The Number Doesn't Tell the Whole Story

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Too frequently, in DUID cases we focus on the number. But what does the number really tell us about impairment? Nothing.

It is scientifically impossible to determine impairment for any drug (even ethanol) based exclusively on a number from analytical chemistry. This is because of the very interesting world of pharmacokinetics and the multi-variant problem of the human body and the human condition. The analytical chemistry result must be equated not simply to symptomatology, but uniquely to it, meaning that the use of the drug uniquely and to the exclusion of all other reasons produced the observations of the marked diminution of dexterity, marked diminution of cognitive function or marked diminution of psychomotor function.

In a typical scenario, blood is taken one hour to two hours after the motor vehicle stop and reveals a "magic number" of 70 ng/mL of Alprazolam (Xanax). No alcohol or illegal drugs were found and the motorist had a valid prescription for Xanax. The officer now has this analytical chemistry result, but the ultimate question of impairment is not that easy to devine.

If you knew nothing about the world of pharmacology and you were presented with a seemly large number such as our example from the analytical chemist examining the drug, then you may think this was a Driving Under the Influence of Drug (DUID) case.

But is it necessarily so?

Is this a fair conclusion based upon this data?

There are limitations to analytical chemistry and what it can tell us.

Analytical chemistry inherently does not take into consideration pharmacodynamics (the drugs effect on the human body). It is the end result of a process that depends upon the input it is given. Blood draws do not happen concurrently with driving and therefore at most it is a measure of the drug's presence and amount in the blood at the time of the blood draw and not reflective of the time of driving. Stated differently and more simply, the human body itself is unique to its individual owner and variations can impact the value of the analytical chemistry result and its later interpretation as to the drug's effect to this unique human being (pharmacodynamics) that is the citizen accused.

Is the 70ng/ml level low, high – inside or outside therapeutic range?

Is this value likely to produce significant impairment?

Did the combination of this drug plus others taken from over-the-counter sources produce a synergistic (additive) or antagonistic effect?

Well, analytical chemistry alone cannot answer these questions relevant to impairment for us. Each person is different. Mama was right. You are like a snowflake. You are unique pharmacologically and respond to the effects of a drug in a unique pharmacodynamic manner. From a strict analytical chemistry to pharmacology point-of-view, having a "magic number" alone cannot prove impairment in a DUI or a DUID case.

This is where pharmacology comes into play. However, there are limitations and conditions precedent even to pharmacology.

Even a trained and clinically experienced pharmacologist has limitations of his or her interpretation of the analytical chemistry result as related to pharmacodynamics. The very minimum information that would need to be known in order for a trained pharmacologist to begin to consider determining the possibility of impairment includes the following:

1. In the case that the police officer made observations of dexterity difficulties, cognitive function issues or psychomotor function dysfunction, or even if he or she attempted to perform or completed a DRE evaluation, the officer or later expert must have information that the motorist is "normal," meaning that the person was free from any medical pre-conditions that could be confused for impairment. As it is the basic assumption of any observation that there is a noticeable change from the person's homeostasis, there must first be a known and established homeostasis to establish deviation. One cannot fairly assume that the person is "normal" and dexterous or cognitively quick or psychomotor coordinated. There are many people in this world who are not.

2. The officer or later expert must be privy to the person's pre-existing physical or mental conditions and then must rule out any and all of them as possible contributors to the perceived observations that are later interpreted as impairment.

3. The officer or later expert must be privy as to what symptoms or diagnosis originally lead the doctor to prescribe the medicine to begin with so as to be aware of the person's un-medicated state. It is an assumption that without the drug that the person would not be impaired. Therefore this data of the person's un-medicated state is necessary to rule out the possibility that the perceived dexterity difficulties, the cognitive function issues or the psychomotor function dysfunction were due to an inappropriately low dosing and therefore that the person appeared impaired when they were not.

4. The officer or later expert must be aware of all medications that the person ingested including the over-the-counter ones so as to be clear that the effect of the analyte of interest and the other medications either over-the-counter or controlled did or did not influence the measured drug in terms of impairment.

5. The officer or later expert must be aware of the dosing history of the patient in terms of the supposed impairing drug as the dosing history may profoundly impact the effect of the drug dose on the human.

6. The officer or later expert must be aware of the recent dosing usage of the patient as it too may impact the conclusion of impairment.

The myth of the one-size fits all "therapeutic range"

As we can quickly see, the concept of a number-based "therapeutic range" of normal and high is not a valid pharmacological model. It is a convention and a device that is ripe for abuse by the under-trained and under-educated. It is at best a tool to begin to determine pharmacodynamic effect, but is certainly not conclusive.

The primary purpose of the therapeutic drug level tables is clinical in nature, not forensic. They are to be used to adjust the dosage of a patient into a range that has been shown to be therapeutically effective for a group of experimental subjects. Clinically this is done by taking a blood sample immediately prior to the next dose after obtaining steady-state. The patient's dose would be adjusted either up or down based upon the plasma or serum level (not whole blood). Toxic levels which are often part of such a table are based upon adverse side-effects that have occurred and blood levels determined. The important point is that these levels have not been correlated with any behavioral effects (pharmacodynamics). There are some drugs that have been studied for their behavioral effects and correlated with plasma levels but these are not in published tables. There are tables of drug levels associated with deaths and these are regular used by medical examiners as but one of many possible factors to help assign a cause of death based upon the totality of the circumstances, but they are not used alone to determine cause of death.

Too many factors need to be considered, such as:

Was it a single-dose event?

Is the person on a maintenance program (e.g., Methadone, Xanax and Lorazepam)?

Was the person in the absorptive phase, peak or elimination phase at the time of the measure?

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What was the potential impact of the drug on the motorist in terms of dexterity, cognitive function or psychomotor function?

Is the analytical chemistry result at the time of the blood draw even relevant at all?

Most importantly, the complicated question of retrograde extrapolation is even trickier in the case of multiple order kinetic drugs.

Conclusion

There is a limitation to analytical chemistry. The idea of simply and solely using an analytical chemistry result and being able to determine impairment is a dangerous suggestion. The idea of interpreting the analytical chemistry result with an eye towards opining impairment is a very complicated task that should be reserved to highly trained pharmacologists who have years of clinical experience with that particular drug that is hypothesized in this case to cause impairment and only then with complete and total relevant clinical data to that unique person. This number produced (i.e., the analytical chemistry result) without the entire relevant rich clinical context truly has the overall significance of random numbers chosen in a lottery drawing.
