Forensic Science Regulator
Overseeing Quality

Lessons Learnt

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Contamination in a Sexual Assault Referral Centre

In 2015, two separate alleged sexual assault cases were 'linked' by DNA. The accused man in case A was linked to the sample taken in case B, even though the suspect in case B was already known to be a different individual.

The cases were being investigated by two different police forces and the forensic laboratory was not a common factor. The only identified common factor was that the complainants in both cases were examined at the same Sexual Assault Referral Centre (SARC) some 30 hours apart. When this potential quality failure was identified, the SARC was temporarily closed and only reopened after a support plan was completed.

Case A

A female was examined after reporting being raped by a male who she had met the previous evening. A suspect was arrested and stated that he had engaged in consensual sexual activity with the complainant. As consent could not be addressed by analysis of intimate swabs, no samples from this complainant were subsequently submitted for analysis, but the male suspect's DNA sample was profiled and loaded to the National DNA database (NDNAD).

Case B

A male was examined in the same SARC thirty hours later, after reporting a sexual assault by a male suspect. In this case, there was also a question about what sexual activity had occurred.

Samples submitted for examination included perianal and anal swabs taken from the complainant. Semen was detected on the perianal and anal swabs and a mixed DNA profile was obtained. The major male DNA profile was loaded to the NDNAD.

The DNA Match

The major male DNA profile from the sample loaded for case B matched the arrestee's sample in case A. Because this match was an unexpected result, the investigating Force initiated a full review and further analysis of the samples/results was performed.

The perianal swab from the male complainant in case B had a weak test result for semen (acid phosphatase), although spermatozoa were easily detected under the microscope. The major DNA profiles achieved from both the seminal and epithelial fraction were full, high level (peak heights over 5,000 relative fluorescence units) and both matched the suspect from case A.

The anal swab from the male complainant in case B, had a negative test result for semen, although a few spermatozoa were detected under the microscope. The seminal fraction yielded a partial profile (average peak height 250 relative fluorescence units) matching the male suspect from case A, as well as a partial profile (peak height 110 relative fluorescence units) matching the male complainant in case B. The epithelial fraction from the anal swab from the male complainant in case B yielded a partial profile (average peak height 400 relative fluorescence units) matching female complainant from case A.

Root Cause Considerations

This issue was reported to the Forensic Science Regulator some five months after the alleged offences, and a month after the unexpected match result.

All Forensic Medical Examiner (FME) staff were contracted via a teaching hospital's Trust. A manager and clinical lead were in post, who held responsibility for training and assessments of competency. A training process, involving cases of observed practice, was in place.

There were no documented operating procedures in place at the time, meaning it was not possible to definitively say what was, or was not, done at the time of the

case. This meant the investigation of the quality incident relied on the memory of practitioners to say what they would have normally done at the time of the case, as well as observing some of the practices in place at the time of the quality investigation. It should be said that many positive practices were noted including the use of appropriate barrier clothing, double gloving, glove changes between each patient and records that cleaning had been performed.

The examinations were on separate days and the personnel in attendance were different in both cases, so direct contamination via these routes was ruled out. Although the airflow was noted as requiring improvement the likelihood of this being a contamination route was considered very remote.

It was noted that, at the end of an examination, unused swabs and bags on the trolley were returned to a drawer, where water ampoules with no protective packaging were also stored. These set-up and clear-down stages were pinch points where cross contamination was possible and handling errors might occur. Could something that was present on the trolley in both cases be the vector? The first items considered were the swabs returned to storage; could a swab be used and not be labelled or accounted for, then be returned and reused the following day in error? For that to be true, multiple failures would have been expected over the two days. This would also require the forensic medical examiner to not notice the following day that the swab seal was broken or that the appearance of the swab head was not as expected. Although this could not be definitively ruled out, it was considered very unlikely. Risks were identified, which required better controls.

The set-up and clear-down stages included other items which might have appeared on both trolleys or might have come into contact in storage with other items used during the examination.

The incident occured many months before the quality investigation and the vast majority of case results show no discernible contamination, indicating that this type of issue is extremely rare. However, it was felt that assessing the level of background DNA in the SARC, when it was considered clean, could help identify any deficiencies in cleaning or storage, and by including trolley items and storage drawers it could help show whether the route via the trolley items was plausible.

This environmental testing detected traces of male DNA on items such as the colposcope, [1] pillow, sample trolley, phone keypad, top of the box containing the swabs and the barrel of the pen used for labelling during the sampling procedure which was now stored in the consumable drawer. It should be noted that all the SARC staff were female. Amongst other things, this testing showed that whatever method was used for cleaning of items such as the pen was ineffective in removing amplifiable DNA. Could just one item become contaminated, remain contaminated the following day and result in the findings? Amongst the possible routes for contamination considered was the following sequence of events:

a. Mixed body fluid material from the complainant in case A was transferred to an item used the following day, for instance the pen used for labelling; it remained on the pen due to inadequate cleaning.
b. Body fluid material was transferred from the pen used to label the swabs prior to sampling to the gloves worn by the forensic medical examiner.
c. The now contaminated gloves were used to open the water ampoule, by twisting the cap off, transferring biological material to the open nozzle end that subsequently contaminated the water drops as they were dispensed.

In the absence of clearly documented procedures, it is not known how risks at many critical stages in this and other scenarios were controlled. Therefore, the overall finding was that all critical stages need to be revisited to minimise risk in the future.

Learning Points to Consider

This SARC was closed until various remedial actions had been completed. New consumables were purchased, single use items replaced, and improvements in controlling sample and consumable storage and handling were implemented. Deep cleaning was carried out followed by environmental monitoring to demonstrate that the cleaning had been effective. An ongoing regime for environmental monitoring was implemented. Learning points from this case, and from other cases where contamination was a risk factor, have been incorporated into the Regulator's guidance on avoiding and detecting contamination [1]. The Regulator has published

[1] A surgical instrument used to examine the vagina and the cervix.

a standard for the collection and recording of forensic science related evidence during sexual assault examinations [2] and associated guidance [3].

The following learning points from this incident were implemented by the affected SARC and are published here to ensure they are considered by all similar facilities:

a. Procedures should be documented and subject to a document control system.
b. DNA anti-contamination processes should be tested to ensure they are effective, and regular environmental monitoring should be undertaken.
c. The trolley/examination area preparation procedures should include the following:
    i. Stocking prior to examination.
    ii. Cleaning prior to set-up.
    iii. Checking of consumables (e.g. seals, dates) when they are set out.
    iv. Post examination stages, including accounting for all instruments, used consumables, labelling, anti-contamination steps for non-disposable items, and the policy for unused consumables.
    v. Cleaning post examination.
d. Sampling processes should be:
    i. Validated to ensure they are fit for purpose, including detailing the sequence of sampling including (when the control skin swab is taken), aseptic handling technique to ensure other related processes including labelling do not increase the risk of the swab head coming into contact with anything it is not supposed to;
    ii. Specific on the recommended frequency of glove changes, and/or any events that might prompt a glove change between sub-stages.
    iii. Standardised on how case notes are recorded, managed and held.
e. There should be clarity on overall responsibility and accountability within each SARC, irrespective of the number of organisations involved in its operation.
f. Training and competence assessment for all staff at the SARC should be recorded and should include training on avoiding DNA contamination.
g. Steps should be taken to minimise the number of items and surfaces that can attract dust (e.g. box in exposed pipes, remove superfluous fixtures and fittings).

h. Air flow from vents should be determined and the cleaning, movements and item location tailored to minimise accidental contamination during sample preparation and recovery.
i. Access control throughout the SARC and specified restricted areas should be reviewed.

References

[1] The Control and Avoidance of Contamination in Forensic Medical Examinations, FSR-G-207. Available at: www.gov.uk/government/publications/sexual-assault-referral-centres-and-custodial-facilities-dna-anti-contamination

[2] Sexual Assault Examination: Requirements for the Assessment, Collection and Recording of Forensic Science Related Evidence,FSR-C-116. Available at: www.gov.uk/government/publications/sexual-assault-examination-requirements-for-forensic-science-related-evidence.

[3] Guidance for the Assessment, Collection and Recording of Forensic Science Related Evidence in Sexual Assault Examinations FSR-G-212. Available at: www.gov.uk/government/publications/sexual-assault-examination-guidance-for-forensic-science-related-evidence.