F50 Evaluating Forensic Evidence in Drug Impairment Cases: Pitfalls and Complexities of Testimony by Non-Medical Witnesses

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The goal of this presentation is to provide attendees with an overview of: (1) why non-medical witness testimony interpreting human performance as drug impairment can lead to an unfair application of justice; and, (2) the common pharmacokinetic and pharmacodynamic issues of the seven distinct drug classifications used in American jurisprudence.

This presentation will impact the forensic science community by explaining how, in order to accurately determine if a human subject is impaired by drugs, the person making the determination must be educated in the interactions of the chemicals found in the drugs with the biological receptors in the brain (pharmacodynamics). The person making the determination must also understand fully how the chemicals from the drugs are absorbed, distributed, and eliminated in the body (pharmacokinetics) and how long that process takes.

Drugs in the body can be broadly classified into two types: (1) zero order drugs; and, (2) non-zero-order drugs. Essentially, this means that for zero-order drugs, the elimination rate is constant and not dependent on any biological variability. Conversely, the elimination in non-zero-order drugs is variable. This non-zero classification is a significant departure from that of ethanol metabolization. Absent a complete subject (patient) medical history, the reported drug concentrations and subjective observations reported by the non-medical witness are incomplete and can be misleading.

Pharmacodynamic effects reported by a non-medical witness require considerable education about the central nervous system's physiology and neurotransmission. The witness must be able to testify about the synaptic vesicle, reuptake, receptors, and the transfer through the synaptic cleft. The witness must also be able to distinguish between the various sites of synthesis as they relate to the class of transmitter.

To understand the significance of transmission differences, the witness must recognize that some drugs stimulate the receptor by fooling the neurotransmitter to respond. Alternatively, another type of drug may depress the site by acting as a wall, preventing the cell from stimulation or engaging with its receptor. The individual responses of both stimulation and depression of neurotransmitters vary from person to person. This makes dosage and interpretation of toxicology report values variable and complex. The non-medical witness must recognize that drug variability is affected by dosage, route of ingestion, length of time taking drug, interaction with other drugs, drug potency, gender, body mass, age, and genetic makeup, including ethnicity.

The non-medical witness must also understand the bioavailability of the drug. This means that the witness must understand what percentage of the consumed drug is free vs. bound. How much of the drug reaches the effected receptor is dependent on how the drug is ingested. Was it a tablet taken orally, an injection administered intramuscularly or intravenously, etc.? Is the drug protein-bound? Is there more than one drug of similar polarity attempting to bind with the same protein or is the drug free to enter the cell? These are all questions that the witness must be able to answer if they are attempting to correlate a drug level with impairment.

Opinion testimony about a drug concentration by a witness that does not possess the necessary medical background in understanding of free and bound drugs and the specifics about the individual drug polarities can be misleading to the jury and the judge. A hearing to determine the admissibility of such opinion evidence should always be required but often is overlooked and instead labeled as fodder for cross-examination.

The non-medical witness opinion evidence is often based on an incomplete scientific picture. This fact requires that the attorneys and judges educate themselves about the considerable limitations of the drug recognition evaluation and stop unequivocal testimony that a certain drug concentration in the body equals impairment universally without considering any medical or physiological information about the individual subject.

Non-Medical Witness Testimony, Pharmacodynamics, Pharmacokinetics