



Gunshot Residue Evidence – A Loose Canon?

by Angela Sharw - The Forensic Firearms Consultancy Ltd 2016

The Forensic Science Service (FSS) was the largest employer of gunshot residue (GSR) experts in England and Wales with an impressive array of instrumentation required for round the clock analysis of the samples taken from suspects of gun crime. Since its closure in 2012 the GSR criminal casework load was split between three main private forensic providers depending on their success or failure at tendering for the work being offered by the police forces in England and Wales. Less than half of the number of GSR experts from the FSS now work for these providers and the majority of the remainder left the profession. Scotland, Northern Ireland and Ireland have their own publicly funded forensic science providers.

The existence of GSR as an evidence type came about almost by accident when in 1974 Robin Keeley, a senior scientist at the Metropolitan Police Forensic Science Laboratory, was conducting a study of particles collected on air filters during a survey of lead levels in the atmosphere of indoor firing ranges. He noticed whilst observing the lead using scanning electron microscopy and x-ray spectrometry, discrete particles composed of lead, antimony and barium and that they appeared to occur only in percussion primer residue; there was no non-firearms source. For the first time scientists had a method for conclusive identification of gunshot residue. At about the same time, and independently, a similar project was undertaken by the Aerospace Corporation in California. The findings were confirmed by other workers and are still valid today.

When a gun is fired the hammer strikes the percussion cap at the base of a cartridge. The primer

detonates and sends a stream of hot gases into the main charge of propellant, which ignites, generating large volumes of gaseous products, which force the projectile down the barrel of the gun. The high temperature inside the cartridge creates conditions in which the individual components of the primer can fuse together. These particles are emitted from the end of the barrel of a gun and from any gaps or openings in the gun's action and can be deposited on the firer, any persons sufficiently close to the firer, and the gun itself. After the material has cooled discrete particles remain containing combinations of the elements of the original primer and contributions from the gun barrel, cartridge case and the bullet. The recovery and identification of GSR on clothing or hand samples can help address questions such as, "has the suspect fired a gun?" GSR is not a conclusive evidence type such as DNA or fingerprints. It is a corroborative evidence type but the usefulness of GSR should not be underestimated as its presence or absence in crimes involving firearms can be crucial to the overall strength of evidence when a case comes to trial.

It is rarely contested that GSR originates from a firearm. What is of far more interest is how the particles came to be present on a suspects clothing, skin or hair. This can only be evaluated within the full circumstances of the case taking into account both the prosecution and defence hypotheses. The type of firearm and ammunition used in the crime is also important information to the GSR expert as it can have an impact on the amount of GSR that may be deposited onto the suspect or their surroundings. GSR is one of the most heavily scrutinised trace evidence types in criminal investigations and the

expert must ensure that police officers, solicitors, barristers and ultimately the court understand the strength of the evidence. With any trace evidence the possibility of cross-contamination should always be uppermost in the mind. In the UK GSR is rare in the general environment and the expectation is that one would not expect it to be present on a suspect with no connection to firearms. However, studies in the UK have discovered that single particles can be found, albeit infrequently, on public transport.

Probably the most well known case involving gunshot residue was the murder of Jill Dando on April 26th 1999 when she was shot once in the head. Police searched the home address of Barry George just over a year later and recovered a coat amongst other items. A single particle of gunshot residue was found inside one of the pockets. The particle had a similar composition to the residue found on Ms Dando's hair, her raincoat and the spent cartridge case recovered at the scene of the shooting. There were four strands of evidence put forward at the original trial in 2001 pertaining to identification evidence, potential lies told by Mr George regarding his knowledge of Ms Dando, a false alibi and the single particle of gunshot residue. The jury found Mr George guilty of Ms Dando's murder.

Picture above opposite, GSR particle found in Barry George's coat pocket (BBC News online, 7th November 2007)



The Criminal Case Review Commission (CCRC) in 2006 requested a review of the oral and written evidence in relation to the significance of the single particle and the way in which the case would have been reported today. While employed at the FSS I carried out this review in conjunction with a colleague. We concluded that the GSR evidence was inconclusive; it was no more likely that the particle had originated from the shooting of Ms Dando than it had come from another source. This was based on the information that the coat in which the particle had been found was not recovered until a year after the shooting. The CCRC referred the case to the Court of Appeal stating that the GSR particle that was given great significance by the Prosecution at the trial in 2001 was, in reality of no probative value. The



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- ❖ Critical analysis of GSR contamination issues

If you need immediate advice, please contact either Mark Mastaglio on +44 7919 217 848 or Angela Shaw on +44 7919 392 397.

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Appeal Court ruled that it was impossible to know what weight, if any, the jury attached to the particle and as such the verdict was ruled unsafe and the conviction quashed. In a retrial in 2008 at the Central Criminal Court the GSR evidence was ruled inadmissible prior to the commencement of the trial. Mr George was acquitted.

This case has generated much discussion among GSR experts around the world and in the main in the UK no significance is placed on the finding of a single particle. The decision on whether or not to admit single GSR particles as evidence rests with the court. In this case both arguments were put before the court but in some jurisdictions single particles are reported as supporting the contention that a suspect has either handled or fired a gun. Additionally in these jurisdictions prosecution experts offer no interpretation to assist the court or jury and do not include an assessment of the possibility of contamination.

One of the many cases that FFC Ltd. have been involved in was that of the Glasgow gangland murder of Kevin Carroll in 2010. A single particle of GSR was identified on a jacket recovered from the home address of the suspect, Ross Monaghan, more than six months after the shooting. The address had been searched by armed police officers that were likely to be contaminated with GSR. The prosecution expert stated that a lack of information about the

source of the particle precluded her saying anything more about how the particle was deposited however after hearing both the prosecution and defence evidence during a voir dire the judge at the High Court in Glasgow ruled the particle inadmissible as evidence citing the possibility that it arrived on the jacket through secondary transfer from the armed police officers clothing. Mr Monaghan was acquitted.

Numerous studies for the presence of GSR on armed police officers, their vehicles and equipment, police officers not associated with firearms and occupational environments have found that sources of contamination do exist. Reporting an unqualified finding of the presence of gunshot residue can ultimately mislead the court. They cannot appreciate the significance of the potential for contamination if it is not mentioned in the results and the case may go ahead with the gunshot residue findings being unchallenged.

The interpretation of GSR is complex and should only be carried out by highly experienced experts knowledgeable in all the facets of the evidence type. FFC Ltd has a proven track record in this regard having been commissioned in cases from all corners of the globe. Get it wrong and miscarriages of justice result; the innocent are convicted and the guilty walk free.

Angela Shaw

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