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**Overview**

- What are synthetic cannabinoids?
- How are they used?
- What kind of effects do they cause?
- Do they change over time?
- What influences the change in SCRAAs?
- How do they affect one's ability to drive safely?



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**Synthetic Cannabinoid Receptor Agonists (SCRAAs)**

- NPS Subclass: Synthetic cannabinoids
  - NOT synthetic marijuana
- Product Names: K2, Spice
- Man-made chemicals that interact with cannabinoid receptors in the body
- Repurposed from a wide body of pharmaceutical research
- Variable potency
- They are increasingly popular among vulnerable populations, youth, homeless people, prisoners, and other drug-using populations.



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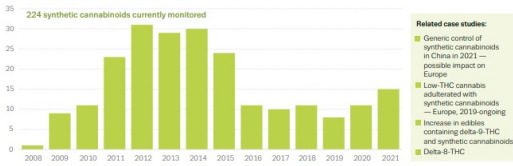
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## Synthetic Cannabinoids reported to EMCDDA

Infographic on synthetic cannabinoids

### Synthetic cannabinoids

a) Number of synthetic cannabinoids notified for the first time, 2008-2021 (EU+2)



**Related case studies:**

- Generic control of synthetic cannabinoids in China in 2021 — possible impact on Europe
- Low-THC cannabis adulterated with synthetic cannabinoids — Europe, 2019-ongoing
- Increase in seizures containing delta 9-THC and synthetic cannabinoids
- Delta 8-THC



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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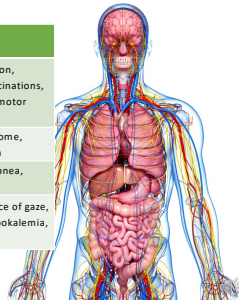
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## SCRA Use Adverse Effects

	Symptoms and Signs
Central nervous system	Agitation, psychosis, irritability, seizures, sedation, disorientation, subdued mood, coma, delirium, hallucinations, dissociation, paranoia, anxiety, self-harm, psychomotor impairment
Cardiovascular	Tachycardia, hypertension, acute coronary syndrome, arrhythmia, chest pain, myocardial infarction
Pulmonary	Respiratory depression, respiratory failure, hypoxea, tachypnea, diffuse alveolar hemorrhages
Other	Nausea, vomiting, fevers, mydriasis, lack of convergence of gaze, blurred vision, acute kidney injury, hyperglycemia, hypokalemia, apoptotic cell death



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### Formulations

- Solution typically sprayed on dried vegetative matter
- E-liquids for vaping
- Impregnated papers, articles of clothing
- Low dose cannabis adulterated with SCRA's
- Homogeneity concerns with some formulations
  - "Hot spots"

FIGURE 6 E-liquid containing SF-MDMB-PICA intended for vaping in an electronic cigarette, seized by Italian Carabinieri in June 2020



FIGURE 7 All-sized printouts, seized in a prison in Scotland, United Kingdom, during 2019, that were impregnated with MDMB-4en-PINACA and SF-MDMB-PICA



Photos © © Craig McQuinn, Lawtonian Research Centre for Forensic Sciences, University of Dundee, United Kingdom

Source: <https://www.emcdda.europa.eu/system/files/publications/14035/synthetic-cannabinoids-in-Europe-EMCDDA-technical-report.pdf>

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### Investigation finds illegal synthetic marijuana in vape and edible products sold as CBD

PUBLISHED MON, SEP 16 2019-8:00 PM EDT | UPDATED MON, SEP 16 2019-6:22 PM EDT

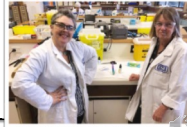
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SHARE f t in

New Zealand officials tap VCU professor's expertise to learn about potential vaping hazards

#### KEY POINTS

- Some operators are cashing in on the CBD craze by substituting cheap and illegal synthetic marijuana for natural CBD in vapes and edibles such as gummy beers.
- The American Association of Poison Control Centers considers CBD an "emerging hazard" due to the potential for mislabeling and contamination.
- A 2017 study in the Journal of the American Medical Association found 70% of CBD products were mislabeled.



Source: <https://www.cnn.com/2019/09/16/investigation-finds-illegal-synthetic-marijuana-in-vape-and-edible-products.solid.su-cbd-03.html>

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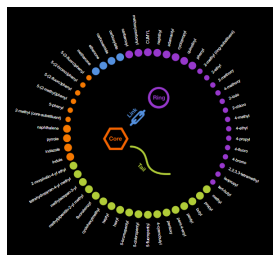
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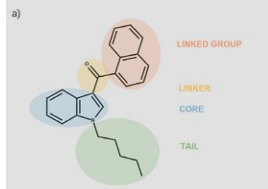
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### Chemical Structure of SCRA's



The four components of synthetic cannabinoids and types of cores: (a) JWH-018 is composed of a pentyl tail, an indole core, a methanone linker and a naphthyl linked group; (b) Emergence of different cores



<http://www.emcdda.europa.eu/topics/pods/synthetic-cannabinoids#en17>

Source: [https://www.emcdda.europa.eu/system/files/publications/14637/20222218\\_PD\\_F\\_730022118EN\\_002.pdf](https://www.emcdda.europa.eu/system/files/publications/14637/20222218_PD_F_730022118EN_002.pdf)

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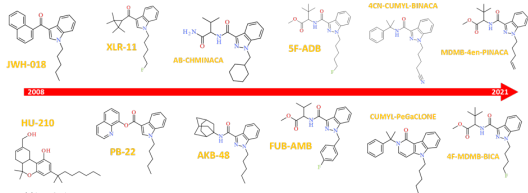
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### Moving Target

- Chemicals change frequently due to patchwork scheduling and regulation
- Different products with same name contain different chemicals
- The same product from the same manufacturer contains different drug, lot to lot



Source: Dr. Alex Krubinski, NPS, Discovery

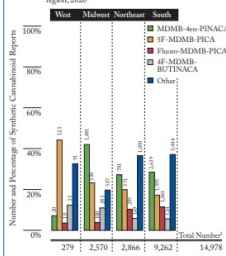
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### NFLIS 2020 Report

Synthetic Cannabinoid Reports	Number	Percent
MDMB-4en-PINACA	4,521	30.19%
SF-MDMB-PICA	2,888	19.28%
Fluoro-MDMB-PICA	1,465	9.79%
4F-MDMB-BUTINACA	1,010	6.74%
Fluoro-MDMB-BUTINACA	283	1.89%
Fluoro-EMB-PICA	263	1.76%
SF-ADB	218	1.46%
ADB-BUTINACA	210	1.40%
4F-MDMB-BUTICA	210	1.40%
SF-EMB-PICA	195	1.30%
SF-EMB-PINACA	121	0.81%
Fluoro-MDMB-BUTICA	118	0.79%
FUB-AMB	116	0.77%
FUB-144	107	0.72%
SF-CUMYL-PINACA	74	0.50%
Other synthetic cannabinoids	3,176	21.20%
<b>Total Synthetic Cannabinoid Reports<sup>2</sup></b>	<b>14,978</b>	<b>100.00%</b>
<b>Total Drug Reports</b>	<b>1,283,971</b>	

Figure 2.5 Distribution of synthetic cannabinoid reports within region, 2020<sup>1</sup>



<sup>1</sup> Includes drug reports submitted to laboratories from January 1, 2020, through December 31, 2020, that were analyzed by March 31, 2021. For most drugs, the 2020 estimates show a noticeable decrease likely due to the impact of the COVID-19 pandemic. Use caution when comparing data from 2020 with data from previous years.  
<sup>2</sup> Numbers and percentages may not sum to total because of rounding.

Source: <https://www.nflis.dea/diversion.usdoj.gov/nflisdata/docs/NFLISdrug2020AnnualReport.pdf>

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### Synthetic cannabinoids: A threat to health security?

**Thousands poisoned in outbreaks**

**Spice appears in Europe**  
 2006-2009  
 190+ cannabinoids in 100s of products  
 Returns of an "all natural" product that had synthetic-like effects when smoked

**2009-2013**  
 Evidence reports 10 seizures of Spice  
 January 2008  
 Seizure made in 2007

**JWH-018 identified in Spice**  
 December 2008  
 Confirmed in Germany & Austria

**EMCDDA expert meeting**  
 March 2009  
 Spice was labeled synthetic cannabinoids

**Spice causing serious problem in prison**  
 December 2011  
 HMP Borehamston, UK. By 2013 Spice was identified as a recreational drug with 40% of prisoners identifying it as a concern by 2014-15.

**MDMB-FUBINACA outbreak**  
 September 2014  
 600+ cases, 16 deaths in Russia

**"Facebook" outbreak**  
 May 2016  
 4000+ FUBINACA sold as ecstasy in Hungary, 10 cases

**"Mocair" outbreak**  
 July 2016  
 900+ cases in Poland

**MDMB-CHINICA**  
 February 2016  
 joint report

**AB-CHMINACA, ADB-CHMINACA, SF-MDMB-PINACA, CUMYL-4en-BINACA**  
 April 2017  
 joint report

**CUMYL-4en-BINACA/CBD outbreak**  
 December 2017  
 Synthetic cannabinoids sold as CBD in US (also in UK)

**Brodifacoum outbreak**  
 March 2018  
 Synthetic cannabinoids adulterated with brodifacoum in US, 320 cases, 8 deaths, 11 babies

**"Santa Maarten" outbreak**  
 July 2018  
 Involves sale of SF-MDMB-PINACA & benzpinacol in Philadelphia, US, 100 cases

**4F-ADB-4en-BINACA spreads in Europe**  
 September 2018-February 2019  
 Seized in 4 countries. Bulk providers from China

Source: [https://www.emcdda.europa.eu/system/files/publications/13464/20205648\\_TD0320796ENN\\_PDF\\_rev.pdf](https://www.emcdda.europa.eu/system/files/publications/13464/20205648_TD0320796ENN_PDF_rev.pdf)

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### Toxicology Testing for SCRAs

- Due to the variety of chemistries and rapid shift, extremely difficult for toxicology labs to maintain current testing
- Routine toxicology testing will most likely not include SCRAs
- If a laboratory has testing, typically requires specialized instrumentation
- If a test is available, the scope of the test may not be current or appropriate
- Some compounds break down quickly, and therefore the parent substance is not the best marker for use

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### Summary

- SCRAs have been detected in DUID cases (as well as overdoses and deaths)
- Product testing is very helpful if tox is negative
- Laboratory testing is challenging due to speed of emergence & proliferation, variable life-spans, and varying chemistries
  - Parent/metabolites and drug instability pose further challenges
- Nomenclature is important
- Quant vs qualitative findings for interpretation
  - Typical toxic ranges for SCRAs have not been identified
- Chinese ban did have an impact
  - New compounds of different chemical classes emerging, but none appear to have taken hold
- Imperative to stay current



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