D59 Employing a Hypothesis-Based Approach in the Processing of Forensic Biology Casework

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After attending this presentation, attendees will learn about initiatives taken to process casework in an efficient manner by performing examinations and interpretations, and by writing reports such that they are all reflective of hypotheses formulated from the case history.

This presentation will impact the forensic community and/or humanity by hearing about how we are striving to process biology casework in relation to the hypothesis being tested, and by hearing of several examples of initiatives implemented in light of this strategy, we anticipate that other forensic labs will be interested in applying similar strategies so that the most relevant questions in a forensic examination are answered in the most efficient and timely manner possible. We also hope to stimulate discussion so that we have opportunities to learn from the experience of other labs.

Forensic scientists working in the adversarial justice system may at times be asked to carry out certain examinations, despite the fact that inferences drawn from the results of such examinations do not adequately address the hypothesis being tested. In such instances, the limitations of a particular result outweigh its probative value without resolving the question at hand. Therefore, it is the responsibility of the scientist to make an evaluation of the potential inferences to be drawn prior to proceeding, so as to minimise the risk that any result generated may be misconstrued or abused in the judicial process. In his report detailing the proceedings of a judicial inquiry into the wrongful murder conviction of a man in Ontario in the mid-eighties, Mr. Justice Fred Kaufman eloquently expressed this principle, as it related to fibre examinations:

"A forensic scientist should approach the situation with an appropriate understanding and respect for the limitations of the fibre comparison process. The scientist should inform himself or herself of the relevant background facts or hypotheses, appreciating that they may later change or be the subject of contested evidence. If the fibre examination will clearly be worthless because it cannot permit any reliable inferences to be drawn, then it should not proceed. Only scientists - not investigators or counsel - can make that determination." At the Centre of Forensic Sciences (CFS), we have strived to employ the same philosophy in all forensic disciplines.

Furthermore, the notion of hypothesis-based testing goes beyond a decision whether or not to examine any given item. The principle extends to all elements of the testing process, including the manner in which results are interpreted and reported to clients. This presentation will describe initiatives taken at the CFS, at every stage of our work, in order to ensure that the principle of hypothesis-based testing is maintained from the outset. Specific examples will be presented to demonstrate the approach at each stage of the process.

Collection of evidence at the scene of the crime

The CFS is not directly involved in the collection of evidence from crime scenes. However, scientists at the CFS designed, in partnership with other stakeholders, a new kit for the collection of biological evidence from victims of sexual assault (sexual assaults comprise roughly 60% of our caseload). Included in the kit are instructions for nurseexaminers to collect samples in accordance with specific allegations and limitations regarding the persistence of biological evidence. Submission of evidence to the lab for analysis

- For most homicides, case conferences are held early in the investigation, at the instigation of the Office of the Chief Coroner, and involve representatives from the police along with scientists with the requisite expertise, and representatives from other agencies, as required. These discussions, which form part of an overall Major Case Management model in the province, serve to disseminate the circumstances of the case so that hypotheses can be formulated based on shared information. From the perspective of the CFS, these meetings serve to focus the scientific examinations that are required and to narrow the list of evidence items to be submitted to the lab. The meetings allow lab staff to make specific commitments to the investigators with respect to turnaround time (target is 30 days), which in turn allows them to plan the investigation more effectively.
- The CFS has recently expanded its services in the area of highvolume property crimes, but in anticipation of a potentially overwhelming response in terms of submissions, has strictly enforced criteria for police designed to identify a single sample from each case to be submitted, such that it has the highest likelihood of yielding a DNA profile as well as the highest likelihood of the profile being attributable to the perpetrator.
- A project to examine cold sexual assault cases was initiated with a major metropolitan police service. The program has demonstrated the benefits of working in partnership with our stakeholders in order to effectively and efficiently address the relevant hypotheses. A minimal number of key items were targeted for submission and examination in each case resulting in a high success rate.

Evaluation of the service request

 ** Presenting Author*

Although not all cases are currently assessed by scientists prior to evidence submission, they are assessed prior to starting the examinations, and only those items which would effectively address the hypothesis at hand are targeted for analysis.

Screening evidence items for body fluids or other suitable sources of DNA

Elements of the case history impact upon the sequence with which items of evidence in a given case may be examined, as well as on the selection of appropriate samples for DNA analysis. Further information regarding how we have implemented strategies for case screening in the framework of a hypothesis-based approach, as well as examples, will be outlined in a supporting poster presentation.

Interpreting and reporting results of DNA analyses

Examples of how the interpretation and reporting of DNA results proceeds in the context of the specific hypothesis being tested will be discussed briefly with reference to the following key points:

- Appreciation for the fundamental technical limitations
  - amount of template DNA
  - indications of degradation/stochastic influences
- Assumptions
- Mixtures of DNAincidental findings and forensic significance
  - DNA profiles from intimate samples
  - factors in an evaluation as to the suitability of a DNA profile for comparison

Further information regarding how we have implemented guidelines for the interpretation and reporting of DNA results in the framework of a hypothesis-based approach, as well as examples, will be outlined in a supporting poster presentation.

The forensic scientist is the person best equipped with the requisite knowledge, training, and experience to make decisions regarding the analysis of evidence, in partnership with stakeholders whom we rely on to provide the case history, with the understanding that alternate hypotheses may be presented at a future date. Applying the principles of hypothesis-based testing at each stage of the process, while respecting the limitations of any inferences to be drawn, ensures not only that the key objectives of a forensic examination are met but also that they are met in the most efficient manner possible.

Forensic Biology, Hypothesis Testing, Efficiency

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