

# New nanotechnology tagging system to help solve gun crime

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Criminals who use firearms may find it much harder to evade justice in future, thanks to an ingenious new bullet tagging technology developed in the UK.

The tiny tags – just 30 microns in diameter and invisible to the naked eye – are designed to be coated onto gun cartridges. They then attach themselves to the hands or gloves of anyone handling the cartridge and are very difficult to wash off completely.

Crucially, some of these 'nanotags' also remain on the cartridge even after it has been fired. This should make it possible to establish a robust forensic link between a cartridge fired during a crime and whoever handled it.

To date it has been extremely hard to establish such a link because of the difficulty in retrieving fingerprints or significant amounts of DNA from cartridge surfaces, which are shiny and smooth. The nanotags, which are quite unlike anything previously used in the fight against gun crime, could therefore lead to a significant increase in successful convictions.

This breakthrough has been achieved by a team of chemists, engineers, management scientists, sociologists and nanotechnologists from Brighton, Brunel, Cranfield, Surrey and York Universities, with funding from the Engineering and Physical Sciences Research Council (EPSRC).

"The tags primarily consist of naturally-occurring pollen, a substance

that evolution has provided with extraordinary adhesive properties," says Professor Paul Sermon from the University of Surrey, who has led the research. "It has been given a unique chemical signature by coating it with titanium oxide, zirconia, silica or a mixture of other oxides. The precise composition of this coating can be varied subtly from one batch of cartridges to another, enabling a firm connection to be made between a particular fired cartridge and its user."

In addition to this breakthrough, the team has also developed a method of trapping forensically-useful amounts of DNA on gun cartridges. It involves increasing the abrasive character of the cartridge case with micro-patterned pyramid textures, or adding an abrasive grit, held in place by a thin layer of resin, to the cartridge base. This rough surface is able to retain dead skin cells from a thumb as it loads a cartridge into a firearm.

A key benefit is also the affordability – a cost-effective way of reliably capturing sufficient DNA from a gun cartridge has never been available before. The technology has been designed to avoid damage to the DNA captured which is caused (i) by temperatures generated as the gun is fired, when heat is rapidly transferred from the burning propellant into the cartridge case and (ii) when copper is extracted from the cartridge case by lactic acid in sweat.

The nanotag and DNA capture technologies could potentially be available for use within as little as 12 months. There may also be scope to apply them in other fields, such as knife crime, in future.

"We're currently focusing on understanding the precise requirements of the police and cartridge manufacturers," comments Professor Sermon. "But our work clearly could make a valuable contribution not only to solving gun crime but also to deterring criminals from resorting to the use of firearms in the first place."

Provided by University of Surrey

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