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**Overview**

- What are synthetic stimulants?
- How do they effect the body?
- How are they used?
- Do they change over time?
- What influences market changes?
- Can they cause cognitive and physical impairment?
- How to laboratories test for synthetic stimulants?

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**What are Synthetic Stimulants?**

- NPS subclass of CNS stimulants
  - Act on the body similar to cocaine, MDMA and/or methamphetamine
  - Sometimes referred to as "synthetic cathinones", but this is a type of chemistry
  - Other chemistry groups involved too
- Sometimes referred to as "Bath Salts"
  - This is strictly for marketing purposes
  - Not to be confused with Epsom salt products
- Other names: "plant food", "jewelry cleaner", "phone screen cleaner"



<https://www.mindpagetoday.com/special-reports/features/100179>

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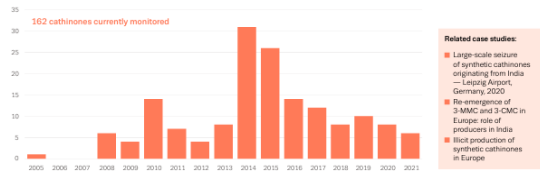
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## Synthetic Cathinones reported to EMCDDA

Infographic on synthetic cathinones

### Synthetic cathinones

a) Number of synthetic cathinones notified for the first time, 2005-2021 (EU+2)



Source: [https://www.emcdda.europa.eu/system/files/publications/14637/20222218\\_PDF\\_TD0522113ENN\\_002.pdf](https://www.emcdda.europa.eu/system/files/publications/14637/20222218_PDF_TD0522113ENN_002.pdf)

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## DRE Matrix



Major Indicators	CNS Depressants	CNS Stimulants	Hallucinogens	Dissociative Anaesthetics	Narcotic Analgesics	Inhalants	Cannabis
HGN	Present	None	None	Present	None	Present	None
Vertical Nystagmus	Present (High Dose)	None	None	Present	None	Present (High Dose)	None
Lack of Convergence	Present	None	None	Present	None	Present	Present
Pupil Size	Normal (1)	Dilated	Dilated	Normal	Constricted	Normal (4)	Dilated (6)
Reaction to Light	Slow	Slow	Normal (3)	Normal	Little or none visible	Slow	Normal
Pulse Rate	Down (2)	Up	Up	Up	Down	Up	Up
Blood Pressure	Down	Up	Up	Up	Down	Up/Down(5)	Up
Body Temperature	Normal	Up	Up	Up	Down	Up/Down/Normal	Normal
Muscle Tone	Flaccid	Rigid	Rigid	Rigid	Flaccid	Normal or Flaccid	Normal

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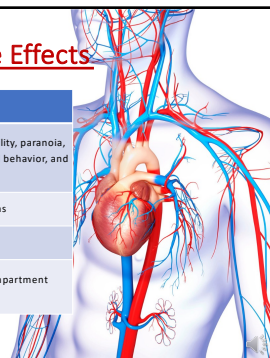
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## Synthetic Stimulant Adverse Effects

Organ System	Symptoms and Signs
Central nervous system	Agitation, psychosis, delusions, aggression, irritability, paranoia, delirium, hallucinations, sedation, coma, abnormal behavior, and altered fluctuating consciousness
Cardiovascular	Tachycardia, hypertension, palpitations
Pulmonary	Increased respiratory rate
Other	Hyperthermia, mydriasis, rhabdomyolysis, compartment syndrome and sweating



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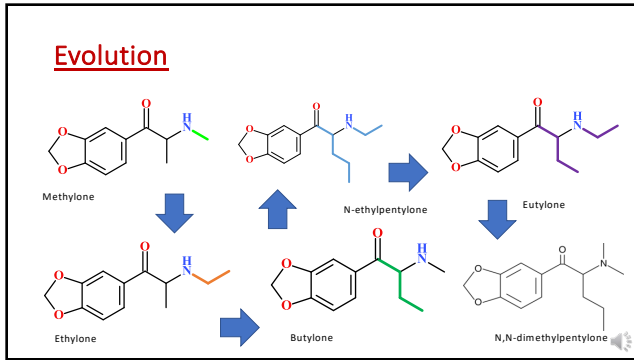
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**TALKING DRUGS**

ARTICLES | ABOUT | DRUGS | ISSUES | REGIONS

My first time encountering Molly

Source: <https://www.talkingdrugs.org/my-first-time-encountering-molly>

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**Drug Checking Resources**

**DANCESAFE**

About Us | Drug Information | Drug Checking | Health & Safety | Event Services | News & Updates | Get Involved

**#TESTIT ALERT!**

#TestIt Alert: Red rectangular Red Bull pill with a bull stamped on one side and "Red Bull" stamped on the other, separated by a score line, sold in Dallas, TX as MDMA but actually contains N-Ethylpentylone

By: Rachel Clark, DanceSafe Intern A red, rectangular pill with a bull stamped on one side and the words "Red Bull" stamped on the other, separated by a score line, was sold in Dallas, TX as MDMA but actually contained N-Ethylpentylone. The sample was sourced in Houston, TX and sold in Dallas, TX. The sample

Source: <https://dancesafe.org/category/testit-alerts/page/5/>

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**DrugsData.org**  
Erowid's anonymous drug analysis program  
Formerly called EcstasyData

Test Results Test Result Statistics About Tests & Data About Us Contact Us FAQ

Active Contents

Photo	Sample Name	Substance	Ratio / Amounts	Date	Location
	The Punisher Sold as: MDMA / Ecstasy	<ul style="list-style-type: none"> <li>MDMA</li> <li>Caffeine</li> <li>Dipentylone</li> </ul>	<ul style="list-style-type: none"> <li>75 mg</li> <li>15 mg</li> </ul>	Sep 02, 2022 (Tested Aug 01, 2022)	Vienna, Austria
	The Punisher Sold as: MDMA / Ecstasy	<ul style="list-style-type: none"> <li>Caffeine</li> <li>SCMG</li> <li>Unidentified</li> </ul>	<ul style="list-style-type: none"> <li>21 mg</li> </ul>	Sep 02, 2022 (Tested Aug 01, 2022)	Vienna, Austria
	Eulie Presents Out Sold as: MDMA / Ecstasy	<ul style="list-style-type: none"> <li>MDMA</li> <li>4-CMC</li> </ul>	<ul style="list-style-type: none"> <li>47 mg</li> </ul>	Sep 02, 2022 (Tested Aug 01, 2022)	Vienna, Austria
	Tekashi99 Sold as: MDMA / Ecstasy	<ul style="list-style-type: none"> <li>MDMA</li> <li>4-Methylmethcathinone</li> <li>Caffeine</li> </ul>	<ul style="list-style-type: none"> <li>90 mg</li> <li>54 mg</li> <li>2 mg</li> </ul>	Sep 02, 2022 (Tested Aug 01, 2022)	Vienna, Austria

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**health** Life, But Better Fitness Food Sleep Mindfulness Relationships

### What is flakka (aka gravel) and why is it more dangerous than cocaine?

By Carina Storm and Special to CNN  
Updated 7:59 PM EDT, Tue May 26, 2015

Alpha-PVP  
α-PVP  
α-pyrrolidinovalerophenone  
α-pyrrolidinopentiphenone

Source: <https://www.cnn.com/2015/05/26/health/flakka-gravel-illegal-drugs/index.html>

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### NFLIS 2020 Report

**Table 2.4 PHENETHYLAMINES**  
Number and percentage of phenethylamine reports in the United States, January 2021–June 2021<sup>1</sup>

Phenethylamine Reports	Number	Percent
Methamphetamine	207,980	92.11%
Ethylone	8,379	3.71%
Amphetamine	4,140	1.83%
MDMA	2,578	1.14%
MDA	418	0.19%
Lisdexamfetamine	320	0.15%
BMDP	196	0.09%
alpha-PHP	158	0.07%
Phentermine	119	0.05%
alpha-PHP	117	0.05%
3,4-Methylenedioxy PVP	80	0.04%
4i-3-Methyl-alpha-PVP	51	0.02%
N-Ethylpentylone	51	0.02%
H-Methylethylone	42	0.02%
Pentylone	40	0.02%
Other phenethylamines	1,122	0.50%
<b>Total Phenethylamine Reports<sup>2</sup></b>	<b>225,801</b>	<b>100.00%</b>
<b>Total Drug Reports</b>	<b>678,902</b>	

Alpha-PHP

Alpha-PiHP

Source: <https://www.nflis.deadiversion.usdoj.gov/nflisdata/docs/NFLISDrug2020AnnualReport.pdf>

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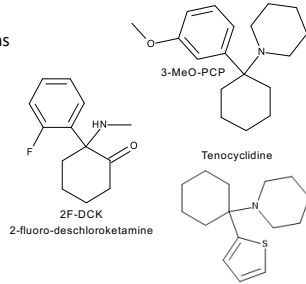
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### NPS Hallucinogens & Dissociatives

- NPS that fall under hallucinogens and dissociative anesthetics
  - LSD analogs
  - NBOMes
  - PCP analogs
  - Ketamine analogs
- These compounds are relatively low prevalence compared to other categories of NPS



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### Synthetic Stimulants & Driving

- NPS stimulants have been detected in DUID cases and motor vehicle crashes
- DUID case involving  $\alpha$ -PVP, ethylone, and methylene (Knoy et al, 2014)
  - Driver stopped due to poor navigation of the roadway
  - DRE officer observed slurred speech, bloodshot watery eyes, involuntary muscle movement
  - Elevated pulse and blood pressure
- Driver crashed his car, fled scene of the incident. Approached policemen asking for safeguard as he was being followed by unknown. MDPV confirmed in serum at 146 ng/mL (Mass et al, 2015)
  - Anxious, upset, and emotionally aroused
- 18 suspected impaired driving cases with  $\alpha$ -PVP (Wright et al, 2016)
  - Behaviors ranged from CNS depression to eluding officers in a high-speed chase

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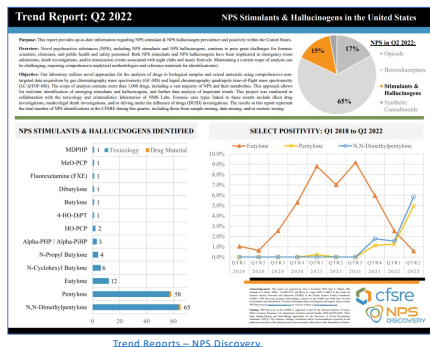
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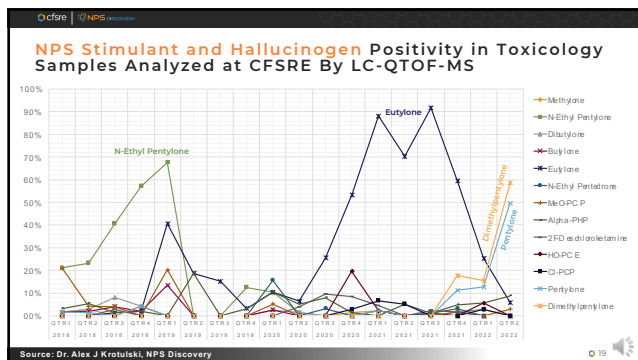
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### Synthetic Stimulant Market Shifts

- Individual domestic scheduling historically has not had much of an impact
- Global action such as export controls or international scheduling has resulted in market shifts
  - Ex. Alpha PVP declined in popularity once China banned its export
- Significant geographical differences
  - Europe has a very different synthetic stimulant scene compared to the US
- In the US, typically only one compound of this class dominates at a time

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### Toxicology Testing

- Synthetic stimulants will not trigger immunoassay screens
- Individual compounds will need to be covered by specialized screening methods, such as high-resolution mass spectrometry
- Isomers are a significant challenge
  - Chromatographic separation will likely be needed in confirmatory assays
- Compound stability also can be of concern

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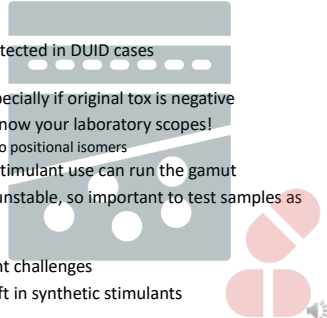
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**Summary**

- Synthetic stimulants have been detected in DUI/D cases
  - Prevalence underestimated
- Product testing can be helpful, especially if original tox is negative
- Toxicology testing is challenging; know your laboratory scopes!
  - Laboratories need to pay attention to positional isomers
- Behavioral effects after synthetic stimulant use can run the gamut
- Some compounds are chemically unstable, so important to test samples as quickly as possible
  - Result is at the time of testing!
- Nomenclature continues to present challenges
- Global forces influence market shift in synthetic stimulants



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