A Very Particular Expert...

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The discovery of gunshot residue (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 energy dispersive x-ray spectrometry (SEM-EDX), discrete particles composed of lead, antimony and barium. He then discovered 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.

Today, the instrumentation has advanced; the systems are now automated, digitised and controlled by fairly sophisticated software and some are the size of large printers that can be set up in an office. But in terms of advancements in the analytical science this is not area in which any groundbreaking developments have occurred. But then, has there needed to be?

If we look at other evidence types, for example DNA, last year saw the biggest change in DNA profiling in the UK for more than a decade with the advent of DNA17. This is the next generation of DNA profiling which offers improved discrimination between DNA profiles greatly reducing the probability of getting a chance match and improved sensitivity over the previous SGMPlus® test. This means the technique provides more information for comparison and will produce profiles where one would not have previously been obtained. The downside of this is that the sensitivity is such as to increase the risk of DNA contamination from the handling of samples by scenes of crime officers and forensic providers, and it means that contamination is more easily detected. There is also an increased risk of detecting background DNA, which may have been

deposited before and after the deposition of the target DNA. Comparing DNA profiles from a suspect and a crime scene is therefore one thing but interpreting what it means is quite another. This cannot be carried out without the scientist being fully furnished with all relevant details of the case being investigated.

DNA is rather like GSR in that it is an opinion based evidence type and the circumstances of the crime together with all of the surrounding information are key to the DNA or GSR expert being able to interpret the findings as fairly, accurately and scientifically sound a way as possible. This includes access to background data, for the DNA expert, this will include staff elimination databases, whilst for the GSR expert this will be surveys assessing the likelihood of cross-contamination from armed police officers or the chances of finding particles of GSR in the general environment. The requirement here, rather than sophisticated advancements in technology and indeed the most conclusive technique for GSR remains that which was developed in 1974, is for an expert to continually build on their knowledge and expertise and never to stop assimilating data upon which to base sound conclusions within their field of expertise.

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 are also important 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, again, is rather like DNA, in that it 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. Forensic Firearms Consultancy Ltd have a proven track record of reviewing and challenging complex GSR cases for both prosecution and defence.

One such case was that of the conviction of Dwaine George in 2002 for murder, attempted murder and possession of a firearm. On 25th July 2001 at Miles Platting, Manchester, Daniel Dale was fatally injured and Darren Thomas was wounded in the hand by shots fired from a Walther PPK self-loading pistol. The gun was recovered from the home address of an alleged associate of Mr George who said he had been storing it prior to the shooting but he was unsure if Mr George had been involved. The Prosecution alleged that Mr George was responsible and the evidence at the trial was entirely circumstantial aside from the GSR findings.

Mr George was arrested and his home address was searched by police almost a month after the shooting. Amongst the items recovered was a jacket from underneath the stairs, and a dummy cartridge consisting of a previously fired cartridge case and bullet, found in Mr George's mother's car. Both items were submitted to the Forensic Science Service (FSS) for examination for the presence of any GSR. The scientist reported finding two GSR particles containing the chemical elements lead, barium, antimony and aluminium (Type 2 GSR) on the front of the jacket and two particles containing the elements barium and aluminium, one on the front and one within the pockets of the jacket. Particles containing barium and aluminium can originate from firearms but they are also produced by certain types of green fireworks therefore it was not possible to say which of these was the most likely source. Type 2 GSR was found in samples from the spent cartridge cases recovered from the scene of the shooting.

The crown scientist concluded that there was some evidence to suggest the jacket had an association with a shooting incident but it was not possible to establish a link with the shooting of Mr Dale. Counsel for the crown asserted that this was evidence supportive of Mr George having been the gunman. The defence appointed their own GSR expert who was of the opinion that it would be unsafe to conclude that the Type 2 GSR on the jacket must be associated with the shooting incident involving Mr Dale as it could have arisen from another source, one such source being the dummy cartridge that contained the same Type of GSR. After having considered all of the evidence the jury found Mr George guilty and he was sentenced to life imprisonment with a tariff of 13 years. Mr George served his sentence and was released on licence.

The Innocence Project and Pro Bono Unit attached to Cardiff Law School took up the case on Mr George's behalf and submitted an application to the Criminal Cases Review Commission (CCRC). The application was based on the judgement in R v Barry George [2007] and a decision in relation to voice recognition evidence.[1] The CCRC having considered the application commissioned Forensic Firearms Consultancy Ltd to undertake a full review of the GSR evidence in light of the R v

Barry George judgement and the perceived changes in assessment of GSR findings. This case of course involved only a single particle of GSR.

In the case of Dwaine George the conclusion of the crown expert, that the Type 2 GSR found on the jacket could have originated from the ammunition fired on the day of the shooting, was correct and this was caveated to state, however, any ammunition containing a similar Type of GSR could also have been the source. The CCRC wanted to know what would be the significance, if any, that would now be attached to a finding of two particles of GSR.

It is not possible for a scientist to comment on the environment in which a shooting incident occurred thirteen years previously but what they are able to do is to comment on how the case would be reported today given their current knowledge and expertise with regard to any background data available and the potential of unknowingly picking up GSR particles from the environment. A survey conducted by the FSS between 2007 and 2010 of samples taken from the seats of buses, trains, taxis and the underground mainly in the London area but also on routes around England reported that a single particle of GSR was found in approximately one in ninety samples. Interestingly, there were also a total of twelve particles containing barium and aluminium found demonstrating that these particles are more commonly observed in the environment than GSR particles.

In addition there were some further GSR findings, which had been reported by the original Crown expert but were not mentioned at the trial in 2002. A jacket had been recovered from the address where the gun was being stored. It was found in a box together with a balaclava. A number of particles of GSR were found on the items that could have originated from the firing of ammunition producing Type 2 GSR. The presence of the GSR could indicate that the person wearing the jacket could have either fired a gun, been standing next to someone firing a gun or handled a gun. If Mr George had any association with the wearer of the jacket and/or the address where it was recovered then GSR could have transferred unknowingly to him or his clothing.

Mr George had also been previously arrested in relation to a shooting incident several months prior to the murder. The arrest was made by armed police officers who were likely to have been contaminated with GSR. It was not known what Mr George was wearing when he was arrested but this could have included the jacket found at his home

address. Mr George was not charged in relation to this incident. It is doubtful that evidence of these other incidents was put before the court at the trial in 2002.

Having considered the GSR findings in the case and the full circumstances FFC Ltd was of the opinion that very little in the way of interpretation could be applied to low levels of GSR (1-3 particles) given that particles can be found in the environment and there were a number of sources that could account for the two particles found on the jacket from Mr George's home address. Not all of these were considered at the original trial. The GSR could be related to the shooting, but it could also have been transferred from handling the dummy cartridge, or picked up unknowingly from contact by armed police officers or through any other exposure Mr George had to a source of GSR. FFC Ltd therefore reported to the CCRC that it would be unsafe to conclude that the GSR must have been associated with the shooting on the 25th July 2001.

The CCRC referred the case to the Court of Appeal reflecting that it could be concluded that the weight of the GSR evidence was not appropriately conveyed to the jury and there should have been a warning relating to the limited significance that could be attached to such evidence. The Court of Appeal upon consideration decided that had the present scientific concerns explained in FFC Ltd.'s report to the CCRC been available to the original trial judge they had no doubt that his directions would have been couched in terms of much greater circumspection and caution. They concluded that having admitted this evidence it might have reasonably affected the decision of the trial jury and the convictions were no longer safe. The appeal was allowed and the convictions quashed.[2]

This case only serves to highlight that 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 against any available background data. 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. ■

References

1, R v George (Barry) [2007] EWCA Crim 2722
2, R v George (Dwaine) [2014] EWCA Crim 2507