G26 Screening Items of Evidence for the Presence of Body Fluids/DNA in Forensic Biology Casework — A Hypothesis-Driven Approach

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After attending this presentation, participants will learn how the implementation of various case screening strategies and initiatives developed in response to case hypotheses has assisted in addressing pertinent forensic questions in a timely and efficient manner.

This presentation will impact the forensic community and/or humanity by adapting processes and undertaking examinations specifically in response to hypotheses formulated by information in case histories has permitted us to work more efficiently while addressing the most pertinent questions in cases. Sharing these successes will assist other laboratories in implementing similar measures.

This poster will present specific examples of case screening strategies and initiatives adopted at the Centre of Forensic Sciences (CFS) designed to facilitate hypothesis-driven examinations. The aim is to promote the examination of relevant items only, in a manner that is timely and efficient.

Many forensic cases require a small number of items to be examined in order to address the pertinent questions at hand. On the other hand, larger and more complex cases require that decisions be made with respect to which items are to be examined, the order in which those items are examined, and, given a particular result, the necessity of additional examinations. Information provided though the case history and case conferencing as well as knowledge gained through experience and training can be used to formulate a hypothesis in accordance with the scientific method to address these decisions.

Recently, CFS case screening procedures were updated and further aligned with the principles of hypothesis testing. An increased emphasis was placed on assessing the relevance of an examination. The following statement from our DNA Case Screening Manual is one example:

"Scientists are required to evaluate the relevance of an examination using the principle of reasonable expectation and to be mindful of the limitations such an examination confers."

The approach is demonstrated through the following examples of classes of cases typically encountered at the CFS:

Sexual Assault Cases

Sex assaults comprise roughly two thirds of the workload of the Biology Section. Examples of initiatives undertaken to screen items more quickly in accordance with the case history provided include:

- The sexual assault examination kit (SAEK) provided to treatment centres throughout the province has been redesigned such that only relevant samples are collected. Furthermore, the design of the kit dovetails with our screening procedures in the laboratory, and provides samples that can be retained for independent testing.
- In sexual assault cases, relevancy of item examination is evaluated and hypothesis-based flowcharts govern the order in which selected items are examined. When vaginal intercourse is the only allegation, oral and rectal samples are not examined. Vaginal samples are examined beginning with the examination of the vaginal smear. If semen is identified, DNA testing of the vaginal swab is immediately initiated and case screening is terminated pending DNA results. In the absence of semen on the vaginal samples, underwear from the complainant is examined for the presence of semen and/or saliva only if vaginal penetration and/or cunnilingus is alleged, and if the underwear were worn shortly after the alleged assault. Clothing is examined for the presence of semen only if the case history indicates that external ejaculation is suspected or if the complainant cannot reliably describe the circumstances of the assault.
- A process was designed to expedite the examination of micro scope smears made from internal samples collected during the SAEK. The examination provides a rapid screen in order to expedite the processing of positive sexual assault cases while minimizing the consumption of related samples.
- A Cold Case Program was established through the joint efforts of the CFS and a major metropolitan police service. This initiative involves the examination/re-examination of unsolved cases by targeting only those cases and those items that are most likely, based on case history, to produce a DNA result attributable to the perpetrator. Strict criteria for submission as well as a hypothesisbased flowchart provided to investigators ensure submission of only relevant items, which leads to a timely examination and the highest chance of success.

Property Crime Cases

The CFS has initiated a "Break and Enter" program to accommodate the submission of evidence from break and enter cases where no suspect is known. The focus of this program is to produce DNA profiles, in a timely fashion, for upload to the National DNA Databank in cases where there are no other investigative leads. To control a potentially unmanageable influx of break and enter casework, strict guidelines were established to target the submission of one item per case that is most likely to be attributed to the perpetrator. Items that are accepted as per the guidelines include swabs of blood, cigarette butts, and swabs

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from drink containers. Items such as swabs of doorknobs, where there is a prior expectation of low levels of DNA having been deposited through innocuous means, are not accepted.

Blood Cases

The principle of hypothesis testing can also be applied in situations where the examination for the presence of blood is required. For example, when processing assault cases where the case history suggests only one bleeding person (complainant), and where a large number of items from the suspect are submitted, the examination of a single item is sufficient if in fact blood is detected. Item selection is based on the circumstances of the event (e.g., a shoe, if there was kicking involved, or the outermost upper garment if there was punching or an assault with a weapon).

Ultimately, the hypothesis-based approach promotes representative sampling over exhaustive sampling and leads to more meaningful results for clients in a timely fashion.

Case Screening, Forensic Biology, Hypothesis Testing

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