

HOW MUCH SHOULD AN ANALYST KNOW?

CACNews, 1997*

*This article was first published in the CACNews in 1997

Norah Rudin, Ph.D.
Keith Inman M.Crim.

How much should an analyst know? This is a classic question in forensic science: How much should the analyst know about the case in which he has been tasked to analyze and interpret physical evidence? Our collective quarter century of experience in the field leads us to this answer: As much as possible.

There are two reasons for knowing the case circumstances when performing an analysis. One is well-recognized; the interpretation of results is done in the context of the history of the sample prior to its collection and preservation (and sometimes after as well). This will assist in distinguishing between "explainable" and "unexplainable differences" between the evidence and a reference sample. But the other reason for knowing something about the case seems overlooked by many analysts: it helps frame the proper question.

While it is true that an analyst can maliciously or sub-consciously bias her examination and interpretation, several good checks and balances for this issue exist and we will cover them in a bit. But in our experience both as public and private lab analysts (not prosecution and defense analyst, as so many seem to characterize these roles), bias is most likely to enter a case at the level of the question that being asked, rather than the meaning or interpretation of a result.

One of the greatest unrecognized contributions that a criminalist can provide is in framing the correct question about the physical evidence, both in the context of the legal question and of the particular circumstances of the case. Given that we as criminalists are experts in understanding the capabilities and limitations of physical evidence, we are in a unique position to offer the criminal justice system a way of providing information about a disputed or unknown fact. When individuals with a stake in the outcome or a hunch as to the culprit (e.g. the detective or prosecutor) are allowed to determine what analysis is done by requesting some specific examination, there is potential not necessarily for a bad analysis, but for an irrelevant one. With access to vital case information, the analyst has a chance to retrieve the relevant analysis from the jaws of oblivion. So the participation of the analyst in determining both the kinds of evidence that will be examined and the types of examinations to be performed is, in our mind, a vital pre-requisite to a competent analysis.

Two examples that illustrate exactly these points come to mind

The first was an indoor rape-homicide where a piece of facial tissue was recovered from an area outside of a door that might have been the escape route of the assailant. Because homicide detectives, either through training or experience, commonly associate facial tissue with a rapist wiping his penis after intercourse, they specifically and only requested the lab to analyze the tissue for semen. The lab returned a report indicating that "semen was not detected". The lab report completely failed to mention the trace blood on the tissue. In fact, it is doubtful that they even saw it! This blood was ultimately a key in the reconstruction of the crime.

The second instance involved a homicide in a motel room, where the victim was found lying dead in the bathtub with her head bludgeoned. It was clear from the scene that the victim was beaten at the same location where she was found; blood spatter was evident all around and the immediate scene presented no alternative interpretations. On the bathtub near her feet amongst some spatter, there was a 3mm spatter of blood in the middle of a latent palm print. The print was matched to a suspect who was an employee of the motel, and who had that morning cleaned the room, including the bathtub. His palm print in that location would not be unlikely given that history. The primary issue became whether one could determine if the blood was deposited before or after the palm print. This blood/print combination was lifted on fingerprint tape and submitted initially to the serology section of the local lab. Because it was an extremely small stain (at least considered so at that time), the analyst performed the only test that could be run on a sample of that size—species determination! She dutifully wrote a completely useless report that the stain in question was human. In fact, absolutely no doubt existed of either the species or origin of the blood (the victim). More important, the choice of analysis could have effectively obliterated any chance of answering the only relevant question in the case—which came first?. Fortunately, someone had the foresight to take excellent photomicrographs before the analyst destroyed the evidence. The denouement of this exam is another topic.

Technicians perform analyses when requested. A criminalist (or scientist, or forensic scientist, fill in your favorite term) will evaluate the efficacy of any requested exam in light of the case circumstances and the legal question(s). You will not get the right answer if you do not ask the right question, no matter how brilliant your examination. And knowing as much as you can about the case will assist in asking relevant questions. Because we are all human, we cannot help but have our own personal and professional prejudices. But one key to a competent professional life is understanding your own limitations and biases, and taking them into consideration in your work.

So on to the specifics of DNA and RFLP band interpretation. An understanding of the sample (its source and history) is necessary in order to incorporate all that we know about DNA and its behavior under various conditions into our interpretation. The results from a DNA analysis are much more likely to falsely exclude a sample from a source than they are to falsely include a sample (barring wholesale contamination), because validation studies have documented the loss of only part of a profile under certain conditions. In order to address the concern of unintentional bias (we will leave the malicious evil-doers out of this discussion), we believe it is wise to adopt "rules of interpretation" (for lack of a better phrase) based on the aforementioned validation studies and then apply them religiously. As examples, we raise the issue of whether one would tend to see a band in a sample if it is also

present in a reference sample that it is "supposed" to match.

In the CAL/DNA laboratory, a hierarchy of interpretation rules is invoked in the following order:

- Assess each lane independently for the presence and identity of bands (and we have defined what constitutes a band).
- Visually identify where concordance exists between lanes (which samples "match", for those who don't like the word concordance).
- Size the bands identified in the first step.
- Size the known and unknown quality control samples (we place a known and a blind QC sample on every gel) and assess whether they are within or outside of a pre-determined acceptable range.
- Mathematically compare concordant bands according to valid statistical criteria; do any other comparisons (mathematical or visual) that are appropriate for a case (e.g., ensuring that a victim's e. cell DNA is concordant with her reference DNA).
- Have a second qualified analyst repeat the entire interpretation process with no knowledge of the details of the case except what samples are in what lane (not who is suspect or victim, or what should match whom).

The second sizing must agree with respect to the bands chosen as real within a profile (some artifacts are not bands), and must meet yet another mathematical criteria for acceptance. Thus each case is independently interpreted twice by different qualified individuals, one of whom formulated the question and ran the test(s), and the other with little knowledge of the issues

With competent and well trained analysts, we can testify that this system works well for ameliorating analytical and interpretation bias (you should hear the fights!). Of course it is not perfect, and we generally welcome competent independent assessment by a qualified individual for an "outside-the-lab" evaluation as a legitimate form of quality control. Please see our commentary on the NIJ report in *Jurimetrics* Spring 1997, Vol. 37, Issue 3.

Keith Inman
CAL/DNA

Norah Rudin, Ph.D.
Forensic DNA Consultant

