

New psychoactive substances as adulterants of controlled drugs. A worrying phenomenon?

Claudio Vidal Giné,* Iván Fornís Espinosa and Mireia Ventura Vilamala

The use of new psychoactive substances (NPS) as adulterants has received little attention in the literature. In this paper, results from Energy Control's drug checking service documenting the use of NPS as adulterants of controlled drugs are presented, and some reflections about possible explanations for this new phenomenon, potential risks for users, and challenges that it poses are discussed. From 2009 to 2012, 24 NPS belonging to several chemical classes such as phenethylamines, substituted cathinones, tryptamines, and methoxetamine were identified in 173 samples believed to be MDMA, amphetamine, ketamine, cocaine, mescaline, or methamphetamine. The NPS adulterant most frequently observed was 2-(4-bromo-2,5-dimethoxyphenyl)ethanamine (2C-B) followed by 1-(4-fluorophenyl)propan-2-amine (4-FA). Sixty-nine different combinations of substances were detected: 20 involving a controlled drug combined with an NPS, and 49 involving one or more NPS that substituted the controlled drug. As these combinations could pose substantial risks to users, the need to improve knowledge about toxicity associated with these combinations, and the danger of these substances being incorporated into the products of illegal markets, are highlighted. Drug checking services and the European Union's early-warning system operated by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) and Europol can play an important role in reducing the harm associated with this phenomenon. Copyright © 2014 John Wiley & Sons, Ltd.

Keywords: new psychoactive substances; adulteration; controlled drugs; illegal market



Energy Control's Drug Checking service



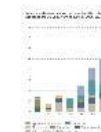
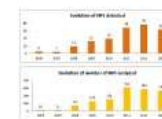
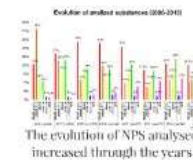
Energy Control, a harm reduction project of ABD, has carried out Drug Checking services since 1998 as a harm reduction strategy.



Drugs are tested through a combination of validated analysis techniques: TLC and GC/MS



Drug users can bring their drugs to a central facility or at festivals, clubs and raves where are provided our outreach activities





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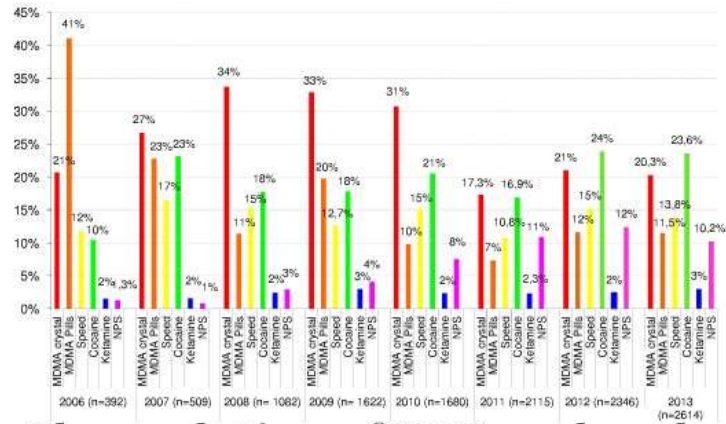
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Evolution of analyzed substances (2006-2013)



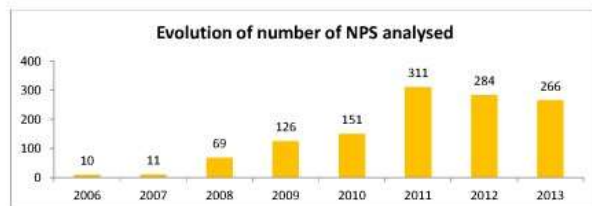
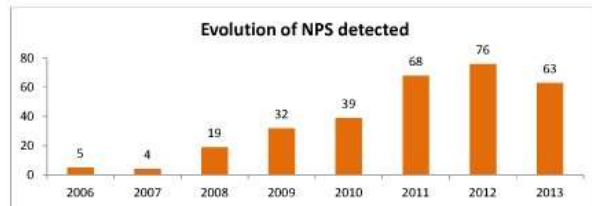
The evolution of NPS analysed increased through the years



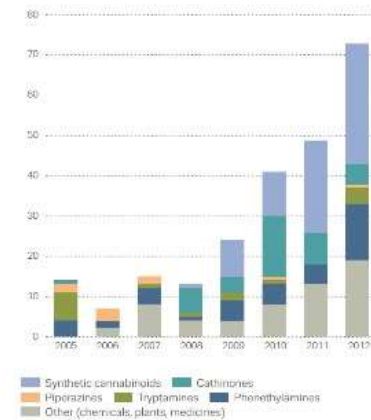
(Abril 1960) Alexander Shulgin → Research Chemicals



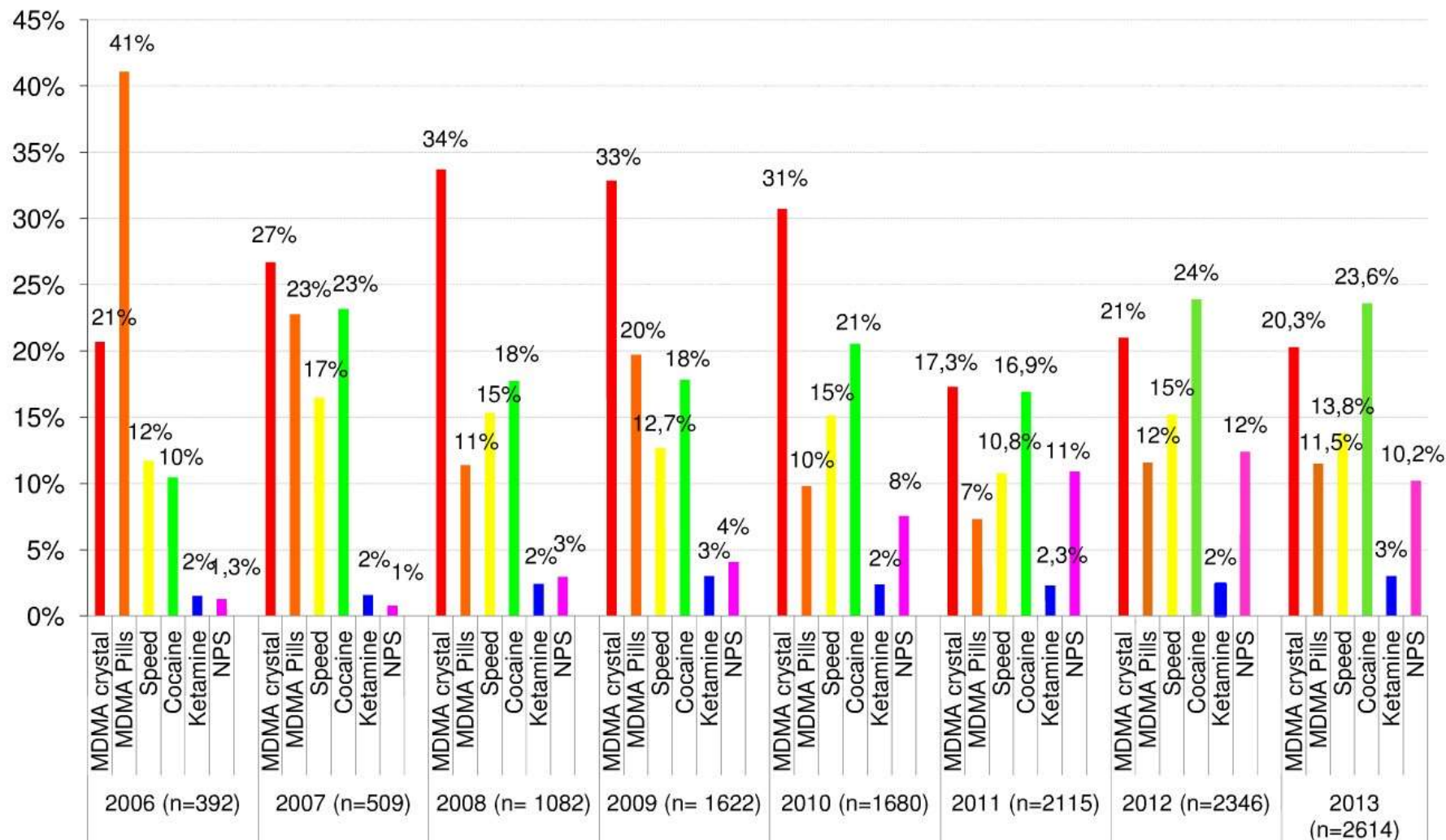
Smartshops/Headshops → Herbal XTC → Legal Highs



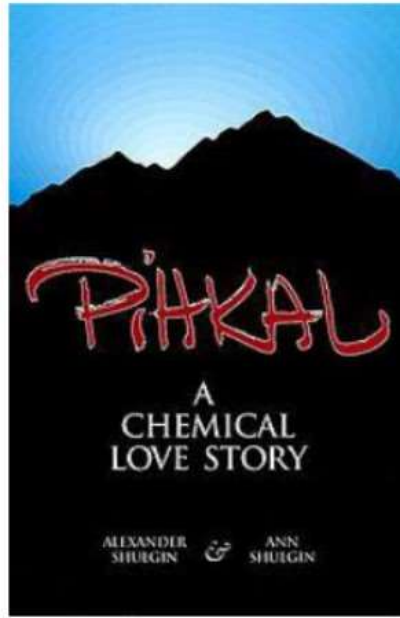
Number and main groups of new psychoactive substances notified to the EU Early warning system, 2005-2012



Evolution of analyzed substances (2006-2013)



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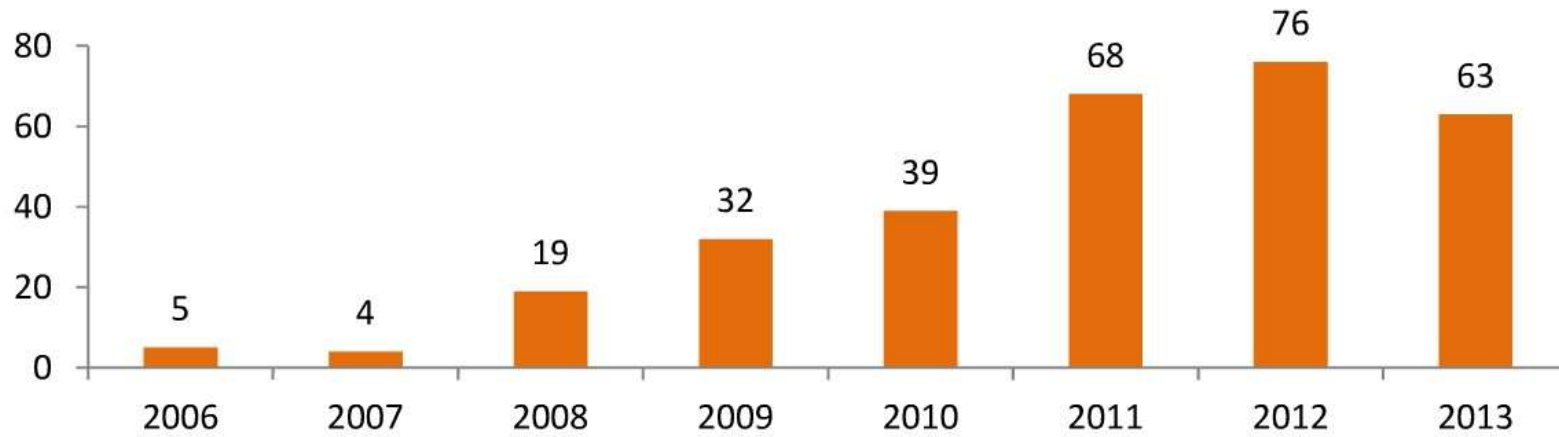
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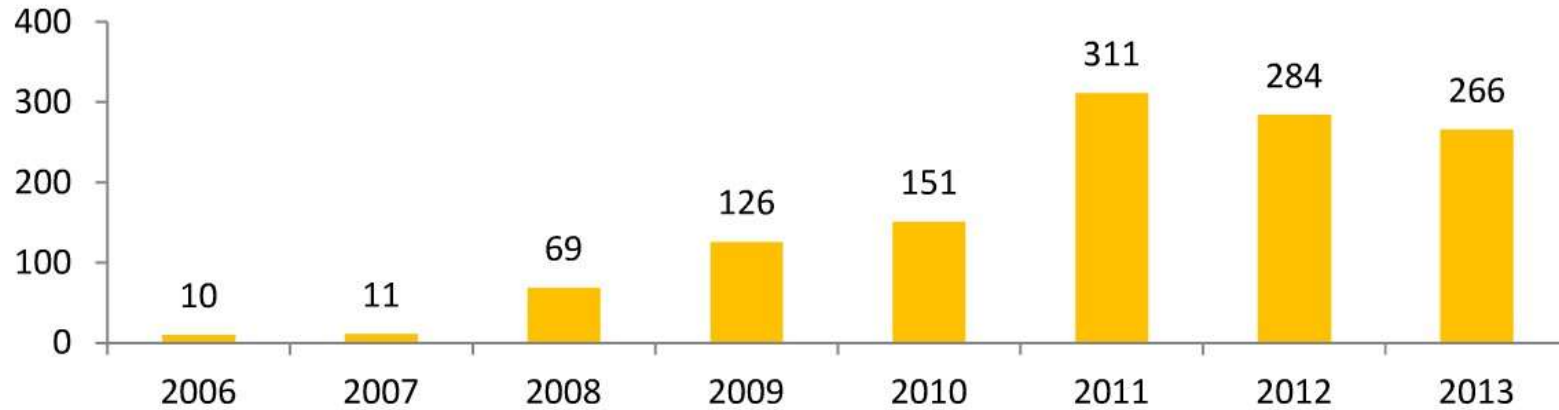
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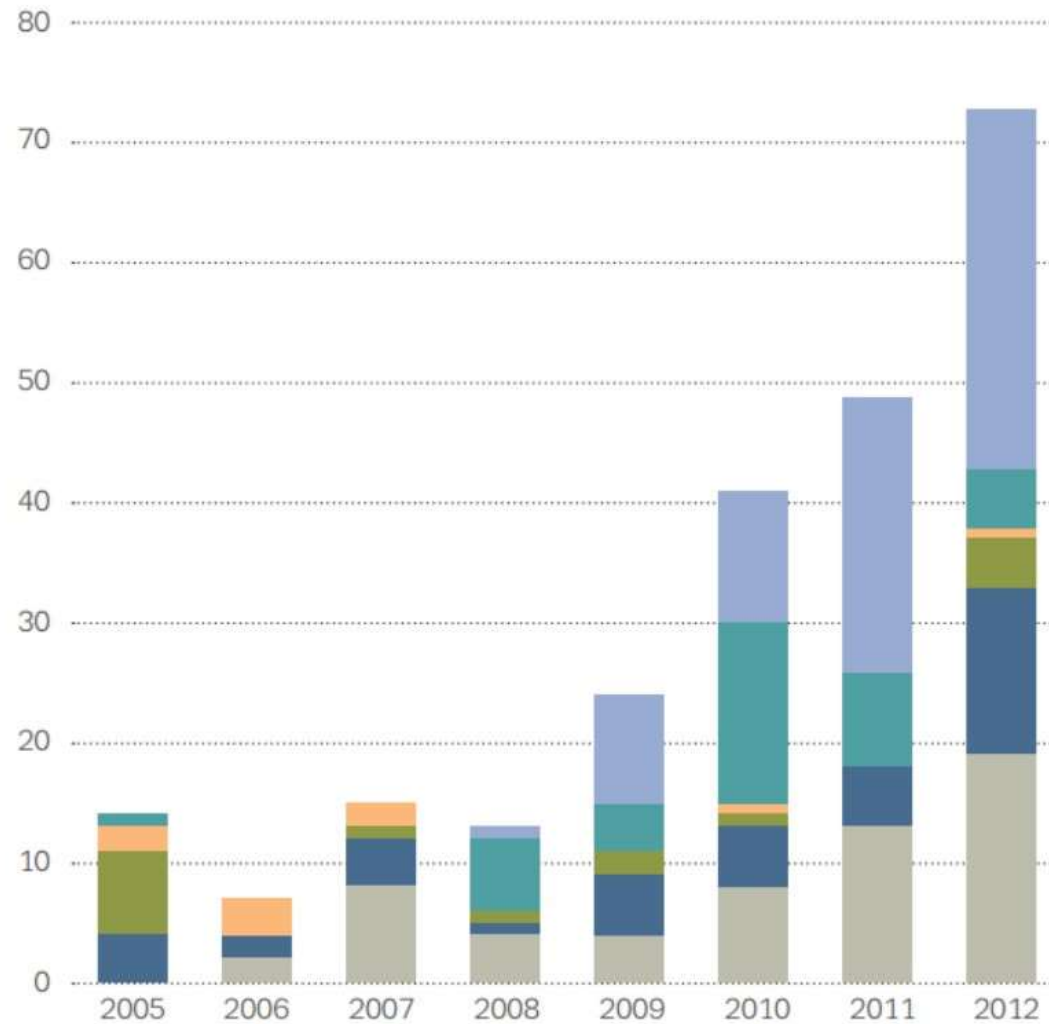
Evolution of NPS detected



Evolution of number of NPS analysed



Number and main groups of new psychoactive substances notified to the EU Early warning system, 2005–2012



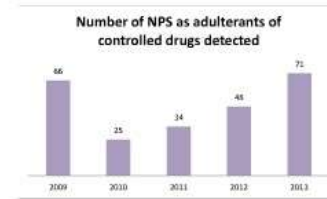
■ Synthetic cannabinoids ■ Cathinones
■ Piperazines ■ Tryptamines ■ Phenethylamines
■ Other (chemicals, plants, medicines)

Data

Table 1. Number of samples in which controlled drugs (NPS) were detected in ecstasy pills (MDA) from 2009 to 2013.

Controlled drug	2009	2010	2011	2012	2013
MDA (tablets)	11	8	36	31	47 (84.2%)
MDA (crystal)	1	1	1	1	1 (1.7%)
Amphetamine	1	1	1	1	1 (1.7%)
LSD	1	1	1	1	1 (1.7%)
Cocaine	1	1	1	1	1 (1.7%)
Methamphetamine	1	1	1	1	1 (1.7%)
Mescaline	1	1	1	1	1 (1.7%)

Since 2009 this worrying phenomena was detected mainly in ecstasy pills



Number of NPS is increasing in last years

	2013	TOTAL
MDMA (tablets)	18	25%
MDMA (crystal)	14	20%
Amphetamine	4	6%
Ketamine	7	10%
LSD	21	30%
Cocaine	6	8%
Methamphetamine	-	-
Mescaline	1	1%

During 2013 not only increased the number of detected substances but also their distribution in different controlled drugs.



91 different combinations detected in 241 submitted samples

Research should also be directed towards the study of the toxicity associated with the interaction of these compounds

Phenethylamines

MDA, MDMA
 One of the most common types of ecstasy pills (MDA) or MDMA (MDMA).
 MDMA is a new version of MDA & LSD.
 Dose: 10-30 mg

LSD
 Very low dose of LSD (microdose).
 Dose: 1-5 micrograms (0.1-0.5 mg)
 General health effects: increased heart rate, increased blood pressure.

Phenethylamines

MDA, MDMA
 The addictive effects of MDA/MDMA include: compulsive use, tolerance, withdrawal, and dependence.
 Dose: 10-30 mg

Cathinones

Mephedrone
 Often used as a stimulant.
 Compulsive use, tolerance, withdrawal, and dependence.
 Dose: 10-30 mg

Mephedrone
 Mephedrone is often used as a stimulant.
 Dose: 10-30 mg

Ketamine's analogs

Mephedrone
 Ketamine analog (dissociative psychotropic).
 Dose: 10-30 mg

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 Ketamine analog (dissociative psychotropic).
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Table 1. Number of illegal drug samples submitted to Energy Control's drug checking services in which NPS were detected

Sample submitted as	Year				Total
	2009	2010	2011	2012	
MDMA (tablets)	47	8	16	16	87 (50.3%)
MDMA (crystal)	11	12	2	4	29 (16.8%)
Amphetamine	6	4	6	6	22 (12.7%)
Ketamine	-	-	4	12	16 (9.2%)
LSD	-	-	2	7	9 (5.2%)
Cocaine	-	1	-	3	4 (2.3%)
Methamphetamine	-	-	4	-	4 (2.3%)
Mescaline	2	-	-	-	2 (1.2%)

Since 2009 this worrying phenomena was detected mainly in ecstasy pills

Number of NPS as adulterants of controlled drugs detected



Number of NPS is increasing in last years

	2013	TOTAL
MDMA (tablets)	18	25%
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Presence of NPS in illegal drugs submitted to Energy Control's Drug Checking Service.

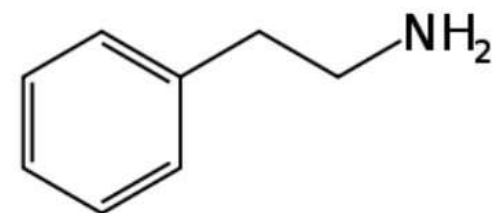
	MDMA PII	MDMA Crystal	Amph.	Ketamine	LSD	Cocaine	Mephambph	Mescaline	Total
1-phenylethan-1-amine		5							5
25C-NBOMe					3				3
25I-NBOMe					15				15
2C-B	71				3			2	76
2C-C					1				1
2C-E	6				1				7
2C-I	4	1				1			6
2-FA	1								1
2-MMC	1								1
3,4-DMMA		1							1
3,5-DMA			1						1
3-FA	2						4		6
4-ACO-DIPT					1	1			2
4-FMA	1								1
4-FA	6	1	22						29
4-MEC	2	4	2	1		3			9
5-APB		1							1
Alpha-PVP		3							3
Buphedrone	1	1				1			3
Butylone						1			1
Dimethylcathinone	1								1
DMA					1				1
DOB					2				2
DOC					6				6
DOI					1			1	2
MDPV						1			1
Mephedrone	4	9	1	4					18
Methylone	3	19							22
Methoxetamine	1		1	22		2			26
p-FPP	1								1
Nº of different NPS	15	10	5	3	10	7	1	2	

Presence of NPS in illegal drugs submitted to Energy Control's Drug Checking Service.

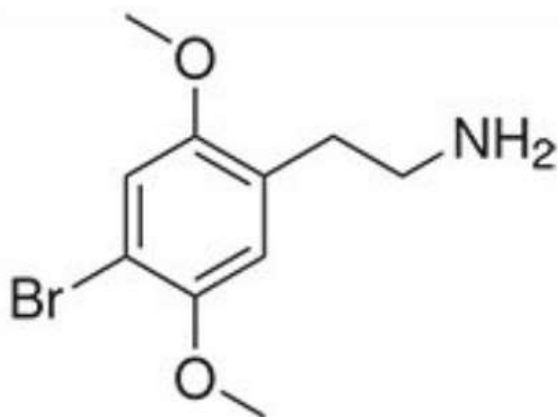
	MDMA Pill	MDMA Crystal	Amph.	Ketamine	LSD	Cocaine	Methamph	Mescaline	Total
1-phenylethan-1-amine		5							5
25C-NBOMe					3				3
25I-NBOMe					15				15
2C-B	71				3			2	76
2C-C					1				1
2C-E	6				1				7
2C-I	4	1				1			6
2-FA	1								1
2-MMC	1								1
3,4-DMMA		1							1
3,5-DMA			1						1
3-FA	2						4		6
4-ACO-DIPT					1	1			2
4-FMA	1								1
4-FA	6	1	22						29
4-MEC	2	4	2	1		3			9
5-APB		1							1
Alpha-PVP		3							3
Buphedrone	1	1				1			3
Butylone						1			1
Dimethylcathinone	1								1

2-FA	1								1
2-MMC	1								1
3,4-DMMA		1							1
3,5-DMA			1						1
3-FA	2						4		6
4-ACO-DIPT					1	1			2
4-FMA	1								1
4-FA	6	1	22						29
4-MEC	2	4	2	1		3			9
5-APB		1							1
Alpha-PVP		3							3
Buphedrone	1	1				1			3
Butylone						1			1
Dimethylcathinone	1								1
DMA					1				1
DOB					2				2
DOC					6				6
DOI					1			1	2
MDPV						1			1
Mephedrone	4	9	1	4					18
Methylone	3	19							22
Methoxetamine	1		1	22		2			26
p-FPP	1								1
Nº of different NPS	15	10	5	3	10	7	1	2	

Phenethylamines



2Cx / 2CTx



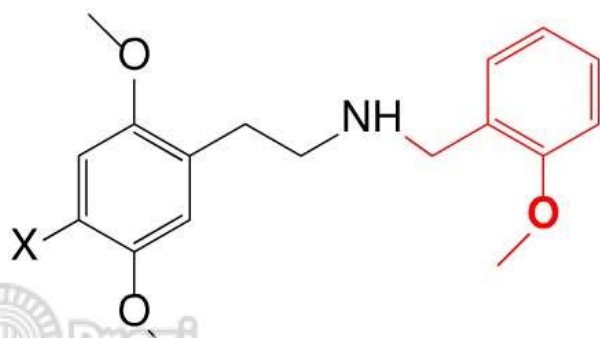
Short-lived stimulants/empathogens (at low doses) or psychedelics (at medium/high doses)

Kind of a mix between **MDMA & LSD**

Dosage \approx 10-30 mg



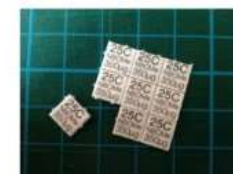
2C-X-NBOMe



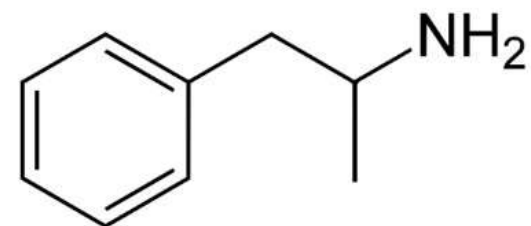
~ **LSD**

Very new group of substances (2004).

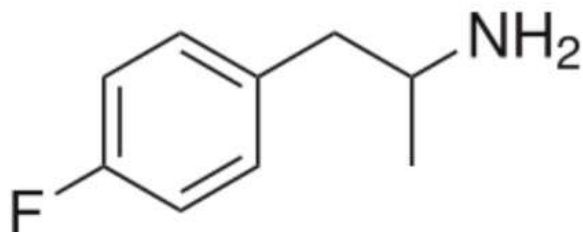
Dosage \approx hundreds of micrograms (<1mg)
Several deaths are related with N-BOMe overdoses



Phenethylamines



4-Fluoroamphetamine



The subjective effects of 4-Fluoroamphetamine include euphoria which some find similar to the effects of MDMA.

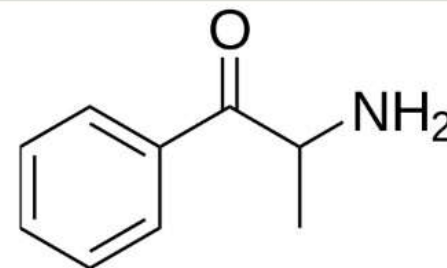
Dosage: 50-300mg



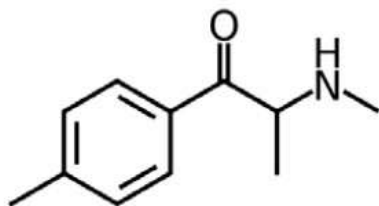
4-Fluoroamphetamine Crystals

Photo by John Cocktoaster, © 2013 Erowid.org

Cathinones



Mephedrone



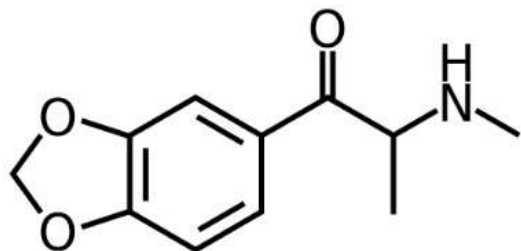
Short-acting stimulants/empathogens

Compulsive redosing, pronounced hangover

Dosage: oral (100-200 mg, **MDMA-like** effects)

insufflated(30-90 mg, **Cocaine-like** effects)

Methylone



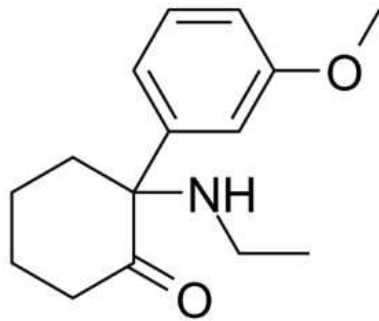
MDMA-like effects, but without the “magic”

Dosage: 100-250 mg (oral & insufflated)



Ketamine's analogs

Methoxetamine



Ketamine analog (dissociative psychedelic).

Dosage: 40-80 mg (oral, insufflated)

Overdose could be more dangerous than ketamine



[repeated, insufflated] "This stuff isn't like ketamine in the sense that, with ketamine, I can return to near normality within half hour to an hour. I was ruined for about 24 hours."

is increasing in last years

detected substances but also their
distribution in different controlled drugs

*91 different combinations detected in
241 submitted samples*

**Research should also be directed towards the study of the
toxicity associated with the interaction of these compounds**

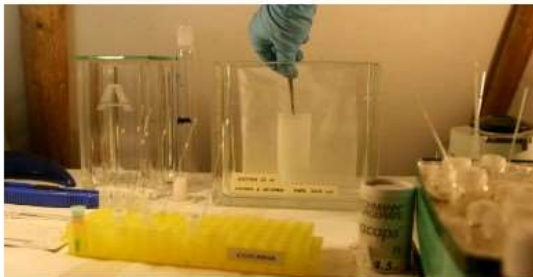
Implications



The first time that NPS were detected as adulterants coincided with a shortage of MDMA observed in several European countries.



The use of several NPS as adulterants of MDMA & LSD has also been documented by other Drug Checking services in Switzerland, Austria and USA.



NPS are usually detected in Drug Checking services, rarely in seizures, which represent the vast majority of data

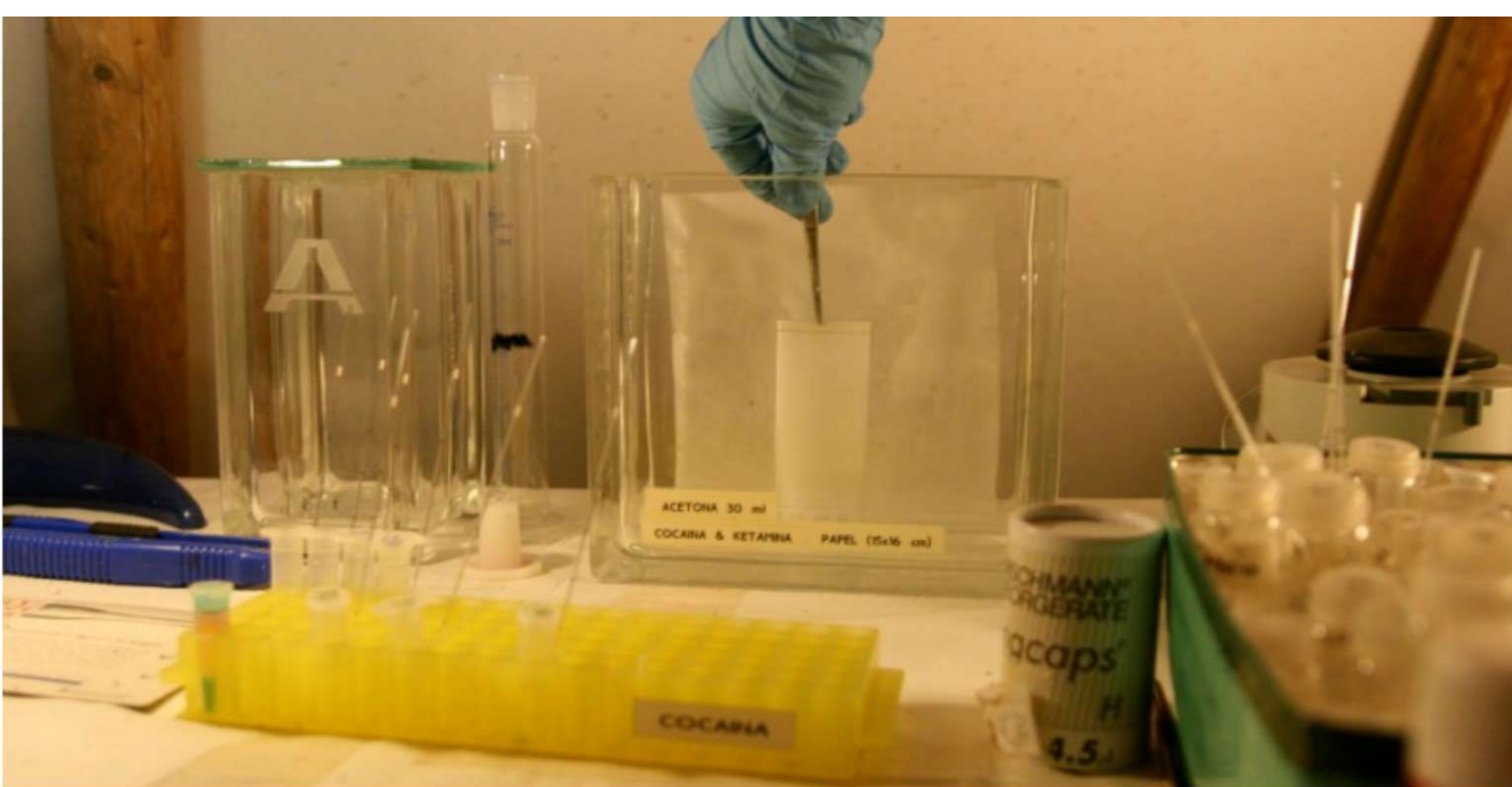




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A photograph of an iceberg floating in the ocean. The tip of the iceberg is visible above the water surface, while the much larger, submerged part is visible below. The sky is blue with some clouds, and the water is a deep blue. The text "We must bring to light this hidden phenomenon" is overlaid in white on the submerged part of the iceberg.

We must bring to light this hidden phenomenon

Thanks for your attention!!!

Perspective

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