K24 Method Development and Validation for the Detection of Cannabinoids in Blood Using LC/MS/MS

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After attending this presentation, attendees will understand how a method was developed and validated for Texas Department of Public Safety (DPS) Crime Laboratory to detect cannabinoids, specifically, Δ^9-THC and carboxy- Δ^9-THC, in blood using LC/MS/MS.

This presentation will impact the forensic science community by allowing for the detection of cannabinoids, Δ^9-THC and carboxy- Δ^9-THC, in blood samples submitted to the DPS Crime Laboratory.

The objective of this research was to develop and validate a method for the detection of cannabinoids in blood using LC/MS/MS.[1] This project is beneficial to the toxicological field in that the compounds of interest, Δ^9-THC and carboxy- Δ^9-THC, would be able to be detected in blood, which is the biological sample that is most often submitted to the Texas DPS Austin Crime Laboratory. Using LC/MS/MS, the cannabinoids would not need to be derivatized, while GC/MS requires it, saving time and therefore money. Methods were developed for detection of cannabinoids in blood on the LC/MS/MS by other agencies and manufacturers, but a cannabinoid method for the DPS laboratory will benefit the entire state by being free of charge to law enforcement agencies. The developed method for DPS was similar to the Dallas County Institute of Forensic Sciences method, but also took into account the methods in published scientific articles. This project required testing the different procedures obtained, and evaluating and optimizing each step performed, including the extraction technique, LLE or SPE. Based on the results, a method for the DPS Crime Laboratory was created.

This method was validated through different parameters that tested selectivity, recovery, linearity, limit of detection, limit of quantitation, carryover, reproducibility, stability, and competency. The method showed no carryover at concentrations four times the highest calibers, 100 ng/mL for Δ^9-THC and 250ng/mL for carboxy- Δ^9-THC, was only selective for Δ^9-THC and carboxy- Δ^9- THC, and showed that both Δ^9-THC and carboxy- Δ^9- THC are stable reconstituted after twenty-four hours. The recovery efficiency for Δ^9-THC was found to be 68.1% for the low concentration, 2ng/mL, and 56.8% for a mid concentration, 25 ng/mL. The recovery efficiency for carboxy- Δ^9-THC was 23.7% for the low concentration, 2 ng/mL, and 18.6% for a mid concentration, 25ng/mL. These results are comparable to other agencies' results. It was also determined that the LOQ for Δ^9-THC was ¼ of the low caliber (0.5 ng/mL) and the LOQ for carboxy- Δ^9- THC was ½ of the low caliber (2.5 ng/mL). The LOD for Δ^9-THC was 1/32 of the low caliber (0.0625ng/mL) while the LOD for carboxy- Δ^9- THC was ¼ of the low caliber (1.25ng/mL). Regarding linearity, both Δ^9-THC and carboxy- Δ^9- THC produced an acceptable curve with a quadratic inverse squared plot. The outside controls were all reproducible and fell well below +/- 20% bias and precision. Therefore, this method can now be used for Texas DPS casework in the future to test for the presence and the concentration of Δ^9-THC and carboxy- Δ^9- THC.

Reference:

[1] Dallas County Institute of Forensic Sciences Toxicology Laboratory. Cannabinoids in blood by LC/MS/MS, Version 2.0.

Δ^9-Tetrahydrocannabinol, Carboxy-Δ^9-Tetrahydrocannabinol, Liquid Chromatography Tandem Mass Spectrometry

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