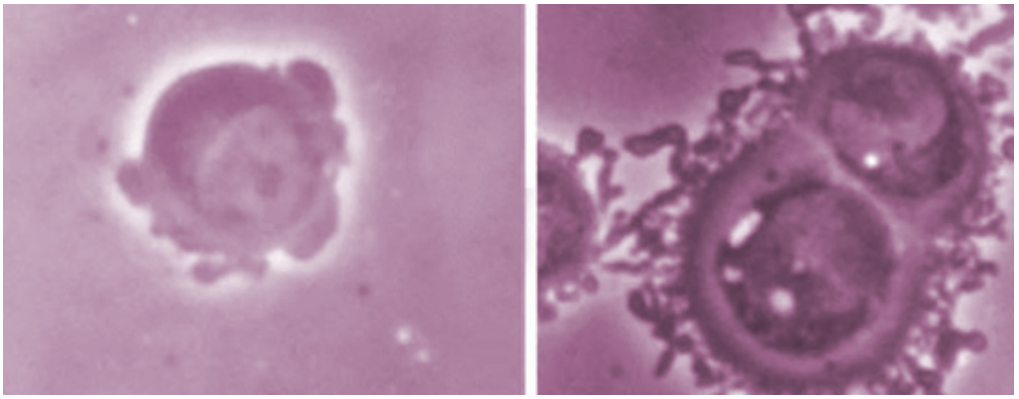
Cells pressed to provide answers in deformation studies

Putting the squeeze on cancer



Compressing cancer cells (left) generates bulges on their surface whilst deforming healthy cells (right) leaves them covered with worm-like projections

Squashing and prodding suspect cells, then watching how they bulge and spring back into shape, can be used to tell cancer cells from healthy ones.

Scientists in South Korea have developed a microfluidic device that can be used to spot the difference between cancerous cells and healthy ones by squeezing them until they deform – a discovery that could lead to a cheap tool for cancer detection. Meanwhile, a UK-based team has used atomic force microscopy (AFM) to test the theory that the most aggressively-spreading cancer cells are those that can deform most easily.

Cancer cells are known to have a less extensive internal cytoskeleton than healthy cells, so behave differently when squeezed. Je-Kyun Park at the Korea Advanced Institute of Science and Technology, Daejeon, South Korea, and colleagues have exploited this property in their two-channel microfluidic device. The first channel holds the sample, and is separated from the second channel by a flexible membrane. Pressurising the second channel compresses the cells in the sample until they deform.

Park found that compressed cancerous cells were left with a series of bulges across their surface. But the healthy cells looked very different, being covered with worm-like projections. The device could be used to further study cytoskeleton changes within cells, says Park, who also notes that other diseases, from malaria to Alzheimer's, are associated with cell cytoskeleton changes.

Previous studies have suggested that the cancer cells with highest metastatic potential – those that spread most aggressively in the body – are the cells that deform most readily, perhaps because they can more easily penetrate other tissues. Elsa Correia Faria and co-workers at the University of Manchester have now used AFM to examine whether this theory holds true for prostate cancer cells, by measuring the force as they indented cells using an AFM tip.

The team found that AFM was a good way to test cells' mechanical properties – but found no correlation between elasticity and metastatic potential. 'There are several reasons why this might be,' says Correia Faria. 'It could be that the situation in vitro, as we perform the test, does not reflect what happens in the body. The other possible reason is that the hypothesis doesn't apply to prostate cancer.' The team now plans to refine its method to identify why the theory didn't appear to apply.

James Mitchell Crow

References

E C Faria *et al*, *Analyst*, 2008, DOI: 10.1039/b803355b

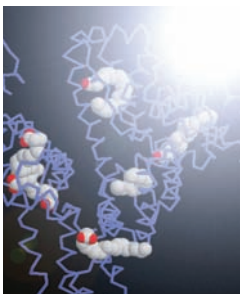
Y C Kim, S-J Park and J-K Park, *Analyst*, 2008, DOI: 10.1039/b805355c

Helical light switch as probe meets drug binding site

New twist on protein binding

A fortuitous discovery by UK chemists has led to a new type of probe for protein interactions that could eventually be used for cellular imaging.

Based on a chiral lanthanide complex, the probe emits circularly polarised light that inverts on protein binding – so monitoring the emitted light allows researchers to follow the interaction between the complex and the protein. Observing this luminescence is a way of studying the chirality of the system, explains David Parker, from Durham University, who led the team behind the research. 'The optical signal you observe is carrying information in its circular polarisation.'



Binding to albumin inverts the polarisation of emitted light

The team found that only one enantiomer of its europium and terbium complexes bound selectively to a drug binding site of the protein serum albumin, and that the luminescence changed dramatically. This is the first example of chiral inversion following non-covalent protein binding of an emissive probe, explains Parker. Potentially this technology could be used to track protein association in vivo in real time, he suggests

The researchers have been seeking to develop responsive optical probes for a while and were delighted when they finally cracked it. 'We were genuinely surprised,' comments Parker. 'The binding free energy and kinetics have to be just right – we've been lucky.'

Ben Feringa an expert in chiral chemistry at the University of Groningen, the Netherlands, welcomes the research. He explains that 'the team has combined dynamic chirality at the molecular level with intrinsic circular polarised emission to study molecular binding events in a unique way. This finding might offer bright prospects in probing details of selective binding to biomacromolecules.'

Russell Johnson

Reference

C P Montgomery *et al*, *Chem. Commun.*, 2008, DOI: 10.1039/b810978h