BIOTECHNOLOGY

Bendy nanotubes do the twist with target proteins

A *TINY* sensor that can reliably detect and identify proteins has been developed independently by two research teams. Based on a carbon nanotube, it produces a telltale electrical signal when it encounters a target protein.

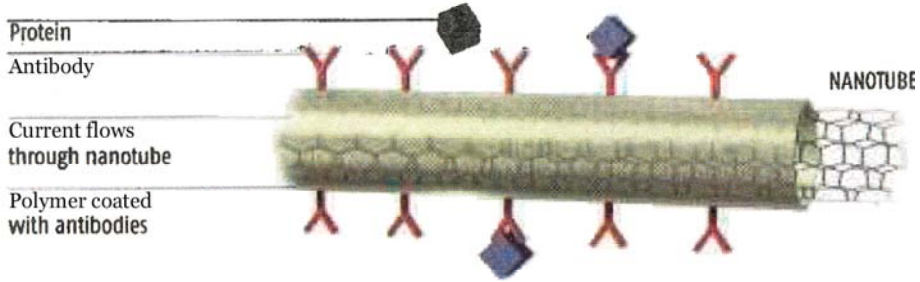
Currently, detecting a particular protein in a mixture of many others is a tricky affair. Starting with an antibody to the target protein, you have to attach a marker molecule that emits light when the antibody binds to the protein. This is a time-consuming process, and for many proteins it has proved impossible to find an antibody and marker that work for that protein alone.

So researchers are on the lookout for better ways to do the job. In 2001, a group at HarvardUniversity showed that most proteins will bind to ultra-thin metal wires, changing the wires' conductivity as they do so. That work has now been built on by two Californian teams: George Grüner and Alexander Star from the start-up Nanomix and Hongjie Dai and Paul Utz of Stanford University.

Both coat carbon nanotubes with a polyethylene-based layer laced with molecules that bind to the target protein. Grüner uses biotin, a small molecule known to bind to the protein streptavidin; Dai is using an antibody for a protein found in people with the

PROTEIN SENSOR

When the protein binds to the antibody, the polymer distorts, bending the nanotube and creat a telltale current change



autoimmune disease lupus.

When the target protein binds to biotin or the antibody' the polymer sleeve becomes distorted. This minutely bends the nanotube and causes a current it is carrying to drop by about 80 per cent.

The teams hope arrays of such sensors reach seeking a different protein, will one day be used by biotech firms to develop "protein chips". By detecting particular proteins, these devices could help diagnose illness raid in the discovery of new drugs, and help out in the emerging field of proteomics.

There are many hurdles to jump first. Steven Block, a biologist at Stanford, points out that detecting a strong interaction between biotin and Streptavidin does not mean the sensors can be adapted to detect any protein interaction. The proof will come, he says, when the teams show how selectivethey are in a complex soup of proteins. Celeste Biever ●