Quantitation of an Oral Fluid Drug Panel Including THC Using High Resolution Accurate-Mass (HRAM) Orbitrap Mass Spectrometry Patterson, C. and Hassell, K; Thermo Fisher Scientific, San Jose, California, United States

Background:

As labs move towards oral fluid for ease of collection and roadside testing, it is important to be able to test for a wide range of analytes and achieve required sensitivity. With the SAMHSA guidelines providing LOQ levels, the extraction protocol and instrumentation need to be sensitive enough to accomplish these cut-offs. Including tetrahydrocannabinol (THC) into the assay provides challenges in the extraction as most drugs of abuse are basic and THC is neutral. This extraction workflow, which extracts THC alongside other drugs of abuse, coupled with the Orbitrap mass spectrometer generates high-resolution accurate mass data that offers improved sensitivity, selectivity, and accuracy for detection and quantitation of drugs of abuse in oral fluid.

Methods:

Nine calibration levels (ranging from 0.5 to 200 ng/mL) were made by spiking stock solution of the 31 target analytes into human oral fluid. Samples were diluted with a preserving buffer and spiked with their corresponding internal standard. 500 µL of each sample were then extracted using DPX INTip™ SCX/WAX SPE. Drug analytes were separated with on a Thermo Scientific™ Accucore™ Biphenyl column connected to a Thermo Scientific™ Vanquish™ Horizon UHPLC system using a fast 7-minute method. Data was acquired on the Thermo Scientific™ Orbitrap™ Exploris™ 120 mass spectrometer using data dependent MS2 mode (ddMS2) with an inclusion list for the 31 target drugs. Thermo Scientific™ TraceFinder™ 5.2 software was used for data acquisition and processing.

Results:

Limits of quantitation (LOQ) determined for the 31 drugs were all below the new SAMHSA guidelines cutoffs and linearity was achieved from as low as 0.5 ng/mL to a ULOL of 1,000 ng/mL. THC delta-9 achieved an LOQ of 1 ng/mL. All drugs were confirmed with mass accuracy of less than 5ppm, retention times, and library matching. This study was also able to overcome some of the issues commonly associated with THC including “stickiness” of the drug to consumables and its susceptibility to being suppressed by oral fluid collection device buffers.

Conclusions:

This fast and sensitive method for oral fluid testing sufficiently passes the SAMHSA guidelines.

Key Words: HRAM, Orbitrap, fast quantitation, drugs of abuse, oral fluid