



**Testimony
Before the
Caucus on International Narcotics Control
United States Senate**

Dangerous Synthetic Drugs

Statement of

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Madame Chairwoman and Members of the Caucus:

Thank you for inviting the National Institute on Drug Abuse (NIDA), a component of the National Institutes of Health (NIH), to participate in this important hearing and offer a scientific perspective on the problem of designer drugs of abuse in this country.

Introduction

The term “designer drug” in the context of drug abuse refers to substances chemically similar to and/or that mimic the drug-like effects of controlled substances. The term is often used synonymously with “club drugs,” “party drugs,” and “synthetic drugs.” Designer drugs affect the central nervous system (CNS) and can display stimulant, depressant and/or hallucinogenic properties.

As recent reports indicate, a large number of new unregulated substances are being abused for their psychoactive properties, often resulting in violent and unpredictable behavior. This growing phenomenon is particularly challenging, first because of the speed with which rogue chemists can modify existing drugs and market them and, second because of the ease with which the Internet allows for the sharing of information about and purchase of products such as “Spice” and “bath salts.”

Spice

In recent years, a growing number of dangerous products have appeared in the U.S. marketplace. One such class of products, referred to as “herbal incenses” with names like K2 and Spice, consists of plant materials laced with synthetic cannabinoids which, when smoked, mimic the effects of delta-9-tetrahydrocannabinols (THC), the principal psychoactive constituent in marijuana. Spice products have become increasingly popular, especially among teens and young adults: most people (60 percent) admitted to an Emergency Department (ED) for their reported Spice use are between 12 and 20 years of age, with those aged 18-20 outnumbering those aged

12-17 by a factor of two (40 percent and 20 percent respectively)¹. Easy access, non-detectability by standard drug tests, and the misperception that Spice products are “natural” and therefore harmless, have all likely contributed to their popularity. The results of the Monitoring the Future Survey underscore the magnitude of this trend in this country: 11.3 percent of high school seniors reported past year use of Spice in 2012, a figure that is second only to marijuana itself (36.4 percent) among illicit drugs abused. According to the American Association of Poison Control Centers, calls related to exposure to synthetic cannabinoids totaled 16,923 between January 1, 2010, and July 30, 2013. Most exposures (58 percent) occurred in the Midwest and Southeast regions².

Very little is known about both the short- and long-term health effects of consuming Spice products, but we have reason to think that their potential health risks may be even more serious than those associated with marijuana use. The fact is that these synthetic cannabinoids have not been tested in humans—so we don’t know how long they stay in the body, how they are metabolized or broken down, at what doses their psychological or physiological effects occur, and how toxic they are. Further, the cannabinoids found in these products bind much more strongly to the cannabinoid receptors in the brain than THC itself, which could lead to more powerful and unpredictable effects, including severe episodes of acute psychotic effects like extreme anxiety, paranoia, and hallucinations.

Indeed, Poison Control Centers have reported a wide range of adverse effects related to Spice abuse. Acute toxic symptoms associated with their use are also reported after intake of high doses of marijuana, but agitation, seizures, high blood pressure, vomiting and low potassium—which could trigger irregular heartbeats—seem to be specific to synthetic cannabinoids³, thus not typically seen in marijuana abusers. Spice can reduce blood supply to the heart and in a few cases it has been associated with heart attacks. And just like marijuana, regular users may experience addiction and withdrawal.

¹ Center for Behavioral Health Statistics and Quality, SAMHSA, Drug Abuse Warning Network, 2011

² Wood KE. Exposure to bath salts and synthetic tetrahydrocannabinol from 2009 to 2012 in the United States. *J Pediatr.* 163(1):213-6 (2013)

³ Hermanns-Clausen, M. Acute toxicity due to the confirmed consumption of synthetic cannabinoids: clinical and laboratory findings. *Addiction.* 108(3):534-44 (2013)

Bath Salts

There is also growing evidence demonstrating the abuse of another class of substances, generically referred to as “bath salts” or “plant foods.” Some of the active ingredients most commonly encountered in seized samples of these products are synthetic cathinone derivatives like methylone, mephedrone, MDPV, and butylone, which, when ingested, snorted, smoked, inhaled, or injected, produce stimulant and other psychoactive effects. These synthetic stimulants are derived from a variety of compounds, and purported to be alternatives to the controlled substances cocaine, amphetamine, and Ecstasy (MDMA).

"Bath salts" have been linked to an alarming number of ED visits across the country. Doctors and clinicians have indicated that ingesting or snorting "bath salts" containing synthetic stimulants can cause chest pains, increased blood pressure, increased heart rate, agitation, hallucinations, extreme paranoia, and delusions. In addition, users of “bath salts” report intense cravings and their frequent consumption can induce tolerance, dependence, and strong withdrawal symptoms when not taking the drug. According to Poison Control Centers’ data, these products seem to be most popular with people who are between 20 and 29 years old. However, poison centers have seen bath-salts exposures in a wide range of ages, from younger than 6 to older than 59. According to the American Association of Poison Control Centers, bath salts exposure calls totaled 9,702 between January 1, 2010, and July 30, 2013. And, again, most exposures (64 percent) occurred in the Midwest and Southeast regions.

The synthetic stimulants present in bath salts are powerful drugs. For example MDPV, one of the most common and best characterized cathinones in “bath salts,” is similar to cocaine in that it can enhance the activity of the brain chemicals dopamine and norepinephrine, albeit with significantly greater potency and selectivity.⁴ This robust stimulation of dopamine transmission is consistent with MDPV’s serious potential for abuse and may account for the adverse effects observed in humans taking high doses of “bath salts” preparations.

⁴ Baumann, M.H. et al. Powerful cocaine-like actions of 3,4-Methylenedioxypropylamphetamine (MDPV), a principal constituent of psychoactive 'bath salts' products. [Neuropsychopharmacology](#). 38(4):552-62 (2013).

It is important to point out that, unlike typical stimulants, many synthetic stimulants can disrupt not only the dopamine (and norepinephrine), but the serotonin system as well, albeit to a lesser degree, thus affecting the brain circuits that modulate both motivation *and* mood/perception. The resulting combined effect is likely to increase the appeal (and the risk) of these substances for users seeking not only the euphoria that comes from boosting dopamine signals but also the distorted perceptions that can result from sudden changes in serotonin transmission. Thus, “bath salts” have the potential to combine the addictive properties of stimulants like cocaine with the mood and perception altering properties of hallucinogens like LSD in one, readily accessible drug.

What is NIDA doing?

NIDA supports a long-standing and multifaceted portfolio of research designed to study the direct effects of common street drugs and their synthetic derivatives. This program is the foundation of our current efforts to better understand the nature and impact of the latest synthetic drug phenomenon.

NIDA’s Intramural Research Program collects, analyzes and disseminates current information about the pharmacology and toxicology of emerging synthetic drugs of abuse. They and other NIDA-supported researchers have already determined the molecular mechanism of action of several “bath salt” cathinones. NIDA has also developed reliable tests to detect and measure designer cathinones and cannabinoids. Other efforts include relevant funding opportunity announcements to spur researchers, both foreign and domestic, to explore the many unknowns associated with the broad and easy access to synthetic drugs. Last month, NIDA organized a workshop entitled Emerging Trends in the Abuse of Designer Drugs and Their Catastrophic Health Effects, designed to provide an update on the chemistry, toxicology, addiction potential and treatment of synthetic drugs, as well as to discuss the barriers to conducting such research and potential means for overcoming them.

In addition, NIDA has an interagency agreement with the Drug Enforcement Administration (DEA) to generate relevant data on emerging drugs of abuse (including synthetic

cannabinoids and cathinone derivatives) and to inform the scheduling of drugs under domestic laws such as the Controlled Substances Act (CSA) as well as international treaties (Single Convention and Psychotropic Convention). Since October 2010, 30 compounds (15 synthetic cannabinoids; 15 synthetic cathinones) have been or are in the process of being evaluated.

A Serious Public Health Risk

Obviously, manufacturers and retailers of these products, which are clearly and disingenuously labeled as “not for human consumption,” do not disclose the synthetic drug contents. And for a good reason: neither the products nor their active ingredients have been approved by the Food and Drug Administration for human consumption, or use in legitimate medical treatment; in fact many of these substances were initially developed as research tools and later co-opted by unscrupulous individuals. Therefore, anyone purchasing such a product(s) at a gas station, head shop or over the Internet has no way of knowing what he or she is actually putting in their body. In addition to potentially harming themselves, synthetic drug abusers are also a risk to others. Some become violent when under the influence, and abusers who operate motor vehicles after using synthetic drugs likely present similar dangers as those under the influence of other abused substances.

Finally, it is critical to recognize that we are facing a new kind of challenge that goes beyond the health and social consequences of specific products such as “bath salts” or “Spice.” Technological advances, market globalization, and the ubiquitous nature of the Internet is likely to generate a continuing flow of cheap psychoactive synthetic drugs for years to come. Researchers are only beginning to chip away at the tip of the synthetic drug iceberg, but it is paramount that we continue to support their efforts to better understand its causes, scope, and consequences to inform the smartest and most effective prevention policies.