



### K69 Cannabinoids in 105 Postmortem Forensic Toxicology Cases

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After attending this presentation, attendees will understand the usefulness and value of postmortem cannabinoid analysis and will have a better understanding of the potential cardiotoxic effects of these compounds in humans.

This presentation will impact the forensic science community by providing postmortem cannabinoid incidence data among different types of deaths and by offering postmortem cannabinoid blood reference concentrations.

Between July 1, 2010, and June 30, 2011, the laboratory performed 1,338 postmortem toxicologic evaluations. Cannabinoids were confirmed/quantified in 105 cases (7.8%) comprising of 31 naturals, 31 homicides, 30 accidents, 12 suicides, and one undetermined. Decedents averaged 40 years (range: 16 – 71) and were predominantly male (72%).

Of the 31 naturals, one had antemortem whole blood (AMB) where only THC-COOH was found (11ng/mL). Twenty-eight had peripheral blood (BLP) where THC (n=25; mean: 8; range 1 – 48ng/mL), THC-COOH (n=22; mean: 75; range 5 – 640ng/mL), and THC-OH (n=4; mean: 77; range: 17 – 210ng/mL) were found. One natural had central/cardiac blood (BLC) and only THC-COOH was detected (69ng/mL). The final natural case involved a decomposed decedent with no blood but THC-COOH was measured in her liver (2.6mg/kg).

In the 31 homicides, four cases had AMB and THC (n=3; mean: 2; range 1 – 5ng/mL), THC-COOH (n=4; mean: 31; range 10 – 78ng/mL), and THC-OH (n=1; 6ng/mL) were detected. Seventeen had BLP and THC (n=15; mean: 21; range 1 – 120ng/mL), THC-COOH (n=15; mean: 39; range: 1 – 170ng/mL), and THC-OH (n=2; 6 and 14ng/mL) were detected. Nine of the homicides had BLC and THC (n=5; mean: 7; range: 1 – 21ng/mL), THC-COOH (n=9; mean: 24; range: 7 – 96ng/mL), and THC-OH (n=1; 6ng/mL) were detected. The final homicide involved a decomposed decedent with no blood but THC-COOH was measured in her liver at a concentration of 1.4mg/kg.

In the 30 accidents, BLP and BLC existed in 27 and 3 cases, respectively. THC (n=20; mean: 6; range: 1 – 27ng/mL), THC-COOH (n=25; mean: 35; range: 5 – 330ng/mL), and THC-OH (n=1; 5ng/mL) were detected. In cases with BLC, THC (n=1; 3ng/mL) and THC-COOH (n=3; mean: 39; range: 5 – 89ng/mL) were found.

In the 12 suicides, only THC (n=8; mean: 7; range 2 – 24ng/mL) and THC-COOH (n=9; mean: 23; range 6 – 51ng/mL) were detected. Finally, in the one undetermined case, THC and THC-COOH were measured in BLP at 6 and 13ng/mL, respectively.

Comparison of postmortem BLP cannabinoid concentrations among types of cases suggest that THC-COOH averages the highest in natural deaths (75ng/mL, which is more than double its concentration in any other manner of death) whereas THC concentrations run on average three times higher in homicides (21ng/mL) than in any other manner of death. THC-OH, most often found when cannabis-containing products are eaten, averaged 77ng/mL in natural deaths as compared to only 10 and 5ng/mL in homicides and accidents, respectively.

Cannabinoids were not listed in the Cause of Death (COD) in any of the 31 homicides or in any of the 31 natural deaths, but featured as a Significant Other Condition (SOC) in 12 of the homicides (39%) and in 23 of the naturals (74%). Cannabinoids were listed in the COD in 8 of the 30 accidents (27%) and listed as an SOC in an additional 12 of these cases (40%). Cannabinoids were listed in the COD in one of the 12 suicides (8%) and were listed as an SOC in five more suicides (42%). Finally, the one undetermined death listed cannabinoids in the COD together with morphine.

Closer examination of the 31 natural deaths suggests that 84% of these (n=26) showed significant cardiac pathology such as hypertensive heart disease, atherosclerotic cardiovascular disease, and cardiomegaly. In three of these cases, the medical examiner was of the opinion that the decedent had suffered probable lethal cardiac arrhythmia which has previously been reported in the clinical literature as a possible toxic manifestation of cannabis overdose.

This study is the first of its kind and demonstrates the usefulness of cannabinoid analyses as part of every death investigation and provides postmortem concentration reference data that will improve the ability of toxicologists, medical examiners, coroners, and others to evaluate cannabinoid concentrations in human postmortem specimens as well as their possible contribution to death.

#### **Cannabinoids, Forensic Toxicology, Cardiotoxicity**