



### **K21 Simultaneous Analysis of Thebaine, 6-MAM and 6 Abused Opiates in Postmortem Fluids and Tissues Using Zymark® Automated Solid-Phase Extraction and Gas Chromatography/Mass Spectrometry**

*Robert D. Johnson, PhD\*, and Russell J. Lewis, PhD, Federal Aviation Administration, AAM-610, CAMI Building, Room 205, 6500 South MacArthur Boulevard, Oklahoma City, OK 73169*

After attending this presentation, attendees will gain knowledge in potentially differentiating between opiates derived from ingested poppy seeds and opiates taken as medication.

This presentation will impact the forensic community and/or humanity by assisting in the potential prevention of false opiate positives due to poppy seed consumption.

Opiates are some of the most widely prescribed drugs in America and are often abused. Demonstrating the presence or absence of opiate compounds in postmortem fluids and/or tissues derived from fatal civil aviation accidents can have serious legal consequences and may help determine the cause of impairment and/or death. However, the consumption of poppy seed products can result in a positive opiate drug test. A simple method for the simultaneous determination of 8 opiate compounds from one extraction was developed. These compounds are hydrocodone, dihydrocodeine, codeine, oxycodone, hydromorphone, 6-monoacetylmorphine, morphine, and thebaine. The inclusion of thebaine is notable as it is an indicator of poppy seed consumption and may help explain morphine/codeine positives in cases where no opiate use was indicated. It must be stressed, however, that it is possible following poppy seed ingestion to find morphine and codeine in urine without detecting thebaine. Therefore, the absence of thebaine cannot preclude poppy seed consumption as the source of morphine and codeine present in a case.

Specimens types analyzed during this study were blood, urine, liver, kidney, and skeletal muscle. Three mL aliquots of liquid specimens and 1 g aliquots of homogenized tissue specimens were precipitated with acetonitrile and extracted using a common solid phase extraction (SPE) procedure in combination with an automated SPE system. This method incorporated gas chromatography/mass spectrometry, and trimethyl silane (TMS) and oxime-TMS derivatives. The limits of detection ranged from 0.78 – 12.5 ng/mL. The linear dynamic range for most analytes was 6.25 – 1600 ng/mL. The extraction efficiencies ranged from 70 – 103%. Accuracy, measured as the relative error obtained from the concentration obtained from a control versus its target value, ranged from 1-14% and precision, measured as the relative standard deviation obtained from 5 repeated injections of the same control, ranged from 1-9%. This method was applied to 8 separate aviation fatalities where opiate compounds had previously been detected. The analytical results obtained will be presented.

#### **Poppy Seeds, Thebaine, GC/MS**