



The Application of Forensic Science in Sexual Offences

by *Ethos Forensics*

The first sexual offences statistics joint bulletin, "An Overview of Sexual Offending in England and Wales", was published in January 2013 by The Ministry of Justice, Home Office and The Office for National Statistics. On average each year in England and Wales, eighty-five thousand women are raped and four hundred thousand are subject to sexual assault. These are the reported crime figures and it may be impossible to gauge the levels of unreported sexual assault incidents. These statistics fulfill one of the many recommendations of The Stern Report of 2010; a comprehensive investigation into the response to rape complaints by the relevant agencies, detailing recommendations to reduce the attrition rate in sexual offence cases and to improve policy and procedure.

In a lecture to Sheffield Hallam University forensic science students, Sue Carney, Forensic Consultant for Ethos Forensics, emphasised that sexual assault scientific interpretations are amongst the most complex and difficult interpretations faced by forensic scientists. Why is this and what are the forensic issues in sexual assault cases?

In many forensic scenarios much of the evidence is time-dependent. This is particularly true of sexual offences

casework. Biological evidence deposited on the body or inside a body orifice during sexual activity persists for a limited time, and loss is accelerated by activities such as washing or bleeding due to injury or menstruation. It's vital that the forensic medical examination of both complainant, and suspect if there is one, is carried out effectively and at the earliest opportunity to maximize the recovery of trace evidence. The Faculty of Forensic & Legal Medicine of the Royal College of Physicians publish guidelines for the collection of forensic specimens in sexual assaults in conjunction with the Forensic Providers and the Association of Chief Police Officers. These are updated regularly, based on current best practice, and offer some degree of standardization although variations in procedure and in the provision of appropriate sexual assault referral centres still remain across the UK. It is certainly not reassuring to perceive the potential outcome of a sexual assault investigation as little more than a post code lottery, but there are other factors at work here.

Much of the information gleaned at the complainant's forensic medical examination is invaluable in determining the most appropriate forensic strategy in the case. It is the forensic scientist, in conjunction with the police force's

forensic submissions or scientific support department who will make these decisions.

Information at the time of setting the forensic strategy is key in assessing the potential outcomes of the laboratory examination of exhibits and indeed, in determining whether the suggested examinations would be worthwhile. In order to assess a case in this manner, the forensic expert uses an interpretive framework based on three principles: Interpreting the evidence by conditioning on the information associated with the case, the conditioning information; Considering the evidence in the light of at least two competing scenarios or versions of events representing the views of the prosecution and the defence; And, considering the likelihood of the evidence rather than the likelihood of the versions of events. Such an approach leads to an evidential interpretation that is balanced, logical, robust and transparent.

Forensic experts have long since realised that their remit must never extend to the provision of expert opinion on matters of guilt or innocence of a defendant. To offer such opinion would commit the 'prosecutor's fallacy' and forensic experts know that the question of guilt versus innocence is purely the realm of the jury. However, this doesn't halt the popularity of the common misconception that forensic experts deal in 'proof'. They do not! The forensic evidence provides additional information to be used by jury members to update their opinion of guilt or innocence (the prior odds) in order to modify their opinion (the posterior odds) taking the value of the evidence into account. The forensic expert presents their evidence in the form of a level of support for a particular view and very rarely, if ever, as conclusive proof. Rulings of The Court of Appeal in some of the earliest cases using DNA evidence, such as that relating to Regina versus Doheny and Adams ([1996] EWCA Crim 728), clarify the role of the expert witness in such matters.

Forensic science interpretation addresses case issues using a 'hierarchy of propositions'. For example, addressing source level might consider from whom semen staining found in a sexual assault case has originated, whilst activity level in the same case might seek to address the issue of whether the defendant engaged in sexual activity with the complainant. In most sexual assault scenarios, addressing issues at activity level is of much more value to the criminal justice process. However, questions surrounding activity level require consideration of the issues surrounding the transfer and persistence of evidence: How was the semen deposited and does it relate to the alleged incident?

The laboratory testing processes used in the identification of biological evidence have limitations that must be taken

into account during the forensic interpretation of a sexual offence case. Many of the chemical tests for body fluids are not specific to those body fluids, giving rise to the possibility of false positive results. This is often compounded by the fact that some body fluid stains may not be readily visible and chemical testing is often used to screen and locate areas of staining. Forensic experts are well aware of the limitations of these tests and must take into account other factors such as the location and distribution of staining and the potential for the presence on exhibits of material from unrelated sources. Again, case conditioning information is key in addressing these concerns.

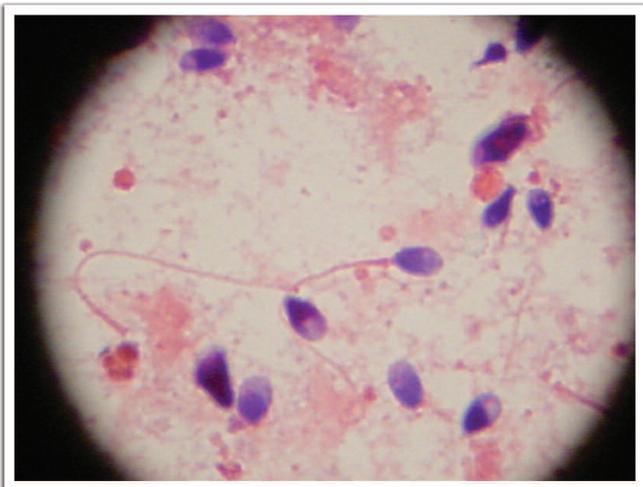
The sensitivity of some body fluid tests is another issue to contend with. If biological evidence is dilute or mixed with another substance then some of the less sensitive chemical tests may fail to detect it. The test for saliva is a case in point here. It is presumptive, so false positives are an issue, it is not particularly sensitive and the chemical reaction itself takes time to develop. These conditions, coupled with the fact that a small proportion of the population are non-producers of the component of saliva that this chemical test reacts with, mean that forensic scientists must exercise caution in attributing particular results to the presence of saliva. Furthermore, an apparent absence of saliva can never be definitive, and as a general rule, an absence of evidence does not necessarily support a view



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Contact, Forensic Consultant
Sue Carney MPhil, BSc (Hons), MFSSoc
Telephone +44 7796 546 224
www.ethosforensics.com



Above - Microscopic image of sperm

that a particular activity did not take place, since there might be other legitimate reasons for that absence. This is especially true of rape scenarios. An absence of semen on intimate swabs does not refute the allegation, since it's possible that rape occurred without ejaculation, or that a condom was worn.

There are, of course, confirmatory tests available for some, but not all, body fluids. Some of these are complex and rarely conducted, such as the crystal tests used as confirmatory tests for blood. Since blood almost always has such a distinctive appearance, it is considered sufficient that if a stain looks like blood and gives a reaction to a presumptive test, then it can be interpreted as being blood. Others are far more routine. For example, the identification of spermatozoa (sperm cells) by microscopy, is almost always definitive in establishing the presence of semen, since sperm are extremely unlikely to have originated from anything else. However, this is not without its complications. Human sperm exist in a variety of subtly different morphologies and such variation in appearance may give rise to difficulties in identification. When viewing a microscopic sample, one is visualising a two-dimensional image of a three-dimensional structure. If a sperm cell is rotated within the field of view, it may not be instantly recognisable. This might be an issue if a sample contains very low numbers of sperm, due either to a delay in retrieving the sample or an individual having a low sperm count, and of those observed, some are not readily identifiable. Another consideration in this circumstance is the fact that sperm cells can be transferred to clothing items in the washing machine. Again, case conditioning information is vital in the cautious interpretation of such findings. If an exhibit has been seized from a washing machine, the forensic expert must question the chance of transfer of sperm from a semen-stained item in the same wash before attributing those sperm cells to the presence of semen on the exhibit.

At the extreme end of the spectrum of limitations of body fluid testing, there are some body fluids for which there is no chemical test, presumptive or confirmatory, currently validated for forensic use. Vaginal secretions are a particularly relevant example. The existence of a reliable and specific test for vaginal cells would greatly enhance the degree of forensic interpretation possible in rape cases. Currently, the cells shed from the lining of the vagina, known as epithelial cells, can be visualized microscopically. But these are largely indistinguishable from epithelial cells from the lining of other body orifices. Saliva is also a good source of epithelial cells, and this, coupled with the fact that in some circumstances, vaginal secretions can indicate a false positive in the presumptive test for saliva, is inevitably problematic in interpreting the outcomes of testing penile swabs in allegations including both oral and vaginal intercourse.

Current research being conducted at several academic institutions, most notably, the University of Huddersfield, seeks to address this issue using a system to characterise specific RNA molecules within various body fluids and tissue types. RNA is a nucleic acid, similar to DNA, that is produced by cells when genes are switched on. The rationale is that different tissues within the body, given their different functions, will have different requirements for actively used genes. Therefore, the pool of RNA molecules within a particular cell type should be specific for that particular tissue type. If this research can develop a specific test for each body fluid, especially vaginal cells, and such a test were relatively straightforward to conduct, then this would offer significant advances in the forensic interpretation of body fluid findings in sexual assault casework.

The issues in sexual offences casework have demonstrated the importance of case conditioning information for effective forensic interpretation. There are usually three main sources of information in a sexual offence case: The complainant's interview transcript, the notes from the forensic medical examination and the statement or interview notes relating to the suspect. From these, the forensic scientist may be able to establish much of the conditioning information required for interpretation. However, some parts of the conditioning information may never be established simply because the information is unavailable or unknown. For example, in a drug-facilitated sexual assault, the complainant may not have a clear recollection of the alleged sexual activity due to intoxication or unconsciousness. Whilst some aspects of such cases may need to be dealt with in an investigative, rather than an evaluative manner, it is also clear that some flexibility must be built into the forensic interpretation of evaluative cases, to allow for uncertainties in the conditioning

information. This is another reason that forensic opinion is rarely provided as definitive proof.

Whilst information is vital for interpretation, is it possible to have too much information? Issues of cognitive bias in forensic science have been the topic of much debate of late. Forensic scientists must be impartial regardless of which 'side' of the trial process they are instructed by. Their duty is to the criminal justice system not to a particular police force or forensic provider. Is it possible that within the reams of extraneous information served up in sexual offence case scenarios, that forensic experts are unknowingly making judgements based on factors such as the social activity of the parties involved in a case, or the appearance of their clothing? Forensic scientists are well aware of the issues of cognitive bias but research indicates that awareness is not sufficient for prevention.

Ethos Forensics have accrued many years of experience in the complex forensic interpretation of sexual offences casework. We have worked on many hundreds of cases including a number of high profile and cold cases in this area. We would be delighted to assist you by providing a comprehensive review and commentary on the limitations of the forensic evidence in your sexual offences case. For a free initial consultation and quotation, contact Sue Carney, Forensic Consultant, on 07796 546 224 or at sue.carney@ethosforensics.com