

## Pitfalls in Forensic Toxicology:

*Or why you need a competent expert.*



Forensic Toxicology is an often misunderstood science. Not only by lay-people, but many times by medical doctors, pharmacists, clinical chemists, and even pharmacologists. Television dramas like CSI, while popularizing forensic science, have contributed to the misunderstanding. With actors simply injecting an extract into a "black box" and getting a complete printout of all the substances in the body, their origins, concentrations, structures, and an interpretation, it is no wonder that no one seems to understand what all the fuss is about.

The reality is that forensic toxicology is very complex. As an attorney, choosing an expert who is able to recognize the pitfalls of forensic toxicology and avoid them is paramount to having a winnable case.

Let's discuss a few of the key pitfalls:

### Specimen

First, the proper specimen must be obtained. It seems like every year there is a new specimen being touted for its virtues. However, the truth is that different specimens tell us different things.

**Urine** is easy to obtain in large volumes and usually has a relatively high concentration of analyte, however it can only tell us what drugs or poisons have been ingested from last 20 minutes to sometimes a month prior to collection. **Hair** is easy to obtain and can tell us what a person ingested a couple of weeks ago and prior, but nothing about what is in his body right now. **Saliva** (oral fluid) can tell us what is in the body right now, but concentrations and specimen volumes are low and some drugs are not excreted in the saliva. **Blood** requires an invasive technique to obtain, but can

us what is effecting the individual at the time it is drawn.

### Analysis

Specimen analysis is an area where many consultants or experts are lacking in expertise. The toxicological analysis of biological specimens is first and foremost an exercise in analytical chemistry. Most medical doctors, pharmacists, pharmacologists and other medical professionals do not have the requisite background in applied analytical chemistry, instrumental analysis, or laboratory experience to properly evaluate this aspect of a case. One should be wary of "hospital toxicology" which often relies on immunoassays and kits. These techniques often do not have the necessary specificity required for forensic work.

### Interpretation

This is the phase at which most consultants become involved, but also an area fraught with peril.

Continued use of many drugs causes the body to develop a **tolerance** to the drug. This can be achieved by the body developing more receptors for the drug thus mitigating its effect, or the body may be stimulated to produce a greater amount of the enzymes responsible for the drug's metabolism thus speeding up its elimination. Occasionally, one must consider whether a person has died because they lost their tolerance during a period of prolonged abstinence. The **age** of a person can play a great role in how they metabolize and react to a drug. Neonates, infants and children can have vastly different enzyme systems, lipid compartments, and liver to total

body weight ratios which can greatly influence case interpretation. **Drug interactions, pre-existing conditions, and effects of medical intervention** can also change an interpretation.

One of the most common mistakes that uninitiated consultants make is treating **postmortem drug concentrations** as if they were antemortem concentrations. While there are too many issues surrounding postmortem interpretation to address in this communication, one of the biggest problems in this regard is applying pharmacokinetic calculations to postmortem results without an understanding of the concepts of postmortem redistribution and site dependence.

### Summary

We have only brushed the surface of the complexities of forensic toxicology, but I hope this discussion will give you some tools for making an informed choice when choosing who will act as your case consultant or expert.

I have over 20 years experience in forensic toxicology ranging from bench analysis to pharmacological interpretation and from pre-employment urine drug screening to death investigation. If I can be of help in evaluating your case, please send an Email or give me a call.

Richardson T. "Pitfalls in Forensic Toxicology." *Ann Clin Biochem.* 37 (2000): 20–44.



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