K30 Clinical Pharmacologic Factors in Interpretation of Serum Benzodiazepine or Opiate Concentrations in Automobile Drivers

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After attending this presentation, attendees will understand some principles of clinical pharmacology that influence the expected effects of benzodiazepines and opiates in individual drivers. Factors such as medical use versus recreational use, the medical condition being treated, the specific benzodiazepine, the duration of treatment, and the time since drug administration will markedly influence the likely effects produced by these drugs in individual drivers.

The presentation will impact the forensic science community by providing insight into important factors that can influence the effects produced by concentrations of benzodiazepines or opiates

Following automobile crashes, in the absence of measurable ethanol concentrations, law enforcement officers often require drivers to submit blood samples for determination of the presence and concentration of drugs. However, millions of drivers use opiates and benzodiazepines for legitimate medical indications. Published literature suggests that 2.4% of drivers are currently taking benzodiazepines, and 11.1% of drivers are taking opiates.

A review of published literature reveals that in patients using these medications chronically, measures of impairment are often no different from placebo. Much data reporting an increase in odds ratio for motor vehicle accidents in drivers taking opiates or benzodiazepines occur within the first one to two weeks of drug exposure, or in drivers using these drugs recreationally.

A review of the literature reveals the following published results. The effects of alprazolam 2mg per day was examined using the Hopkins verbal learning test and by measuring benzodiazepine receptor density using SPECT scans. Subjects treated for 24 days showed a steady decrease in impairment scores, with day 24 effects proving no different than placebo. This indication of tolerance correlated with steady decreases in benzodiazepine receptor density. A similar study, measuring psychomotor performance and memory in subjects treated with alprazolam (.25-2mg) daily for three weeks, showed that after two to three weeks of daily administration, no significant impairment remained. Another double-blind placebo controlled crossover trial in 16 normal male volunteers confirmed that sedative and psychomotor effects, following chronic alprazolam administration, were no different from placebo after ten and four days respectively. The effects of diazepam (.2mg/kg for 15 days followed by .3mg/kg for seven days) and oxazepam (.8mg/kg for 15 days followed by 1.2mg/kg for seven days) were also studied using a battery of psychometric tests in healthy subjects. Following the first dose there was marked impairment; however by the end of 15 days performance was similar to testing prior to drug administration. When the dose was then increased for the final week of treatment no further impairment was measured. Even when examining only the acute effects of benzodiazepines there are marked differences between agents. A study compared the skills related to driving after a single administration of diazepam 10mg and lorazepam 2.5mg. Lorazepam impaired all measured skills for 12 hours while diazepam impaired only perceptual speed and coordinative skills for five to seven hours. Nonetheless, there were measurable plasma concentrations of both drugs for at least 24 hours.

Much like benzodiazepines, there is an intuitive presumption that all individuals with measurable blood concentrations of an opiate will be impaired. However, a substantial amount of literature suggests impairment from chronic therapeutic opiate use is no different from placebo. A study in Texas compared the driving records of 104 former heroin users during one year while they were maintained on methadone. No significant difference was found in convictions for accidents, negligent collisions, or other moving violations compared to the entire pool of Texas licensed drivers. Another study, which examined various forms of cognitive function in 17 opiate-dependent subjects, demonstrated an improvement two months after methadone maintenance when compared to baseline. Likewise, six patients with severe non-malignant pain demonstrated positive behavioral and neurophysiological changes after instituting a sustained daily morphine dosage. Patients' mood and clinical pain were rated on visual analog scales, while their reaction time was measured using a standard auditory task. The non-impairment of patients' reaction time and evaluation of mood both failed to indicate a sedative effect. Neurophysiologic measures such as late auditory evoked potentials (AEP) and a P300 component were used to measure vigilance and cognitive performance. Auditory P2 and P300 amplitude actually increased under morphine use showing improved vigilance

These and other studies by various authors which have appeared in peer reviewed publications and their own clinical experience from a pharmacokinetic and pharmacodynamic perspective will be discussed. In addition, there will be discussions about those patients treated with opiates or benzodiazepines whose medical diagnosis can produce symptoms easily misinterpreted as drug impairment. Examples include cancer pain treated with opiates and spasticity treated with benzodiazepines, both which can produce outward signs that can be confused with drug intoxication.

In summary, the impairing effects produced by specific concentrations of opiates or benzodiazepines will vary depending on whether these medications are being used to treat chronic medical conditions, being used acutely, or being used recreationally.

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Benzodiazepines, Opiates, Automobile Drivers

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