Practical Challenges to Positive Drug Tests for Marijuana

With the advent of drug testing in the workplace and the consequences of a positive drug test, several issues have arisen in defending or explaining a positive result for a given drug of abuse. Marijuana is the illicit drug with the highest percentage of positives in workplace drug testing. Consequently, marijuana was the first such drug for which excuses were provided to explain the positive test result.

Passive inhalation was the first defense offered. This prompted several studies to ascertain whether passive inhalation of marijuana smoke could produce a positive drug test (1–4). The majority of these studies showed that although passive inhalation of marijuana smoke under certain circumstances could produce detectable concentrations of Δ9-tetrahydrocannabinol (THC) metabolite in urine, those concentrations were not above the cutoffs used under the federal workplace drug testing guidelines (50 µg/L for screening and 15 µg/L for confirmation). One study (5), however, showed that concentrations above these cutoffs could be attained when the exposure conditions were very severe and, hence, unrealistic. Today, passive inhalation is not nearly the issue that it was at the beginning of drug testing in the workplace.

The second issue was passive ingestion. Unknowingly ingesting of marijuana tea, brownies prepared with marijuana, or the like was the line of defense that followed passive inhalation. Although studies were carried out to investigate this issue (6, 7), there was no question that if someone orally ingested cooked marijuana, urinary excretion of Δ9-THC metabolite would correlate with the amount ingested. The issue was whether the concentrations found in the urine at a specific time after ingestion could be explained in the absence of a detectable biological activity at the time of ingestion. This issue still has no definitive resolution in light of the fact that individuals have explained that there was alcohol consumed with the meals, which could mask the effects of marijuana.

Over the last few years, hemp-seed oil and hemp-seed products have come to the forefront of defense issues in marijuana cases. Hemp seeds and hemp-seed oil are products that have been legal, that are being ingested by individuals for health reasons (hemp-seed oil is known to contain high concentrations of unsaturated fatty acids), and that were thought, until recently, to contain no THC. The fact that these products do contain THC presents a challenge in prosecuting positive marijuana-use cases. The seriousness of the issue was demonstrated by studies in which an individual or a few individuals ingested a hemp-seed product (hemp-seed oil or hemp-seed-oil capsules), and the THC metabolite was measured in their urine (8–11). Hemp-seed oil is presumed to be prepared from the fiber-type cannabis, which contains very low concentrations of THC. If, however, the oil is prepared from drug-type seeds with a high THC content, the oil will contain higher concentrations of THC. Moreover, the presence of THC in the cannabis seeds is attributable to adherence of the resin to the outside of the seeds as a result of physical contact with the plant material during processing. As the oil is pressed out of the seeds, it extracts THC from the exterior seed coat. Plant particles present with the seeds will also be extracted by the oil, increasing the THC content of the oil (12). Therefore, the THC content of the oil is a function of the type of seeds (fiber- or drug-type) and the presence of leaf debris. Analysis of a wide variety of hemp-seed products and hemp-seed oil has revealed a broad range of THC content (anywhere from a few mg/L to >200 mg/L). This variation in the THC content coupled with variations in the use patterns of these products among individuals (from the equivalent of 1 mL of oil in the form of soft gelatin capsules to ≥1 tablespoons of oil) make it difficult to offer generalized statements about whether the use of hemp-seed products could produce a positive urine drug test.

Recently, the hemp-seed industry has made an effort to lower the THC content of the seeds by including a wash step before pressing or by shelling the seeds. Shelled seeds were found to contain very little THC (in the range of 2 µg/g). A study was therefore initiated by Leson et al. (13) to investigate the possibility of a positive urine drug test as a result of daily ingestion of various amounts of these “new” preparations, with total daily doses of THC ranging from 0.09 to 0.6 mg (equivalent to 45–300 g of hulled hemp seeds containing 2 µg/g THC or 19–120 mL of hemp-seed oil at 5 mg/L THC) in the form of blends of hemp-seed oil and canola oil to achieve the required dose of THC in a total of 15 mL of oil. The study design was based on the premise that if one ingested hemp-seed oil on a regular basis (daily), analysis of the urine after several days of ingestion would reveal detectable urine concentrations at times after steady-state conditions were achieved.

To limit the number of samples to be analyzed and still obtain meaningful data, urine samples were collected 4–8 h after dosing on days 9 and 10 and after 1 and 3 days of dose termination. With the exception of one urine specimen from the 0.6 mg daily dosing, all urine specimens failed to screen positive for cannabinoids at 50 µg/L. Furthermore, the highest gas chromatography–mass spectrometry (GC/MS) confirmation concentration in any of the urine samples was 5.2 µg/L, far below the 15 µg/L GC/MS confirmation cutoff used in regulated drug testing. The shortcoming of this study was the limited number of urine collections, although the 4–8 h delay was designed to achieve collection at times approximating the $c_{\text{max}}$.

The latest study to address the impact of the use of hemp-seed oil on urine drug tests is reported in this issue (14). The study was designed to address the pharmacokinetics and pharmacodynamics of oral THC in the form of hemp-seed oil or prescription Marinol capsules. The study design included dosing three times daily for 5 consecutive days and collection of all urine samples.
voided throughout the study. This design and the analysis of all samples assured that no positive urine would go undetected, a significant difference from the previous study by Leson et al. (13). Although the data for the low doses of THC in this study (0.39 and 0.47 mg total dose of THC) were generally similar to those reported by Leson et al. (13), a few samples exceeded the federally mandated screening cutoff of 50 µg/L and the 15 µg/L GC/MS confirmation cutoff. Intersubject variability coupled with the fact that all urine specimens were collected in the present study could explain the higher incidence of positive urines in this new study (14). The conclusion, however, was that it is possible, but unlikely, for a urine specimen to test positive at the federally mandated cannabinoid cutoffs if the manufacturers’ dosing recommendations for the ingestion of low-THC-concentration hemp oils are followed.

Therefore, the interpretation of positive urine tests for marijuana should be made with care and on a case-by-case basis. Claims of ingestion of food stuffs containing hemp-seed oil should be verified by analysis of the products ingested to determine the THC dose allegedly ingested and to determine whether the THC metabolite concentration in the urine is consistent with the dose ingested.

References