Bath salts difficult to detect in biological samples, study finds

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Synthetic cathinones are derived from cathinone which is present in the khat plant. These recreational drugs produce effects similar to amphetamines and have been associated with numerous fatalities. Although the Drug Enforcement Administration (DEA) banned some synthetic cathinones in 2011, new designer drugs continue to appear, presenting a real challenge for forensic laboratories.

"State and federal efforts to curb the use of these drugs have had some success, but the proliferation of new synthetic cathinones presents an ongoing challenge to the forensic community," said Dr. Sarah Kerrigan, Chair of the Department of Forensic Science at SHSU. "The forensic community's analytical methods must keep pace with illicit drug trends, but not all laboratories are capable of testing for these drugs despite the fact that their use may have very serious public health and safety consequences."

Many forensic laboratories routinely use gas chromatography/mass spectrometry (GC/MS) to detect the use of drugs in biological samples in fatalities, intoxication or impaired driving cases. However, some of these drugs may actually degrade during the process. Alternative techniques such as liquid chromatography-tandem mass spectrometry (LC/MS/MS) or liquid chromatography-quadrupole-time-of-flight/mass spectrometry (LC-q-TOF) are significantly more expensive and not all laboratories have this capability due to limited resources.

Bath salts were traditionally sold in smoke shops and on the internet. In

2011, the DEA began banning cathinones, but manufacturers were quick to replace them with new alternatives to circumvent current legislation. Because of these changes and continued sales on the internet, it is difficult to regulate, legislate and enforce the laws. In addition, many toxicology labs do not test for these drugs. While identifying these substances in seized drug materials such as pills and powders is relatively easy, it is much harder to detect them in biological evidence. Identification is hampered by drug instability and the possibility of thermal degradation during analysis.

Among the compounds studied were 4-EMC, 4-MEC, buphedrone, butylone, ethcathinone, ethylone, flephendrone, MDPBP, MMDPV, mephedrone, methcathinone, methedrone, methylone, MPBP, naphyrone, pentedrone, pentylone, PVP and pyrovalerone.

Due to the speed at which these drugs have evolved, the SHSU study calls for a systematic approach to understand how the various structural facets of the synthetic cathinones influence their stability. This approach is believed to be more likely to lend itself to meaningful interpretation of newer analogs and derivatives that have not yet been developed or are still emerging as new designer drugs.

The report, "Improved Detection of Synthetic Cathinones in Forensic Toxicology Samples: Thermal Degradation and Analytical Considerations," is available from the National Criminal Justice Reference Service at https://www.ncjrs.gov/pdffiles1/nij/grants/249251.pdf and was recently published in the *Journal of Analytical Toxicology*.

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