



K7 Analysis and Characterization of the First- and Second-Generation Raving Dragon Novelty Bath Salts

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After attending this presentation, attendees will see an example of how quickly a single brand of bath salts can change its ingredients as well as the spectroscopic characterization of 3,4-methylenedioxy-N-methylcathinone (methylone) and 2-methylamino-1-phenylpentan-1-one (pentedrone).

This presentation will impact the forensic science community by illustrating an example of the change in active ingredients found in bath salt preparations after the administrator of the Drug Enforcement Administration (DEA) issued a temporary schedule for three synthetic cathinones under the Controlled Substances Act (CSA). These substances were: 4-methyl-N-methylcathinone (mephedrone), 3,4-methylenedioxy-N-methylcathinone (methylone), and 3,4-methylenedioxypyrovalerone (MDPV). Also presented will be the Mass Spectrum, Nuclear Magnetic Resonance (NMR), Ultraviolet (UV), and Infrared (IR) spectroscopic characterization of the first-generation methylone and the second-generation 2-methylamino-1-phenylpentan-1-one (pentedrone), the lone ingredients found in the bath salts sold under the brand "Raving Dragon."

Introduction: In recent years, a large number of new, uncontrolled designer drugs have appeared on the market. Several of the new synthetic drugs that are sold as bath salts belong to one of the classes of β -ketophenylethylamines or phenethylamines. These drugs are available in small packets containing milligrams to gram quantities. They are available via the internet or at various convenience stores, gas stations, truck shops, tattoo parlors, and discount tobacco outlets and are often sold as bath salts with the disclaimer, "Not For Human Consumption."

In February of 2011, several packets containing 0.3g of an off-white powder sold under the name Raving Dragon Novelty Bath Salts were obtained via a website of the same name. This product was removed from the market in October of that year, coinciding with the DEA issuing a temporary schedule of mephedrone, methylone, and MDPV under the CSA. Four months later in February of 2012, a new bath salt was released from the same company under the new name Raving Dragon Voodoo Dust; again several packets were obtained containing 0.5g of a fine white powder.

Methods: Both products were subjected to various spectroscopic techniques: mass spectroscopy (Shimadzu MDGCMS QP-2010 Ultra), NMR spectroscopy (Bruker Ultrashield Plus-400MHz), UV (Shimadzu UV-1601 UV-Visible Spectrophotometer), and IR spectroscopy (Thermo Scientific Nicolet IS10), for the characterization and identification of the active ingredients in the packets. Once the spectroscopic techniques results were obtained for the active ingredients, these results were compared to reference standards in order to confirm their identity and purity.

Results: It was determined that the first-generation Raving Dragon Novelty Bath Salts contained methylone, one of the three compounds added to the banned substance list in October of 2011. The second-generation novelty bath salt, Raving Dragon Voodoo Dust, was found to contain pentedrone. At the present time, pentedrone is unscheduled by the DEA. The purity of the bath salts was determined by UV using the specific absorbance (defined as the $A_{1\text{cm}}^{1\%}$ value) of the reference standard vs. the bath salt. Methylone with an $A_{1\text{cm}}^{1\%}$ of 550 at $\lambda = 235$ was determined to be 89% of the ingredients of the Raving Dragon Novelty Bath Salts. Pentedrone with an $A_{1\text{cm}}^{1\%}$ of 579 at $\lambda = 256$ was calculated to be 100% of the ingredients of the Raving Dragon Voodoo Dust.

Discussion: Recently, numerous articles relating to the pharmacological and toxicological effects of methylone, including several postmortem cases, have been published. Pentedrone has been previously identified in samples intercepted by the Canada Border Services Agency, customs in Berlin, and police organizations in several federal states of Germany. No specific pharmacological and toxicological data is available.

Conclusion: Once a synthetic compound or group of synthetic compounds are added to the DEA list of scheduled compounds, new analogs appear in their place. In the case of the Raving Dragon Novelty Bath Salts, methylone was replaced within four months of its scheduling with pentedrone as the active ingredient. Pentedrone should be added to the fast-growing group of "Legal High" (designer) drugs that can be expected to be found in bath salt products. The analysis of the Raving Dragon Brand Bath Salts illustrates the rapidly changing active ingredients in "Legal High" preparations that are readily available to the public.

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Bath Salts, Methylone, Pentedrone