Mass spectrometry reveals clues as to why some soldiers are no longer fighting fit

Uranium exposed

US scientists have developed a way to tell if war veterans have been in contact with depleted uranium.

Depleted uranium is a by-product of uranium enrichment for nuclear power plants. It has less of the uranium-235 isotope than natural uranium. It is used in a variety of materials, including tank armour and ammunition. There are concerns that it might be bad for the health of soldiers who are exposed it through, for example, wounds or inhalation.

Todor Todorov, at the US Geological Survey in Denver, and colleagues analysed blood samples from US Gulf War I veterans who had been involved in friendly fire incidents. 'Depleted uranium exposure from the Gulf War and conflicts in the former Yugoslavia has been a health concern in the past decade for military and peace keeping forces,' says Todorov. Using inductively coupled plasma mass spectrometry, he measured the ratio of uranium isotopes in the blood samples. Because the isotope ratios for depleted and natural uranium are different, Todorov was able to work out the source of the uranium.

Tanks may be damaging as well as protecting soldiers' health

Reference
T I Todorov *et al*, *J. Anal. At. Spectrom.*, 2009, DOI: 10.1039/b816058a

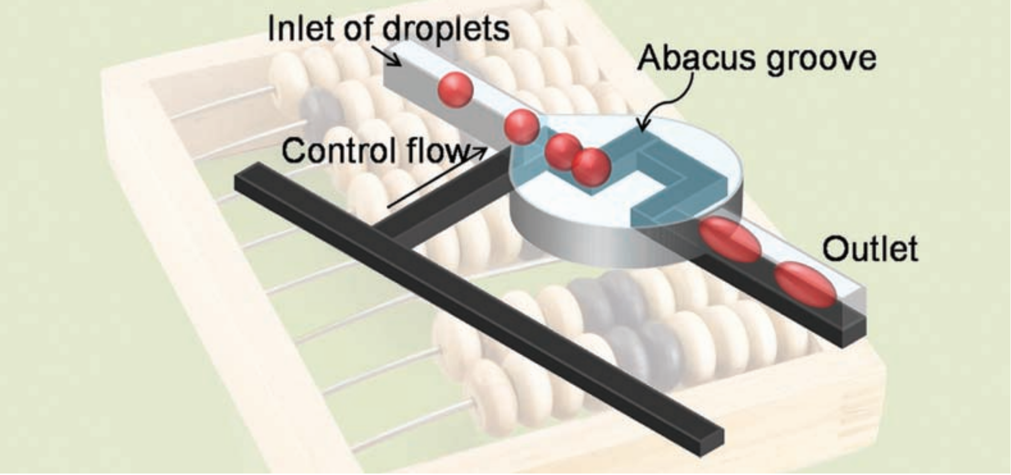
Other methods to identify uranium exposure analyse urine samples. Todorov explains that by using blood, he can gain information on depleted uranium transport rates in the body. 'This can be used to develop biokinetic models for depleted uranium exposure,' he says, adding that the method is simple, rapid and robust.

In the future, the team plans to focus on developing bioassays for measuring the level of uranium in semen so that the effects of depleted uranium exposure on reproductive health can be evaluated.

Madelaine Chapman

Retaining and adding droplets mimics logic operations

Counting the drops



The droplets merge at the abacus groove to form larger droplets

Korean scientists have created a microfluidic abacus that allows them to add droplets together. The system can mimic the logic operations of an electronic chip, they say.

Je-Kyun Park and Eujin Um at KAIST, Daejeon, created a wide microfluidic chamber with a sharply bending groove cut into it. When droplets enter the chamber, they are guided by the groove but get stuck at its rectangular corners. As more droplets enter the groove, they merge at the bend to form a bigger droplet, which is eventually forced out of the chamber as the pressure builds up behind it. Although the droplets enter the chamber at a fixed rate, Park introduced a control flow to vary the number of merging droplets – as the flow rate increases, the number of droplets merging decreases because the merged droplet is forced out the chamber more quickly.

'Scientists have been attempting to mimic the logic operations of electronic chips using droplets and bubbles,' says Park. Each droplet can represent a unit of information, he explains, and being able to control the retention and addition of drops means they can be used as on–off switches, for example. 'This work will lead to the automation of lab-on-a-chip processes without external power sources,' Park predicts.

Park also showed that multiple droplet adding chambers can be linked together to form more complex droplet counters, and different types of droplets can be merged in different ratios at the bend. 'As the system becomes more complex, we will have to develop elaborate means to provide pumping and tubing,' says Park.

Rachel Cooper

Reference
E Um *et al*, *Lab Chip*, 2009, **9**, 207 (DOI: 10.1039/b814948H)