



Research paper

Hair testing to assess both known and unknown use of drugs amongst ecstasy users in the electronic dance music scene



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ABSTRACT

Background: Data on both known and unknown drug use in the electronic dance music (EDM) scene is important to inform prevention and harm reduction. While surveys are the most common method of querying drug use, additional biological data can help validate use and detect unknown/unintentional use of drugs such as new psychoactive substances (NPS). We sought to determine the extent of both known and unknown use of various substances in this high-risk scene.

Methods: We hair-tested 90 self-reported past-year ecstasy/MDMA/Molly users attending EDM parties in New York City during the summer of 2016 using UHPLC–MS/MS. Results were compared to self-reported past-year use.

Results: Three quarters (74.4%) tested positive for MDMA, a third (33.3%) tested positive for an NPS, and 27.8% tested positive specifically for one or more synthetic cathinones (e.g., butylone, ethylone, pentylone, methylone, alpha-PVP). Half (51.1%) of participants tested positive for a drug not self-reported, with most testing positive for synthetic cathinones (72.0%), methamphetamine (69.0%), other NPS stimulants (e.g., 4-FA, 5/6-APB; 66.7%), or new dissociatives (e.g., methoxetamine, diphenidine; 60.0%). Attending parties every other week or more often, reporting higher-frequency ecstasy pill use, having tested one's ecstasy, and having found out one's ecstasy was adulterated, were risk factors for testing positive for synthetic cathinones and NPS in general.

Conclusion: Hair testing appears to be a valuable addition to drug epidemiology studies. Many EDM party attendees—even those who test their ecstasy—are unknowingly using NPS and/or other drugs. Prevention information and harm reduction may help reduce unknown/unintentional use.

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Introduction

Electronic dance music (EDM) parties are high-risk scenes for both known and unknown use of a variety of psychoactive substances. Recent studies indicate that illicit drug use is highly prevalent amongst nightclub and festival attendees (Hughes, Moxham-Hall, Ritter, Weatherburn, & MacCoun, 2017; Miller, Byrnes, Branner, Voas, & Johnson, 2013; Miller et al., 2015; Nordfjaern, Bretteville-Jensen, Edland-Gryt, & Gripenberg, 2016; Palamar, Barratt, Ferris, & Winstock, 2016; Palamar, Griffin-Tomas,

& Ompad, 2015; Palamar, Salomone, Vincenti, & Cleland, 2016). A recent national survey of Australian dance festival-attending adults found that 78.1% of recent users reported using an illicit drug at their last-attended festival, and of users, 85.1% reported use of ecstasy (Hughes et al., 2017). A recent study of EDM party attendees in New York City (NYC) estimated lifetime use of ecstasy/MDMA or "Molly" amongst young adult (age 18–25) attendees to be 42.8% (95% CI: 32.8, 52.7) (Palamar, Acosta, Ompad, & Cleland, 2016). "Molly" is a common street name for powder or crystalline MDMA in the US; thus, since ecstasy and Molly are both street names for MDMA, some epidemiology surveys in the US now use these terms interchangeably or in combination (Palamar, 2017).

Dance festivals have become common in the US in recent years, and drug use amongst individuals in these scenes has been associated with severe adverse outcomes including death

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(Centers for Disease Control and Prevention, 2010; Friedman et al., 2017; Ridpath et al., 2014). For example, an investigation of 22 individuals poisoned at a large dance festival in NYC found that 65% (11 of 17) of individuals toxicology-tested after poisoning tested positive for methylone (a synthetic cathinone) (Ridpath et al., 2014). However, it is unknown how many of these individuals were aware they were using methylone or if they believed they were using MDMA. While use of more traditional drugs such as ecstasy is most common in these environments, hundreds of new psychoactive substances (NPS) such as methylone have emerged in recent years (European Monitoring Centre for Drugs and Drug Addiction, 2015; U.S. Drug Enforcement Administration, 2016) and many have been detected as adulterants in or replacements for traditional drugs such as ecstasy (Brunt et al., 2016; Caudevilla-Gálligo, Ventura, Indave Ruiz, & Fornís, 2013; Palamar, Acosta, Ompad et al., 2016; Vidal Gine et al., 2016). Biological confirmation of self-reported use is informative as it helps validate prevalence, but research on unintentional or unknown use of drugs—particularly NPS—is important to further guide continued prevention, education, and harm reduction efforts within these high-risk scenes.

Researchers at European organisations such as Energy Control in Spain (Caudevilla-Gálligo et al., 2013; Giné, Espinosa, & Vilamala, 2014), the Drug Information Monitoring System (DIMS) in the Netherlands (Brunt & Niesink, 2011), and international collaborative organisations such as the Trans European Drug Information (TEDI) project (Brunt et al., 2016) have been testing contents of traditional drugs such as ecstasy and have been detecting NPS such as synthetic cathinones in samples. NPS such as synthetic cathinones—alone or in combination with ecstasy or one another—especially if taken unknowingly, can potentially lead to a higher likelihood of adverse effects than solely MDMA (Brunt, Koeter, Niesink, & van den Brink, 2012). While these studies provide great insight into drug adulteration in Europe, very few formal drug-testing studies have been conducted in the US and these studies were conducted decades ago (e.g., Baggot et al., 2000; Renfro, 1986). Moreover, while test results of drug product (e.g., pill/powder testing) are informative, research is also needed to help determine the characteristics of individuals who have already (often unknowingly) used specific NPS—often under the assumption it is ecstasy or “Molly”.

Hair testing for NPS is an important new addition to biological testing. While blood, urine, and saliva are often adequate for assessing current intoxication or very recent use (use within the past few days) (Juffer, Walsh, Cone, & Sampson-Cone, 2006; Smith-Kielland, Skuterud, & Mørland, 1999; Vindenes et al., 2011; Wille et al., 2009), many drugs—including NPS—can be detected in hair months after use. For example, synthetic cathinones can be detected in hair samples 24 months after use (depending on length of hair) (Kintz, Salomone, & Vincenti, 2015; Lendoiro et al., 2017; Rust, Baumgartner, Dally, & Kraemer, 2012; Salomone, Palamar, Gerace, Di Corcia, & Vincenti, 2017; Vincenti, Salomone, Gerace, & Pirro, 2013). Most standard drug tests only test for select traditional drugs and not NPS; however, hair testing allows us to test for a wider array of substances and for a more extensive period after use. In 2015, we piloted our hair-testing methodology as an addition to a drug use epidemiology survey of individuals in the EDM scene and published data derived from 48 ecstasy users (Palamar, Salomone et al., 2016). However, results were limited, in part, because only lifetime drug use was queried. In this paper, we expand upon this original study and report on and compare self-reported past-year drug use and biological hair test results of 90 individuals in the EDM scene in NYC who reported past-year ecstasy use. Specifically, our aims of this study were to (1) determine prevalence of testing positive for specific drugs and drug classes, (2) determine the extent of discordant reporting

(defined as reporting no use of a drug, but testing positive for that drug), and (3) delineate characteristics of testing positive or providing a discordant report for select drug classes. While we expected most individuals to test positive for MDMA, we hypothesized that a large portion of individuals would test positive for drugs not reportedly used.

Methods

Participants and procedure

1087 individuals entering EDM parties in New York City were surveyed from May through September 2016. Parties were randomly selected using time-space sampling (MacKellar et al., 2007; Palamar, Acosta, Sherman, Ompad, & Cleland, 2016). Individuals were eligible if they (1) were about to attend the selected party and (2) identified as age 18–40. Individuals were approached and asked if they were attending the randomly selected party. Those determined eligible were asked if they would take a survey about drug use. After providing informed consent, participants completed the survey on a tablet. Participants who completed the survey were compensated \$10. Upon completion, a subset of participants was asked if they were willing to provide a hair sample to be tested for “new drugs such as ‘bath salts’”. If the participant agreed, the recruiter cut a small lock of hair (~100 hairs) from the participant—as close to his or her scalp as possible using a clean scissor. In some cases, male participants volunteered to clip or buzz body hair from the arm, chest, or leg with an electronic razor. Hair was folded in a piece of tin foil and stored in an envelope labelled with the participant’s study ID number which was linked to the participant’s survey responses. We collected 178 hair samples from a subset of those surveyed. Due to limited funding and extreme environmental conditions not conducive to hair testing (e.g., windy/rainy days) on some recruitment days, we only obtained hair samples from a convenience sample of those surveyed.

Measures

Participants were asked their age, sex, race/ethnicity, and educational attainment. Age, race/ethnicity, and educational attainment were dichotomised into variables indicating whether they identified as age 25–40 (vs. age 18–24 [“young adults”]), white (vs. non-white), and having earned a college degree or higher (vs. less than a college degree), respectively. Participants were also asked how often they attended rave/nightclub/festival/dance parties with answer options: never, a few times a year, every couple of months, every month, every other week, and every week or more often (Palamar, Barratt et al., 2016). We recoded attendance into a dichotomous variable (via median-split) with responses recoded into attend less than once every other week vs. attend at least every other week.

The survey asked participants about “known” lifetime and past-year use of a variety of traditional drugs and NPS. Drugs and drug classes queried included “ecstasy/MDMA/Molly”, other MDx drugs (e.g., MDA, MDEA), methamphetamine, amphetamine (nonmedical use), ketamine, PCP, and drugs commonly defined as NPS such as “bath salts” (synthetic cathinones), other NPS stimulants (e.g., 4-FA, 5/6-APB), dissociative NPS (e.g., methoxetamine [MXE]), 2C-B, and PMMA. Particular focus was paid to synthetic cathinones and participants were queried about use of 27 of these compounds including methylone (“M1”), butylone (“B1”), mephedrone (“MCAT”, “Meow Meow”), alpha-PVP (“Flakka”), and “bath salt unknown or not listed”. Participants were also provided the

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