

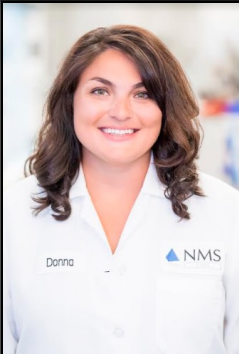


Introduction to NPS

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Forensic Toxicologist with NMS Labs



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Instructor Bio – Donna Papsun

- Forensic Toxicologist with NMS Labs
- Dual Bachelor of Science degrees in Chemistry and Forensic & Investigative Sciences
- Master of Science degree in Pharmacology
- Board certified by the American Board of Forensic Toxicology
- 4 years bench level analytical toxicology experience
- 10 years experience performing case review as a toxicologist, primarily DUID and postmortem cases
- Testified >140 times in different states and jurisdictions
- Subject matter expertise in NPS, including presentations and publications

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Disclosures



- Donna Papsun is a paid employee of NMS Labs, a commercial provider of Toxicology and other forensic testing services.
- The Center for Forensic Science Research & Education is an affiliated non-profit research institution of NMS Labs

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Learning Objectives




- What are NPS?
- What factors influence NPS?
- How are NPS monitored?
- How are toxicology laboratories impacted by NPS?

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Novel Psychoactive Substances




- Scientific term that encompasses new highs hitting the market
 - Compounds are either repurposed from pharmaceutical research or chemically modified by other drugs of abuse
- Other terms include designer drugs, “research chemicals”, “legal highs” – *and not necessarily!*
- Product names can vary greatly, including K2, incense, room deodorizer, “bath salts”, etc

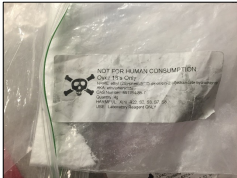


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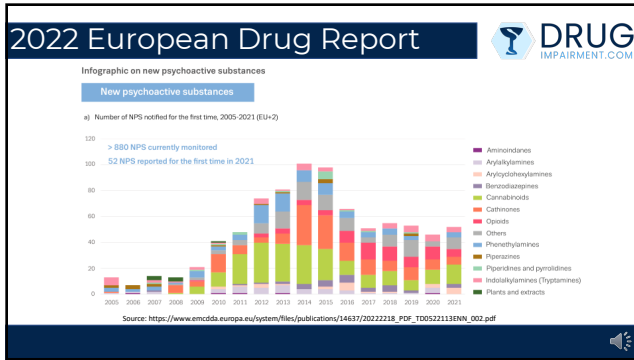
Novel Psychoactive Substances



- Sold as variety of products, including powders, pills, etc
- Sold online and in headshops
- Appeal to recreational users
 - Easily accessible
 - “Grey” legal zone
 - Circumvent routine drug testing
- Labeled as “not for human consumption”



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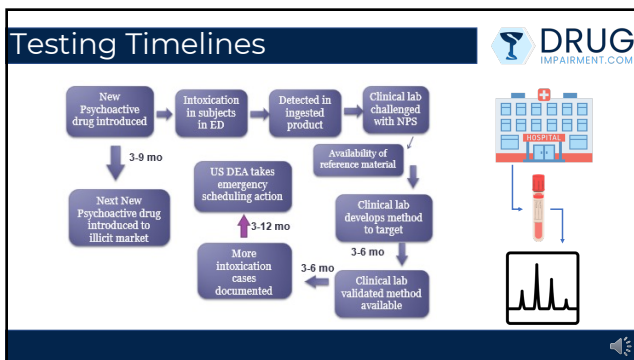


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NPS Phenomenon

- New
- Transient (typically!)
- Limited available information
- Limited reference material
- Underestimated prevalence
- Subject to national & international influences
- Can pose significant threat to public health & public safety

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NPS Cases

- Biggest challenge facing first responders would be recognition
 - Effects of designer drugs (or novel psychoactive substances) mimic/closely related to traditional substances
 - Some compounds may result in different categories of drug symptoms
 - Compounds are constantly evolving
 - Routine testing will likely not cover these newer substances
 - Testing may not exist for new substances

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DRE Matrix

Major Indicators	CNS Depressants	CNS Stimulants	Hallucinogens	Dissociative Anesthetics	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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Traditionally Encountered

- CNS Depressants
 - Benzodiazepines
 - Diazepam (Valium®)
 - Lorazepam (Ativan®)
 - Clonazepam (Klonopin®)
 - Narcotic Analgesics
 - Opiates/Opioids
 - Morphine
 - Oxycodone (OxyContin®)
 - Hydrocodone (Vicodin®)
 - Heroin
- CNS Stimulants
 - Methamphetamine
 - Cocaine
- Dissociative Anesthetics
 - PCP
- Cannabinoids
- Hallucinogens
 - LSD


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There's more!

- CNS Depressants
 - Benzodiazepines
 - Etizolam
 - Bromazolam
 - Clonazolam
 - Narcotic Analgesics
 - Opioids
 - Fentanyl derivatives
 - para-Fluorofentanyl
 - Novel Synthetic Opioids
 - Isotonitazene
 - 2-Methyl AP-237
 - U-47700
 - CNS Stimulants
 - alpha-PHP/alpha-PiHP
 - N,N-Dimethylpentylone
 - Dissociative Anesthetics
 - 3-MeO-PCP
 - 2FI-Deschloroketamine
 - Synthetic Cannabinoids

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DEA TOX Quarterly Report Q2 2022




DRUG

IMPAIRMENT

Drug Class	Drug	State Round#	Confirmed Levels mg of drug/gram of drug product (%)	Actual Amount within Drug Product
Exhibit 1: Total weight: 808.1 mg				
Test Inhibitor	Acetaminophen		75.171 (%)	23.1 mg
Opioioid	Fentanyl		49.143 (%)	13.7 mg
Amphetamine	Mephentermine		21.171 (%)	5.1 mg
Carbamazep	ABU/THA/CAT		3.171 (33.1%)	1.1 mg
Second sample	Ecstasy		1.121 (1.1%)	0.1 mg
Prescription	4-ADAP	NA	0.091 (0.09%)	0.01 mg
Opioioid	pentamorphine		0.091 (0.09%)	0.01 mg
Amphetamine	Fluoromethamphetamine		0.121 (0.02%)	0.017 mg (1.1%)
Amphetamine	Isobutone		0.121 (0.02%)	0.046 mg (4.1%)
Opioioid	Tramadol		0.121 (0.02%)	0.017 mg (1.1%)
Opioioid	Atropine/antagonist		0.121 (0.02%)	0.017 mg (1.1%)
Opioioid	Carfentanyl		0.191 (0.02%)	0.021 mg (2.1%)
Prescription	Oxycodone/pseudoephedrine		0.071 (0.007%)	0.002 mg (1.1%)

Figure 10: Drug Product exhibit #9 - Blue Powder



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Laboratory Testing

- Time delay between NPS appearance on market and availability of testing
- Forensic laboratories have to be prepared with a dynamic test scope
 - Constant updates keeping up with the market
 - Patchwork regulation
 - Testing challenge analytical capabilities
 - Identification of proper target is key (can be tricky!)
- Interpretation of results can be fairly limited
 - Qualitative vs quantitative
 - Small amounts in system result in adverse side effects

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NSC-ADID Recommendations

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- National Safety Council's Alcohol, Drugs, and Impairment Division (NSC-ADID) oversees an initiative to standardize toxicology laboratory testing practices for DUID cases
- Acknowledges drug trends evolve and technology changes
- NPS drug/drug classes recommended for Tier II
 - Synthetic cannabinoids
 - Cathinones
 - Mitragynine
 - Novel benzodiazepines
 - Fentanyl analogs & novel opioids
- Consensus that laboratories should include compounds based on their local rates of prevalence and testing capabilities


Source: D'Orazio AL, Mohr ALA, Chan-Hosokawa A, et al. 2021. Recommendations for Toxicological Investigation of Drug-Impaired Driving. *Motor Vehicle Fatalities – 2021 Update*. *Journal of Analytical Toxicology*. 45:529-536.

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NPS Recognition

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- Discovery of paraphernalia
 - Packets
 - Unconsumed substance
 - Potential for chemical testing
- Demographic evaluation
 - Potentially more popular among a younger demographic
 - Those who are being monitored with urine toxicology tests
 - NPS mixed in illicit drug supply
- Step-wise toxicology may be needed
 - Scope of testing should be evaluated



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Summary

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- Increased number of substances that could give DREs indicators of traditional classes
- NPS counter parts of traditional substances pose hazards to safe driving
- Police officers and toxicology laboratories need to be aware of expanded amount of recreational substances
 - May still get negative toxicology results
- Toxicology labs need to be able to offer testing for NPS
- Investigators need to be cognizant of routine testing vs specialized testing; any information from defendant may be crucial in identifying intoxicating substance

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Recommendations



- Understand substances in circulation change all the time!
 - Street and product names mean little (ex. "molly", "acid")
- Stay current with changing landscape of NPS
 - Read drug forums, DEA emerging threat reports, etc
 - www.NPSDiscovery.org
- Investigation will help narrowing down field of possibilities
 - Chemical testing suggested if products are seized
 - Follow your instincts
- Talk to your toxicology laboratory!



Source: New Synthetic Cannabinoid: 4F-MDMB-BINACA – NPS Discovery

[illegible]