Published on *Voice For The Defense Online* (http://voiceforthedefenseonline.com)

A Thorn in the Side of Forensic DNA: Complex Mixtures

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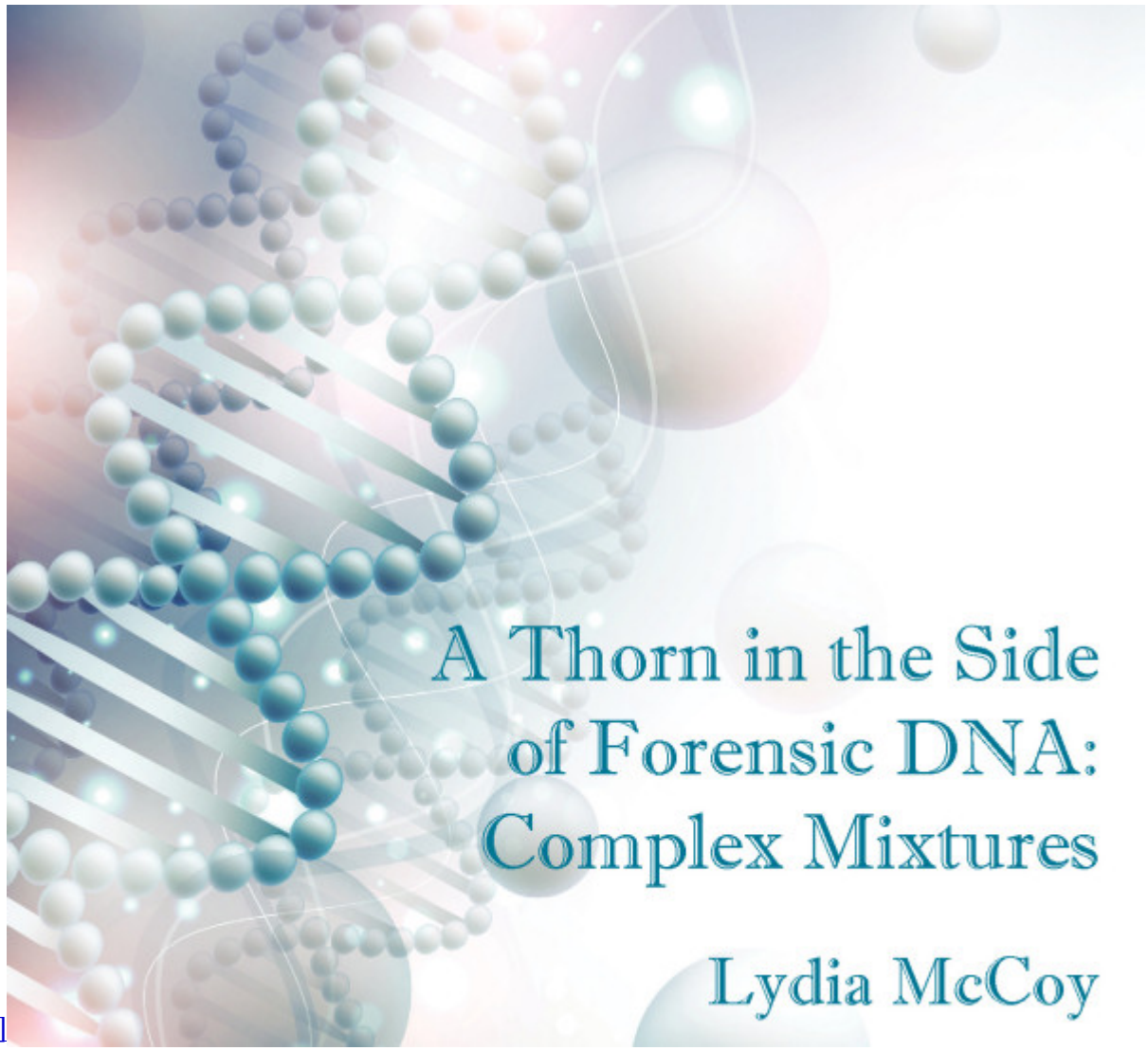
Thursday, January 26th, 2017

[3] 

The consultants are discussing your case. They are vigorously proclaiming how the case falls short, and you are feeling like a sure win is in the bag. Then you ask them how should we go at them in trial. It?s then that you hear things in a deflated tone like, ?Well, what they did isn?t wrong, just not how I would have done it.?

What happened to the fervor?

In forensic DNA, there are many ways of analyzing a case, and due to the variability from case to case, the guidelines are very flexible. Complex DNA mixtures is one area that can be subjective, resulting in differing outcomes. How confident are you the alleles in the profile are real and not artifacts like allele drop-in or drop-out? How confident are you in the number of contributors? How sure are you the alleles being attributed to people are theirs and not someone else?s? How do you know the person you?re putting together allele by allele is a suspect, and not an innocent bystander or not a person at all? There are many questions to consider when interpreting a complex DNA mixture profile. As such, this will always be a need for better resolution of the profile, better confidence in the testing results, and, especially with the increased sensitivity of DNA technology, a better understanding of what the results mean. As a result of the flexible guidelines, the consultant might have concluded differently, but the original analyst did nothing wrong. The subjectivity allowed in the interpretation is needed due to the differences between cases, but makes it more difficult to stand up and declare ?You are wrong!?

So, with the complex DNA mixtures being such a thorn, why isn?t anybody working on it? The truth is they are and have been for quite some time. This past September the 2016 PCAST (President?s Council of Advisors on Science and Technology) went into critical detail on the subjective nature of interpretation issues regarding complex forensic DNA mixtures, and the overall need for more research to standardize the interpretation and statistical analysis. However, they are not the first to point out the issues (e.g., 2009 National Research Council), and in fact the industry has been working on these issues for some time, as can be seen in any Google search. As an example, in 2009 the Journal of Forensic Science published an article titled ?Mixture Interpretation: Defining the relevant features for guidelines for the assessment of mixed DNA profiles in forensic casework,? one of many great papers discussing these same issues. The questions or doubts seem never ending because the same questions come back around with each advancement. For example, the industry has been developing probabilistic genotyping software. This is a great next step that could remove some subjectivity and help standardize profile interpretation. In time, though, as its use increases, errors will be discovered and issues will need to be resolved through research.

With continued research and continued growth, a whole new set of questions arises. As pointed out by the PCAST report, change can have significant implications. When, in 2015, the FBI made corrections to the population database, nobody suspected the changes would significantly alter the fate of cases. But some cases in Texas were found to have major changes, and thus the DNA Mixture Notification Subcommittee was formed. The committee found part of the problem was the subjectivity of concluding on a complex mixture; also contributing was a change in the statistics.

The forensic DNA analysis being done now is vastly different from what it was ten years ago, and ten years from now it will again be vastly different. While this is an easy concept to understand, the implications are a hard pill to swallow. Juries tend to believe forensic DNA is infallible, according to William Thompson?s paper, ?The potential for error in forensic DNA testing,? published in 2008 for the Council for Responsible Genetics. Should cases be periodically re-examined? It has been shown that a shift in philosophy can have a significant impact on a case. If periodical re-examination is performed, how often or under what circumstances? Maybe a separate lab should be created for re-examinations so as not to disrupt or add more burden to labs working current cases? How significant of a change constitutes a new trial? How do you compensate someone who was legitimately convicted based on accepted and up-to-date science then, but now the science has changed and shed new light? Perhaps the answer is to view forensic results as a tool and not an answer. They offer a lead for investigators to follow up on, or validation of a story. Finding someone?s DNA profile on a piece of evidence does nothing to tell you when it was deposited or how it was deposited. Certainly, there are situations where someone?s DNA just shouldn?t be present, but a complete look at the case and scenario will always be needed when considering any evidentiary results.

As the forensic sciences evolve, these questions, doubts, and concerns will persist. Perhaps they should. When confronting them, the industry takes the next step towards perfection.

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