

D. Graham-Rowe, 'Could lab rats be replaced by a lung on a chip?' *New Scientist*, 202/2712, 20 (2009).



## Could a 'lung-on-a-chip' replace countless lab rats?

"MICROLUNGS" grown from human tissue might one day help to replace the vast numbers of rats used to check the safety of drugs, cosmetics and other chemicals. The work is part of a growing drive to develop toxicology tests based on human cells as a replacement for animal testing.

Such efforts are made partly for ethical concerns, and partly because animal testing is so time-consuming and expensive. For example, the European Union's REACH regulations require about 30,000 chemicals to be tested for toxicity over the next decade. Yet testing the effects of inhaling a single dose of a particular

chemical typically requires more than 200 rats, while testing the chronic effects of breathing it in over time can take more than 3000. Meanwhile the EU Cosmetics Directive - which covers items from deodorants and perfume to air-fresheners - seeks to ban all tests of cosmetics on animals by 2013.

The obvious alternative is to test chemicals on human cells grown in the lab. The difficulty, however, lies in enticing those cells to form complex tissue that responds as our organs do. Cell biologist Kelly Bérubé at the University of Cardiff, UK, has managed to grow human lung cells into flat differentiated layers that resemble

the inner lining of the lungs. Her method is already being used for drug testing by companies such as Unilever and AstraZeneca. But when allowed to grow in three dimensions, as in the body, cells arrange themselves very differently, and this can change how they respond to chemical stimuli. "We need to move from something

### "Cells grow on little plastic spheres, essentially producing a tiny inside-out lung around each bead"

flat to 3D structures," says Bérubé.

A popular approach is to seed plastic scaffolds with stem cells to grow artificial "organs", but Bérubé and her colleagues have found an alternative which could allow thousands of drugs to be screened at once.

Instead of large scaffolds, Bérubé has grown lung cells on the surface of plastic spheres half a millimetre in diameter, essentially producing a tiny inside-out lung around each bead. The ultimate aim is to develop a chip on which thousands of microlungs can be grown then tested simultaneously, she told the Cheltenham Festival of Science in the UK last week.

The big challenges will be getting the technique accepted by regulatory authorities and convincing academia that tiny globs of lab-grown tissue can tell us as much in tests as whole animals. But Bérubé points out that rat models are less relevant to humans than most people realise. Chocolate, for example, is lethal to rats and their anatomy is such that they can only breathe through their noses. Duncan Graham-Rowe ■

20 | *NewScientist* | 13 June 2009