B47 Proof of a Negative?

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After attending this presentation, attendees will learn an approach to teaching the concept of negative evidence to students or trainees using crime scene search protocols as exemplars.

This presentation will impact the forensic community and/or humanity by introducing forensic science practitioners and educators to the concept of constructing a probability assessment for a crime scene search protocol, in particular to the probability that a negative search can, under the right circumstances, infer a probability that the evidence was not there.

Determining the error rate for many forensic science examinations is relatively straightforward. For example, the probability of correctly: identifying a compound, assigning a DNA pattern to its donor, and reconstructing a vehicle's speed at the time of an accident, have all been considered. But, what if a crime scene search produces no evidence? What is the probability that it really was there (merely overlooked) versus the probability that it really was not there? What is the approach for calculating the error rate for a crime scene search such that one can offer a reliable assertion that an item of interest really was not there when its absence will support an issue in the case, i.e., negative evidence? The reliability associated with locating, or assuring the absence of, an item of evidence is no less trivial than the reliability associated with its examination. The question then is, what is the probability that a particular search protocol will locate (or miss) a particular item in a particular matrix at a scene?

This question is analogous to the concept of limit of detection in toxicological analyses. And, like those tests, the answer depends on the compound of interest, the matrix within which it is hidden, and the technique used to detect it. But, unlike the relatively uniform approaches associated with identifying chemical compounds in body fluids, the variety in forms of evidence, types of matrices, and detection techniques that comprise crime scene searches precludes simple solutions. Indeed, like much of forensic science, the question can sometimes be answered quantitatively but more often it can only be answered qualitatively. Faced with all of this complexity, the educational challenge is first to convey the concept itself.

An approach is presented for teaching students how to consider the question of presence versus absence. An exercise is constructed around the task of locating small items, such as cartridge cases, in an outdoor plot. A variety of search techniques is employed with the varying successes recorded. From these data, a comparison can be constructed as to the relative probabilities of finding the item of interest. One also can determine the relative "cost" in terms of time and equipment required. These findings lead to another question – What would be the increase in the probability of finding the item(s) if two different techniques were employed instead of just one? This question allows the instructor to introduce the idea of Bayesian probability as applied to an examination, rather than just to its impact on the case as is commonly presented. Considering a Bayesian approach, though, requires a consideration of both false positives and false negatives along with the usual consideration of true negatives and positives. Using cartridge cases as an exemplar allows for plausible scenarios to be advanced in which a probability exists of finding items that have nothing to do with the case at hand. This introduces the idea of combining quantitative data from objective sources with "expert," "background," estimated, thus, subjective information. Although the students do not have the skills, based on the exercise alone, to develop reliable data as to a search protocol's error rate, they know the procedure and have a better understanding of what it takes to "prove a negative."

Negative Evidence, Crime Scene Search, Protocol Error Rate