



European Monitoring Centre
for Drugs and Drug Addiction

PERSPECTIVES ON DRUGS

Injection of synthetic cathinones

Over 80 synthetic cathinone derivatives were detected via the EU Early Warning System (EU-EWS) between 2005 and 2014. This analysis explores new worrying localised and national outbreaks of injecting these substances and recommends close monitoring of the issue as a public health priority.

Against a backdrop of an overall decline in the injecting of illicit drugs in Europe, recent reports of the injection of new psychoactive substances (NPS), in particular synthetic cathinones, have emerged as a worrying new trend.

Synthetic cathinones first appeared on the European illicit drug market in 2005. These substances have effects similar to known stimulant drugs and are structurally related to cathinone, which is found in the Khat plant (*Catha edulis*). Mephedrone is the synthetic cathinone that has received particular attention, first appearing as a so-called 'legal high' on the market in many countries, before European-level control measures were introduced in 2010. A number of other synthetic cathinones (including pentedrone, methylone, MDPV, 4-MEC and N-ethylbuphedrone) are available and used on the European drug scene. Many synthetic cathinones have, for varying periods of time, been legally available in European countries, often sold through physical retail outlets or via websites. Ease of availability coupled with relatively low prices and high purity compared to street drugs, and popularisation via Internet-driven social media, are likely to have contributed to current levels of use.

Developing a clear understanding of patterns and levels of use of synthetic cathinones in Europe remains a challenge. As it is a relatively new phenomenon, existing monitoring systems are not geared towards it, no agreed analytic laboratory standards exist, and users are seldom aware of precisely which substance or combination of substances they have used. Furthermore purchasing on the Internet enables users to remain discreet and thus a much hidden population. Important insights have been collected for this analysis, however, from a limited number of national and targeted surveys, data presented in Reitox national reports and the scientific literature.

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emcdda.europa.eu/topics/pods/synthetic-cathinones-injection



Available evidence suggests that in most countries the use of synthetic cathinones in the general population remains low, and the limited number of countries that have included either mephedrone or other synthetic cathinones in recent general population surveys ⁽¹⁾ indicate a last year prevalence rate of 1 % or less among adults. However, there are other groups where higher prevalence levels of synthetic cathinone use are reported, such as clubbers, high-risk drug users and treatment entrants. For example, targeted studies of mephedrone use among samples of young European clubbers report last-year prevalence levels of between 1 % and 14 % ⁽²⁾. In addition, Public Health England (2013) reported the number of clients aged 18 years or over entering treatment for mephedrone use increased between 2011/12 and 2012/13 from 900 to 1630.

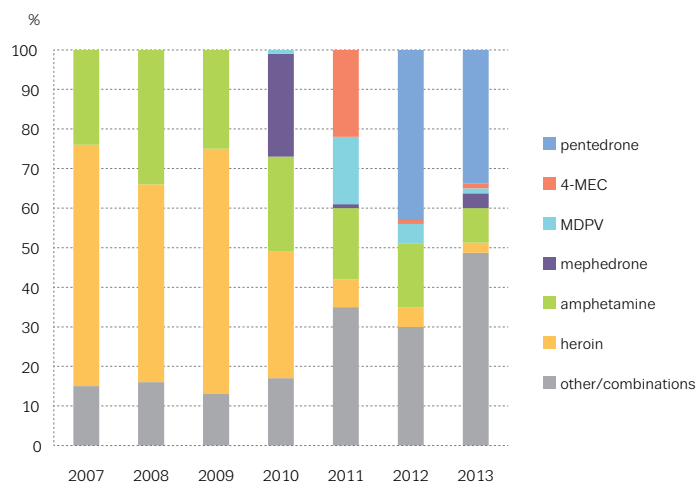
While most cathinone use involves either snorting the drugs as a powder or oral use, a recent worrying phenomenon has emerged of synthetic cathinones being injected by some groups of drug users. On the whole, reports suggest that injecting cathinone users are primarily injectors of other drugs (heroin, amphetamines) who, for a variety of reasons, switch to cathinone injection or include cathinones in their drug-using repertoire. In addition, there are reports of long-term abstinent ex-opiate users who have started to inject cathinones (Rácz et al., 2014; Daly, 2012; Van Hout and Bingham, 2012), and limited reports of young people beginning their injecting career with cathinones (Daly, 2012; Austrian Reitox national focal point, 2013).

In some European countries the injection of synthetic cathinones is reported to be a relatively low-level and localised phenomenon, restricted to particular groups of high-risk drug users (Austria, Belgium, the Czech Republic, France, Germany, Ireland, Poland, Spain and the United Kingdom). In Hungary and Romania, however, a more substantial level of use of synthetic cathinones injection has been identified among large cohorts of high-risk drug users.

Synthetic cathinone injection: two countries with widespread use among high-risk users

In both Hungary and Romania, acute shortages in the availability of heroin in 2010 and 2011, along with the increased availability of cathinones sold as 'legal highs' in physical retail outlets in Romania and in online shops in Hungary, have played a role in the development of a generalised level of synthetic cathinones injection among existing cohorts of high-risk drug users. In Hungary, the use of synthetic cathinones mainly among heroin injectors has been documented by needle and syringe programmes, which reported that by 2013 some 58 % of programme clients nationwide were injecting cathinones as their primary drug (Hungarian national focal point, 2014). After almost pushing

Analysis of seized injecting equipment (needle, syringe, filter, spoon) in Hungary ⁽³⁾



Source: Hungarian national focal point, 2014.

heroin out of the market, synthetic cathinones also began to displace amphetamines. It is interesting to note that the cathinone of choice changed over time in a way that appears to be directly linked with availability — when one cathinone was controlled, it was quickly replaced by a cathinone that was not controlled (see figure).

Hungarian opioid substitution programmes also reported in 2012 that between 10–50 % of their clients were using synthetic cathinones. The percentage of primary synthetic cathinone users entering specialised drug treatment for the first time, although not systematically monitored in Hungary, has been estimated at just under 20 % in 2012 (Péterfi et al., 2014).

Romania has also recorded a rapid spread in availability and use of synthetic cathinones and other new psychoactive substances, originally made widely available through physical retail outlets (known as 'dream shops'). A needle and syringe programme in Bucharest, for example, reported in 2012 that of 1 326 surveyed clients, 51 % injected new psychoactive substances (mainly synthetic cathinones), 44 % injected heroin and 5 % injected both NPS and heroin. Data on clients entering specialised drug treatment in Romania in 2012 showed that a third (33 %) of clients reported new psychoactive substances as their primary drug. However, 2013 has seen a drop in the number injecting cathinones, with only 18 % of clients being NPS users entering treatment. Other indicators (e.g. emergency room admissions, drug related deaths) seem to confirm this decrease.

⁽¹⁾ Czech Republic, Spain, Malta, Slovenia, Slovakia, Poland, Portugal and the United Kingdom.

⁽²⁾ The known minimum and maximum are 0.9 % (Flemish study) and 13.8 % (UK study).

⁽³⁾ The methodology can be found in Péterfi et al., 2014.

More limited or localised reports of synthetic cathinones injection

More localised outbreaks of cathinones injection have been identified in several countries, typically involving high-risk drug users in contact with low-threshold facilities, psychiatric facilities, and drug treatment centres.

In France, a recent study has developed a scientific approach to obtain information through the chemical analysis of residues in syringes (Néfau et al., 2015). In total, 3 489 syringes were collected from 17 sites in Paris where syringe retrieval devices are located. The analysis results showed that 23 % of the syringes contained 4-methylethylcathinone. The appearance of this cathinone and its growing presence in the syringes was observed between summer and winter 2012, mainly at sites where cocaine was the most previously injected drugs.

A 2011 study of Irish prisoners showed that this population reported injecting cathinones. It found that a last year prevalence of injection of mephedrone was 13 % among females and 2 % among males. The respective figures for methylone were 7 % and 1 % (Drummond, et al. 2014). Data from a 2012 needle and syringe programme survey in Ireland reported that over 6 % of the participants had used mephedrone in the past month, and of these 95 % had injected it. In addition, several in-depth qualitative studies that confirm the presence of mephedrone injection have been conducted in Dublin (e.g. Van Hout and Bingham, 2012).

In Austria a small 2010 survey among drug treatment clients in Graz (n=27) identified that just under 60 % of surveyed mephedrone users reported injecting the drug. The reported frequency of use was relatively intensive among this group, with 50 doses of the drug per week on average, and a third of respondents reporting that mephedrone was the drug causing them the most problems. Both older polydrug users and younger users without previous opioid experience were represented among these users (Austrian Reitox national focal point, 2013). At present, mephedrone appears to be declining in Austria (Austrian Reitox national focal point, 2014).

Mephedrone injection has also been reported in the United Kingdom, based on law enforcement reports (Chadd, 2013), although the evidence of increased mephedrone injection in the study location (South Wales) was mainly anecdotal. In addition, the national Druglink Street Drug Trends 2012 survey in the UK reported on mephedrone users who were experiencing multiple harms and making contact with drug services. These included both experienced users of other drugs switching to mephedrone, and novice users who

Facts and figures

Synthetic cathinones encompass a wide group of substances that are synthetic derivatives of cathinone, which is naturally present in the Khat (*Catha edulis*) plant. They include mephedrone, pentedrone, methylone, MDPV and 4-MEC. See the EMCDDA drug profile on synthetic cathinones.

Street names for synthetic cathinones vary by country and include Miaow Miaow, M-Cat, Msmack, Drone, Fert, Bubbles (in English-speaking countries), Kati, Pentakristály (in Hungary), and Funky, Cocolino, El Padrino and Magico (in the Czech Republic).

Synthetic cathinones mainly appear on the drug markets as powders and tablets.

Between 2005 and 2014 more than 81 synthetic cathinone derivatives were reported to the EU Early Warning System (see interactive element online).

Methcathinone was first developed in the 1930s as an antidepressant. Since then it has been used illicitly in the former Soviet Union countries and Poland (⁴).

In Israel, the use of khat-extracted cathinones spread in the early 2000s. These substances were banned in 2004; further derivatives were banned in 2010.

Synthetic cathinones were first seized in Europe in 2005 (methylone in the Netherlands).

In 2010 mephedrone was submitted to control measures in the European Union.

have never injected other drugs before. Some users were mixing mephedrone with heroin, in a 'speedball' type of use. Mephedrone users were reportedly younger than other groups of high-risk drug users seen by drug services. In 2013, the Unlinked Anonymous Monitoring Survey of people who inject drugs in contact with services found that during the preceding year 8 % of the participants had injected mephedrone (Public Health England, 2014; Health Protection Scotland, Public Health Wales, and Public Health Agency Northern Ireland, 2014).

A recent survey among Spanish harm reduction centre clients in Barcelona highlighted the injecting use of the synthetic cathinone 4-MEC among their population. In this study, 46 % of clients reported lifetime consumption of any new psychoactive substance (most often 4-MEC), mostly in combination with heroin, and half of users had injected the

(⁴) Bretteville-Jensen et al., 2013 provide an account of the history of synthetic cathinones.

NPS. Analysis of urine samples also identified recent 4-MEC use in almost 20 % of the tested samples (Aranda et al., 2014).

A similar study at city level was carried out in Finland in the Helsinki area. Of a sample of 100 'marginalised drug users', 54 reported using MDPV in the past year and of these 96 % had injected the drug (Tammi et al., 2011).

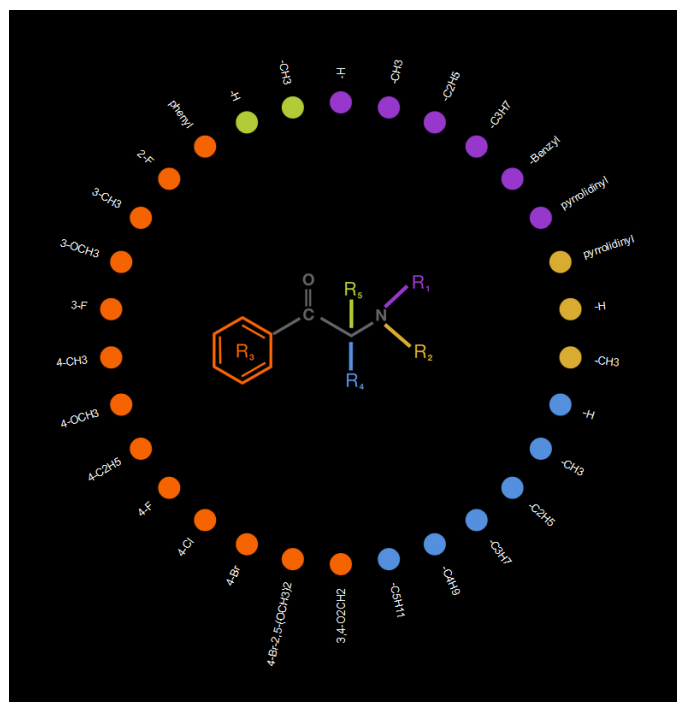
There is additional limited data on the use of cathinones or more generally of NPS by people who inject drugs, but where the route of administration is non-specified or unknown. For example, survey data from low-threshold programme clients in the Czech Republic in 2012, of whom 95 % were injectors, found 10.5 % had used a new synthetic drug in the last year. In 2013, about one third of high risk drug users in Prague – who are mostly injectors – (4,800) were estimated to have used new synthetic drugs likely containing synthetic cathinones (such as Funky and El Magico) in the last 12 months, however just few (approximately 2 %) have reported synthetic cathinones as primary drug (Czech national focal point, 2015). Similarly, a 2012 survey of clients at needle and syringe programmes in Poland found that 15 % of clients reported 'new psychoactive drugs' as their most problematic substance, while 12 % had used mephedrone in the month preceding the survey (and 14 % had used other NPS).

In the Swedish city of Västerås, an increase in the number of cases of stimulant-related intoxications requiring admission to the hospital emergency department fuelled further investigation of this phenomenon. This revealed that 76 % of cases were related to the use of the cathinone MDPV and 95 % occurred among chronic drug users who were often hepatitis C virus (HCV) positive, signalling drug injection (Lindeman et al., 2012).

Cathinones injecting among men who have sex with men (MSM)

There is increasing concern about the emergence of a new trend among some sub-groups of gay men involving the injection of illicit drugs, including cathinones and methamphetamine, in a practice known as 'slamming'. This usually takes place at 'chem sex' parties (Bourne et al., 2014) where mephedrone is typically used in parallel or in combination with other drugs such as methamphetamine (London), GHB/GBL, cocaine (France) and sildenafil ('Viagra') to enhance sexual experiences. Parties can last from around eight hours up to three days (Spire et al., 2013) with the participants frequently engaging in risky sexual practices such as not using condoms and sharing multiple partners (Stuart, 2013). Consequently, this form of use is associated with a highly elevated risk of the spread of blood-borne and sexually transmitted diseases. In London, data from Antidote, a

Interactive element



Interactive element on demystifying the chemistry available on the EMCDDA website: www.emcdda.europa.eu/topics/pods/synthetic-cathinones-injection

specialist drug clinic targeting services at the gay community, showed that 75 % of clients using mephedrone were doing so solely to facilitate sex, with 80 % injecting it. Of these users, 75 % reported being human immunodeficiency virus (HIV) positive and 70 % reported sharing needles. To date in Europe, this new practice has primarily been documented among restricted sub-groups of gay men in London and a small number of French cities (Lahaie et al., 2013); however, the potential exists, in this highly mobile population, for it to become more widespread.

Conclusions

This analysis has documented emerging evidence of new patterns of synthetic cathinone injection amongst subpopulations of drug users in Europe. There is concern about the addictive potential of these drugs and associated physical and mental health harms experienced by users (see 'Health consequences'), and about the high-risk behaviours associated with injection of these substances. While at present there are no specific interventions targeted at synthetic cathinone users, given that, for several researched synthetic cathinones, there appear to be similar mechanisms of action, effects and harms as for amphetamines, interventions with evidence of effectiveness for these drugs may prove useful (EMCDDA, 2014). Bearing in mind the serious potential impact of new patterns of injection being identified, the close monitoring of synthetic cathinones use in Europe is clearly an important public health priority.

Health consequences associated with use and injection of synthetic cathinones

Synthetic cathinones have been linked to a range of health problems for users (Miotto et al., 2013). The drugs toxicity at high doses, which is similar to that of cocaine, MDMA and amphetamines (Dargan and Wood, 2013), has resulted in emergency room presentations across Europe; deaths involving synthetic cathinones do occur (Wood and Dargan, 2012; Corkery et al., 2012).

Injecting synthetic cathinones use has been associated with a high frequency of injection for several of the substances, with European injectors of synthetic cathinones reporting a number of injection-related and other complications. These include an intense burning sensation at the injection site, with repetitive injection resulting in skin erosion, localised infections, blisters, spots, abscesses, gangrenous tissue, blood clots, permanent numbness and spasms. In addition, some problems associated with synthetic cathinones injection and the spread of infectious diseases have been highlighted. In Hungary, possible increases in HCV infection were observed in synthetic cathinones injectors and associated with high frequency of injection (for some cathinones 11.5 times a day on average, Horvath, 2013). In Romania the high frequency of injecting these drugs (6–8 times per day according to local studies), coupled with a reduction in the availability of sterile injecting equipment, are cited as factors playing a role in the recent HIV outbreak (Botescu et al., 2012).

In addition to injection-related risks, cathinones use has also been associated with risky sexual practices (Van Hout and Brennan, 2011a; Stuart, 2013; Spire et al., 2013). In addition to reports of 'slamming' parties in sub-populations

of MSM in London and French cities, a qualitative study of mephedrone users in Ireland reported that use of the drug even in non-injecting recreational users was linked to sexual encounters involving multiple partners and a lack of condom use (Van Hout and Brennan, 2011b).

The psychological side-effects of synthetic cathinones can include a difficult 'comedown', depression, anxiety, panic attacks, paranoia and psychosis. Compulsive use and dependence symptoms have been reported by synthetic cathinone users. These include strong cravings, relatively rapid development of tolerance and prolonged binges, sometimes lasting for many days. The compulsive nature of use might stem from the fact that the effects of several of these drugs are in general short-lived, with a maximum of 2–4 hours at oral administration (Corkery et al., 2012; Miotto, 2013; EMCDDA, 2010). A study of psychiatric inpatient facilities in Germany (Livak et al., 2013) reported on patient admissions presenting with synthetic cathinones-related psychotic symptoms. Psychotic states following mephedrone use often persisted for several days despite the administration of neuroleptic medication. Most of these cases were polydrug users who had often used injection as a route of administration for cathinones. Hungary has also reported high levels of psychiatric comorbidity associated with cathinone use, in addition to factors such as acute psychosis, violence and decrease in treatment compliance among this patient group (Hungarian Reitox national focal point, 2013, Szily and Bitter, 2013, Rácz and Bodrogi, 2014).

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