



Novel Hallucinogens and Plant-Derived Highs

Emily Dye

Forensic Chemist

Special Testing and Research Laboratory

Drug Enforcement Administration

Outline

- Hallucinogens
 - 2C Compounds
 - NBOMe Compounds
 - DOX Compounds
- Empathogens
 - Aminoindanes
 - APDB
 - APB
- Plant-Derived Highs
 - Kratom
 - Fly Agaric Mushrooms
 - Kava Kava
 - Kanna

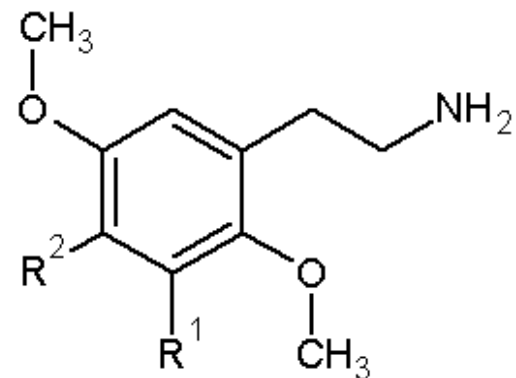


2C Compounds

- Psychedelic phenethylamines
- Synthesized by Alexander Shulgin
 - Published in PiHKAL
- 27 known compounds
 - Most common: 2C-C, 2C-B, and 2C-I



2C Compounds



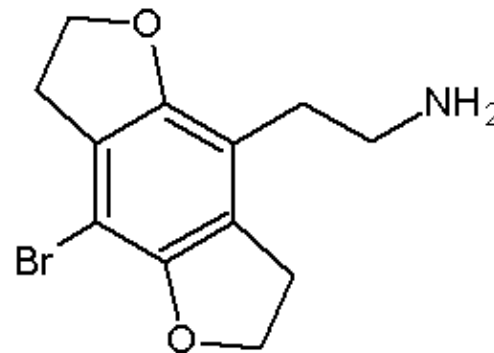
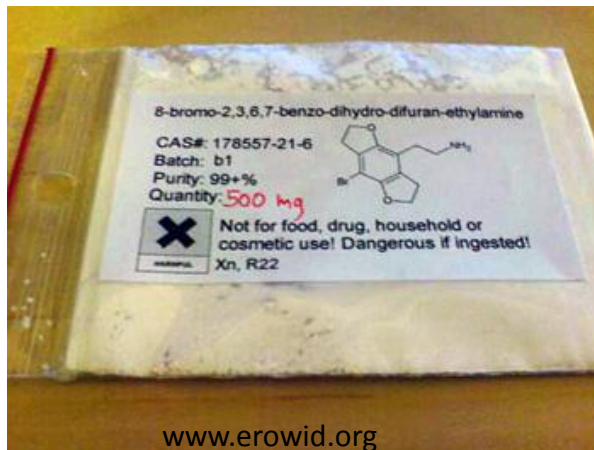
Name	R ¹	R ²
2C-B	H	Br
2C-C*	H	Cl
2C-D*	H	CH ₃
2C-E*	H	CH ₂ CH ₃
2C-F	H	F
2C-G	CH ₃	CH ₃
2C-G-3		(CH ₂) ₃
2C-G-4		(CH ₂) ₄
2C-G-N		(CH) ₄
2C-H*	H	H
2C-I*	H	I
2C-N*	H	NO ₂
2C-O	H	OCH ₃
2C-O-4	H	OCH(CH ₃) ₂
2C-P*	H	CH ₂ CH ₂ CH ₃

Name	R ¹	R ²
2C-Se	H	SeCH ₃
2C-T	H	SCH ₃
2C-T-2*	H	SCH ₂ CH ₃
2C-T-4*	H	SCH(CH ₃) ₂
2C-T-7	H	S(CH ₂) ₂ CH ₃
2C-T-8	H	SCH ₂ CH(CH ₂) ₂
2C-T-9	H	SC(CH ₃) ₃
2C-T-13	H	S(CH ₂) ₂ OCH ₃
2C-T-15	H	SCH(CH ₂) ₂
2C-T-17	H	SCH(CH ₃)CH ₂ CH ₃
2C-T-21	H	S(CH ₂) ₂ F
2C-TFM	H	CF ₃



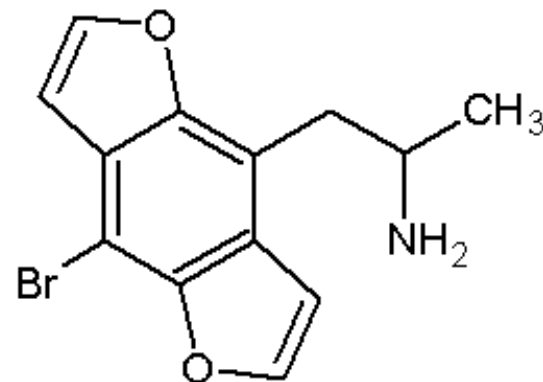
2C-B-FLY

- Psychedelic phenethylamine
- Synthesized by Aaron Monte



Bromo-DragonFLY

- Psychedelic phenethylamine
- Synthesized in the lab of David Nichols
- Deaths associated with misrepresentation as 2C-B-FLY



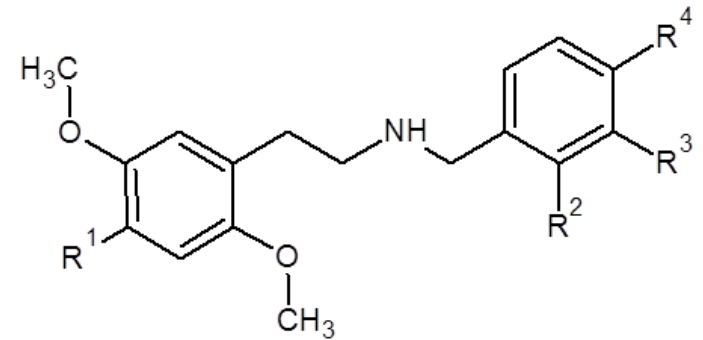
www.erowid.org



NBOMe Compounds

- Hallucinogenic phenethylamines

- Synthesized by Heim, *et al.*



- Isomers can be distinguished via RT and MS



Name	R ¹	R ²	R ³	R ⁴	Name	R ¹	R ²	R ³	R ⁴
25B-NB2OMe	Br	OCH ₃	H	H	25N-NB2OMe	NO ₂	OCH ₃	H	H
25B-NB3OMe	Br	H	OCH ₃	H	25N-NB3OMe	NO ₂	H	OCH ₃	H
25B-NB4OMe	Br	H	H	OCH ₃	25N-NB4OMe	NO ₂	H	H	OCH ₃
25C-NB2OMe	Cl	OCH ₃	H	H	25P-NB2OMe	CH ₂ CH ₂ CH ₃	OCH ₃	H	H
25C-NB3OMe	Cl	H	OCH ₃	H	25P-NB3OMe	CH ₂ CH ₂ CH ₃	H	OCH ₃	H
25C-NB4OMe	Cl	H	H	OCH ₃	25P-NB4OMe	CH ₂ CH ₂ CH ₃	H	H	OCH ₃
25D-NB2OMe	CH ₃	OCH ₃	H	H	25T2-NB2OMe	CH ₃ CH ₂ S	OCH ₃	H	H
25D-NB3OMe	CH ₃	H	OCH ₃	H	25T2-NB3OMe	CH ₃ CH ₂ S	H	OCH ₃	H
25D-NB4OMe	CH ₃	H	H	OCH ₃	25T2-NB4OMe	CH ₃ CH ₂ S	H	H	OCH ₃
25E-NB2OMe	C ₂ H ₅	OCH ₃	H	H	25T4-NB2OMe	(CH ₃) ₂ CHS	OCH ₃	H	H
25E-NB3OMe	C ₂ H ₅	H	OCH ₃	H	25T4-NB3OMe	(CH ₃) ₂ CHS	H	OCH ₃	H
25E-NB4OMe	C ₂ H ₅	H	H	OCH ₃	25T4-NB4OMe	(CH ₃) ₂ CHS	H	H	OCH ₃
25H-NB2OMe	H	OCH ₃	H	H	25T7-NB2OMe	CH ₃ (CH ₂) ₂ S	OCH ₃	H	H
25H-NB3OMe	H	H	OCH ₃	H	25T7-NB3OMe	CH ₃ (CH ₂) ₂ S	H	OCH ₃	H
25H-NB4OMe	H	H	H	OCH ₃	25T7-NB4OMe	CH ₃ (CH ₂) ₂ S	H	H	OCH ₃
25I-NB2OMe	I	OCH ₃	H	H	<h1>NBOMe Compounds</h1>				
25I-NB3OMe	I	H	OCH ₃	H					
25I-NB4OMe	I	H	H	OCH ₃					



NBOMe Dangers

- Compounds are highly hallucinogenic at very low dosages
 - As low as 50 μg
 - Has been seen in kilogram quantities
- Due to their potency, misjudging the dose of NBOMe series chemicals carries very real risks. A substantial dosage error could lead to undesirable or dangerous effects. *If one of these compounds is in pure powder form, small breezes, accidental inhalation, or touching the eyes or mouth after handling could result in full-blown effects or dangerous overdoses.* Because of these dangers, NBOMe series chemicals should be labeled clearly and handled with laboratory methods (goggles, gloves, mask) to minimize risks. www.erowid.org/chemicals/nbome/nbome_dose.shtml

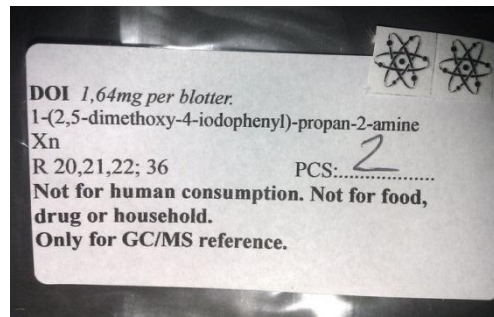


DOX

- Psychedelic phenethylamine
- Synthesized by Alexander Shulgin
 - Published in PiHKAL
- Most common: DOB, DOC, DOI, DOM



www.erowid.org

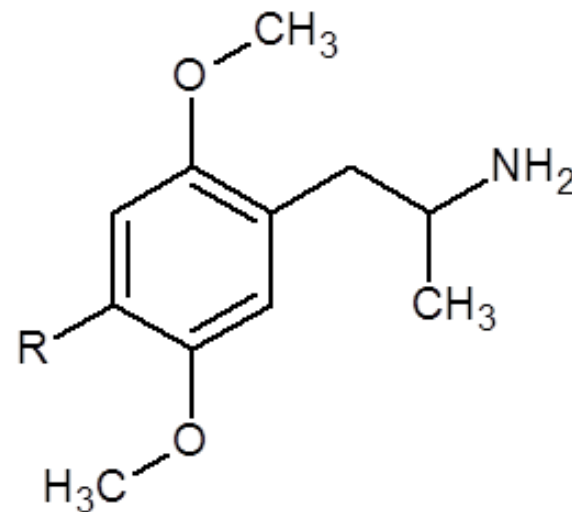


www.erowid.org



DOX Compounds

Name	R
DOAM	C ₅ H ₁₁
DOB	Br
DOBU	C ₄ H ₉
DOC	Cl
MEM	OCH ₂ CH ₃
DOET	CH ₂ CH ₃
Aleph-2	SCH ₂ CH ₃
DOF	F
DOEF	C ₂ H ₄ F
DOI	I
Aleph-4	SC ₃ H ₇
TMA-2	OCH ₃

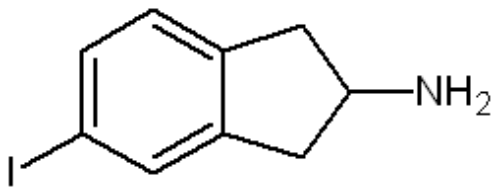


Name	R
DOM	CH ₃
Aleph-1	SCH ₃
DON	NO ₂
Aleph-6	SC ₆ H ₅
DOPR	C ₃ H ₇
Aleph-7	SC ₃ H ₇
DOTFM	CF ₃

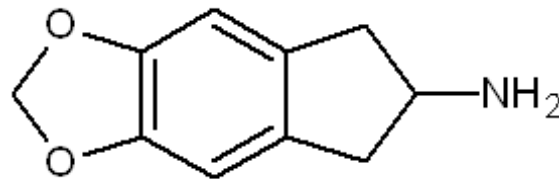


Aminoindanes

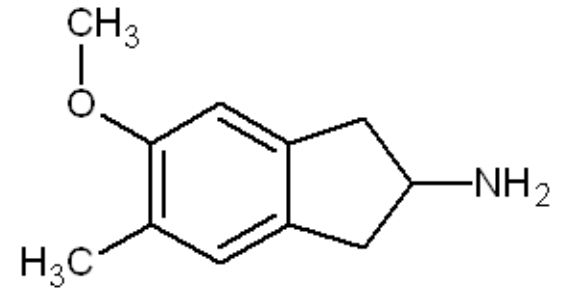
- Psychoactive empathogen
- Synthesized in the lab of David Nichols



5-IAI



MDAI

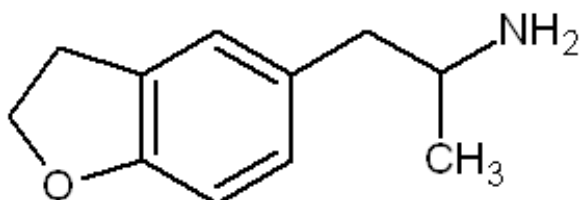


MMAI

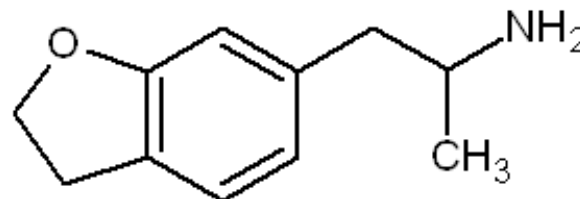


5-APDB and 6-APDB

- Phenethylamine empathogen
- Synthesized in the lab of David Nichols
- Different color test results
- Difficult to differentiate via RT or MS, but IR is different



5-APDB

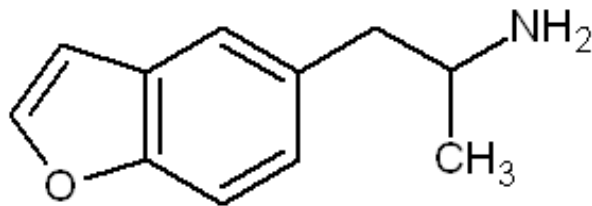


6-APDB

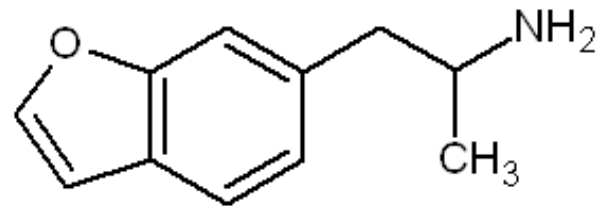


5-APB and 6-APB

- Phenethylamine empathogen
- Different color test results
- Difficult to differentiate via RT or MS, but IR is different



5-APB

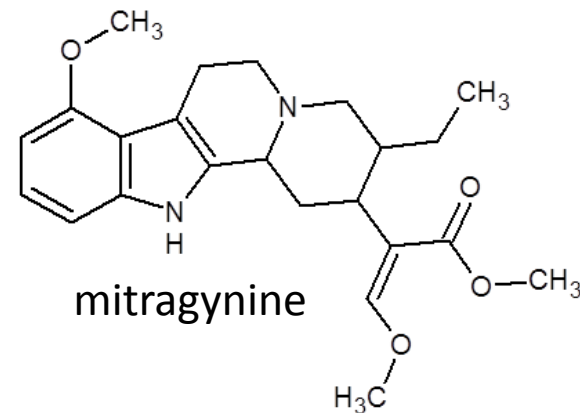


6-APB



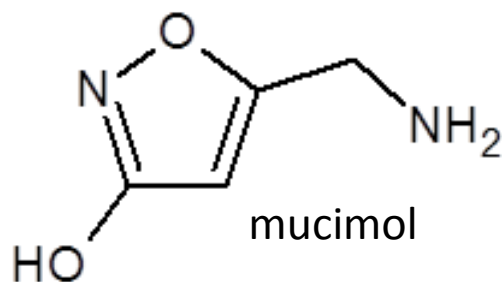
Kratom (*Mitragyna speciosa*)

- Can be found as:
 - Whole or powdered leaf
 - Resin
- Legal status:
 - No federal regulation
 - Some states have controls in place



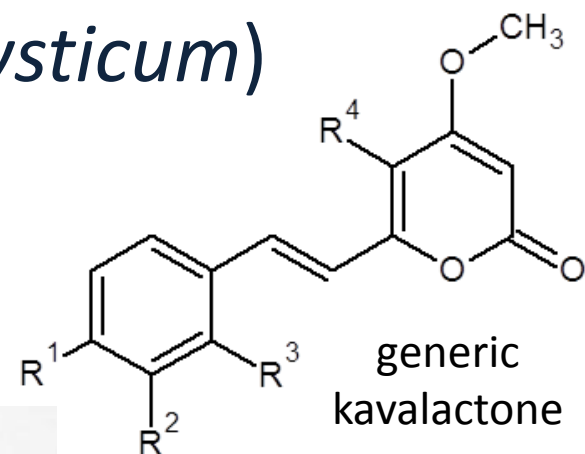
Fly Agaric Mushrooms (*Amanita muscaria*)

- Can be found as:
 - Dried mushroom material
 - Extract
- Legal status:
 - No federal regulation
 - LA and TN have controls in place



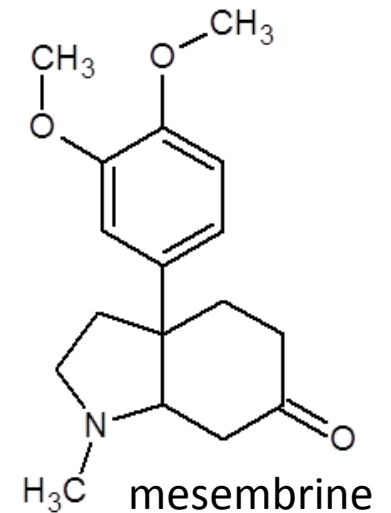
Kava Kava (*Piper methysticum*)

- Can be found as:
 - Ground or whole leaf
 - Ground root
 - Extract
- Legal status:
 - No federal regulation
 - FDA and CDC have issued warnings



Kanna aka Channa (*Sceletium tortuosum*)

- Can be found as:
 - Ground or whole leaf
 - Extract
- Legal status:
 - No federal regulation



Thank you



Emily Dye

Emily.K.Dye@usdoj.gov

703-668-3381

U.S. Drug Enforcement Administration



References

- Reed, EC and Kiddon, GS. “The Characterization of Three FLY Compounds (2C-B-FLY, 3C-B-FLY, and Bromo-DragonFLY).” *Microgram Journal* (2007) Vol. 5, No. 1 – 4, pg 26.
- Maurer, HH. “Chemistry, Pharmacology, and Metabolism of Emerging Drugs of Abuse.” *Therapeutic Drug Monitoring* (2010). Vol. 32, pg 544-549.
- Chan, KB, Pakiam, C, and Rahim, RA. “Psychoactive Plant Abuse: The Identification of Mitragynine in Ketum and in Ketum Preparations.” *Bulletin on Narcotics* (2005) Vol. 57, No. 1 – 2, pg 249-256.
- Collins M. “Some New Psychoactive Substances: Precursor chemicals and synthesis-driven end-products.” *Drug Testing and Analysis* (2011) Vol. 3, pg 404-416.
- Zuba, D, and Sekula, K. “Analytical characterization of three hallucinogenic N-(2-methoxy)benzyl derivatives of the 2C-series of phenethylamine drugs.” *Drug Testing and Analysis* (2012) epub 31Aug2012.
- Zuba, D, Sekula, K, and Buczek, A. “25C-NBOMe – New potent hallucinogenic substance identified on the drug market.” *Forensic Science International* (2013) Vol 227, No. 1 – 3, pg 7-14.
- Ratsch, C. *The Encyclopedia of Psychoactive Plants: Ethnopharmacology and Its Applications*. Inner Traditions International: 1998 (2005 English Translation).
- Casale, J and Hays, P. “The Characterization of 6-(2-Aminopropyl)benzofuran and Differentiation from its 4-,5-,and 7-Positional Analogues.” *Microgram Journal* (2012) Vol. 9, No. 2, pg 61.
- Casale, J and Hays, P. “Characterization of Eleven 2,5-Dimethoxy-N-(2-methoxybenzyl) phenethylamine (NBOMe) Derivatives and Differentiation from their 3- and 4-Methoxybenzyl Analogues Part – 1.” *Microgram Journal* (2012) Vol. 9, No. 2, pg 84.

