

Textile Fibre Evidence: Reporting and Interpretation in 2013

Since the recent closure of the Forensic Science Service (FSS) the majority of the evidential textile fibre comparisons in criminal cases in England and Wales are now done by 4 or 5 smaller forensic science providers. So, what has changed in terms of reliability and consistency of reporting?

Forensic fibre evidence has the potential to link an individual to a crime, or discarded items to either a crime or a defendant. This form of forensic evidence also has the potential to exonerate defendants. Cases range from the comparison of a few fibres caught on broken glass at the scene of a burglary, to examination of the clothing of a murder victim for fibres matching those of a suspect's clothing, and vice versa.

Fibre examinations can be time consuming and consequently expensive, but do not always need to be. Increasingly Police investigators try to reduce cost by deciding the forensic strategy and instructing specific examinations, rather than seeking the advice and guidance of an expert as to what will be evidentially significant.

This approach can result in very confined examinations being requested and vital examinations being ignored. For example:

Requesting an examination of only the driver's seat of a stolen vehicle for fibres matching the clothing of a particular individual, where the issue is whether that person was driving the vehicle, even where the defendant's account is that they were a passenger. The front passenger seat, at least, should also be examined to see if this was devoid of his clothing fibres. What if numerous matching fibres were on the passenger seat and very few on the driver's seat? Could he have leaned across the driver's seat with his arm and transferred fibres from his clothing in this way?

Confirmation of the absence of fibres on car seat tapings is a much shorter and relatively inexpensive exercise.

Hence, the need to instruct an independent fibres expert to check the right questions have been asked and appropriate examinations have been carried out; and to describe the evidential value of the prosecution findings.

Police forces increasingly use screening units to assess exhibits for a particular type of forensic examination. This can result in garments being deemed, incorrectly, as not suitable for fibre examination by staff with inadequate specialist training. A screening decision may be based on perceived physical features such as the colour of the garment or expected commonness of the fibre type, or the length of time between the offence and the seizure of the garment. Forensic scientists on the other hand are trained to assess each case on its own merits rather than adopt a 'one rule fits all' approach. The decision to not send a case for fibre examination can result in crucial evidence being missed. We have carried out forensic fibre examinations of exhibits dismissed by the prosecution and on a number of occasions these have provided the critical evidence in the case.

When garments are submitted by the Police for examination there are variations in the laboratory techniques adopted by different prosecution providers and also some huge variations in how findings are interpreted.

Examination techniques

The fibre type and colour will have a bearing on which techniques can be used but the usual sequence of events, used by most providers, will be:

- Microscopic comparison (using a high power microscope, samples are examined under white and coloured

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light. This method provides information on the colour, shape and diameter of a fibre, its fluorescent properties and its generic type).

- Comparison using MSP (a non-destructive method for measuring fibre colour across the UV/visible spectrum).
- Comparison using FTIR (a method used to determine the chemical structure of fibres, particularly useful in distinguishing types of man-made fibre).
- Comparison using TLC (a destructive method used to separate fibre dyes into individual components for comparison).

Some providers will routinely use TLC (thin layer chromatography) to examine the dye characteristics of recovered and control fibres, whereas others will rarely do so, often choosing instead to carry out 'first derivative' manipulation of spectra obtained by MSP (microspectrophotometry). The latter technique is much less costly than the former, however, there appears to be wide variation in individual scientists' grasp of this method. We have encountered cases where fibres excluded by the Crown scientist could have been recorded as a match and vice versa, fibres reported as matching by the Crown scientist that should have been considered as a non-match.

The difficulty with first derivative MSP was highlighted in a paper published in Science and Justice (Ref: Science and Justice 47 (2007) 9–18 'An investigation into the use of calculating the first derivative of absorbance spectra as a tool for forensic fibre analysis' K. Wiggins, R. Palmer, W. Hutchinson, P. Drummond). This investigation concluded:

'Care should be taken at all times when calculating the first derivative and interpreting first derivative data. Such data should never

be considered in isolation from the original absorbance spectrum.'

It would be prudent, therefore, that solicitors get any first derivative results being used in evidence checked to make sure they have been appropriately interpreted in the context of the case.

Raman spectroscopy, another technique used to analyse fibres, has been adopted by only one of the current UK forensic fibre providers. There are inherent problems with this technique; it needs a comprehensive database to accurately identify dyes and suffers from specific problems that make interpretation of results difficult. It has been the subject of a number of studies/projects by the European Fibres Group (a collaboration of different European forensic laboratories which carry out fibre comparison work), - however, all of these studies have shown that it has little further to add when using a combination of 'traditional' techniques i.e. microscopy, MSP, FTIR, TLC – hence a reluctance on the part of most providers to pay for and validate expensive equipment which adds little if any extra discrimination.

In essence, there is now little consistency in the range of methods used as 'routine' by the various forensic providers supplying textile fibre analysis to Police forces.

Interpretation of the findings

Each case should be expertly interpreted based on its individual circumstances and findings; however we have found the strength of some conclusions given to court to be hugely out of line with the levels of support used by other forensic fibre examiners. For example, typical cases for which we are in agreement with the general strength reported are:

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- **Numerous** blue/grey cotton fibres (matching suspect's top) **and two different types** of blue polyester fibres (matching suspect's trousers) found on car seat; reported as a very strong link.
- **Three different types** of matching purple synthetic rug fibres found on a suspect's jeans; reported as a strong link.
- **Two different types** of grey acrylic fibre matching a balaclava found on vehicle headrest. Reported as a moderately strong link.
- **Two identical** blue wool fibres, found on a T-Shirt, matching the cardigan of the victim. Reported as a weak link.

Conversely, in a recent case just **two** matching pale brown cotton fibres were found on a fleece, yet the prosecution scientist reported this to Court as being a strong link; a conclusion that is anomalous with the stated strength of evidence reported in many other cases.

Basis for opinion

Numerous target fibre studies and population studies, carried out by different organisations worldwide, have examined the number and types of extraneous fibres on clothing, car seats, cinema seats and even in head hair. The purpose was to help assess the likelihood of a casework finding of matching fibres being coincidental.

The collective results are summarised in the second edition of 'Forensic Examination of Fibres' by Robertson and Grieve as:

'These data suggest that coincidental matches, where the fibres originate from a source other than the putative one, are

unlikely to occur in the majority of cases. The exception, where alternative sources may be responsible, are with low numbers of matching fibres (<5) or when very common fibres e.g. blue wool, are involved.'

And in an FSS Report (No. RR 832 A study in relation to the Random Distribution of Four Fibre Types on clothing (incorporating a review of previous Target Fibre Studies), 2003 as:

'From these studies a broadly similar set of conclusions has been drawn: finding more than a small number of matching fibres by pure coincidence is very unlikely. The exceptions, where alternative sources may be responsible, are when low numbers of matching fibres (less than five) or when very common fibres are involved.'

The finding of only two matching pale brown cotton fibres falls into the category of 'low numbers of matching fibres' and brown cotton also into the category of 'common fibres'. As such, the scientific studies conclude 'alternative sources for these fibres may be responsible'. The description of this as strong evidence would appear, therefore, to be at odds with the scientific research.

In summary, Fibre experts must be careful not to ignore the results of scientifically conducted studies or will run the risk of overstating the strength of their evidence.

In the broader context, it is our opinion that forensic textile fibre examination is a much underused form of evidence by Police forces, often left out of their forensic strategies where it could be the most likely examination to provide probative evidence. When it is used it is generally used well but, in some cases, the conclusions reached can be very variable in their accuracy.

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