



Cannabis, Hemp, and Cannabinoid Product Safety: A focus on THC Isomers

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06/10/22

PATIENTS OUT OF TIME – KANSAS CITY

A stylized illustration of a person's head and shoulders. The head is light brown, and the hair is dark. The brain is visible, colored in shades of blue and purple. Inside the brain, there are several yellow spheres connected by lines, representing a molecular structure. The background is a light gray with some faint, glowing particles.

Who am I? And what am I doing here?

PhD in molecular
pharmacology of
cannabinoids, basic
and clinical research

Helped create hemp
and cannabis
operation and product
safety standards

Court qualified expert
witness, advising and
consulting for
regulators and industry

Please scan this QR code

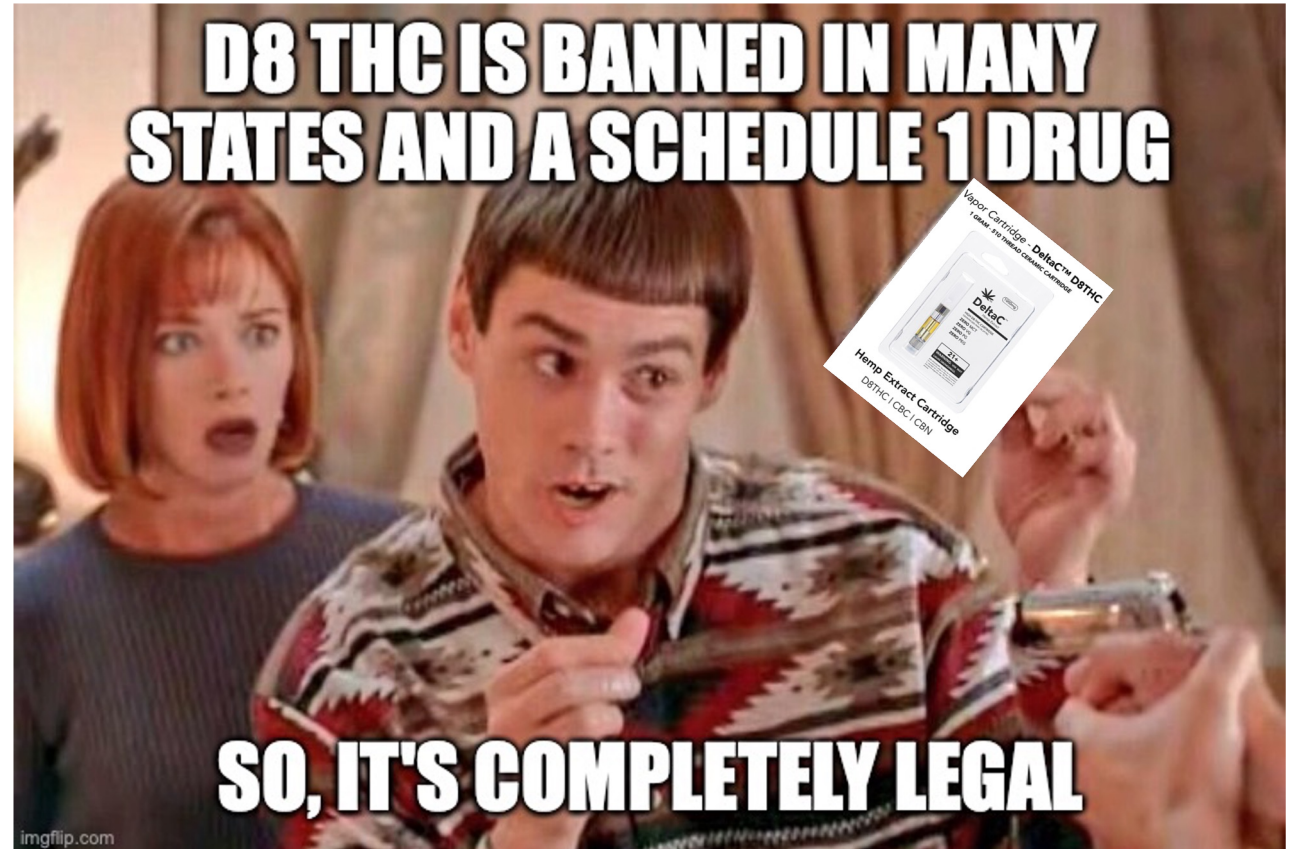
For reporting experiences,
complaints, and unexpected
effects from hemp and
cannabis products.



Quoting Quotables

“Unfortunately, nobody that was dealing with this legislation knew what delta-8 was.”

Jonathan Miller, Attorney with the U.S. Hemp Roundtable



Outline

- Overview – What do we know?
- The Issues
 - Are states reaching a consensus?
 - What exactly is a delta-8 THC product and how is it made?
- Public Health Issues

Takeaways and Learning Objectives

There is a need to regulate chemicals, not where they come from

CBD can be used to synthesize a horde of THC isomers

Many states have started to ban synthetic, semisynthetic, derived, or artificially created THC isomers

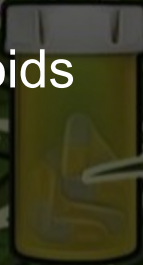
Many controversial issues about the grey area that surround D8THC and other THC isomers

Data by Simon, Gomez, and Marcu (2021) show increase in adverse events, respiratory events associated with D8THC but not other cannabinoids



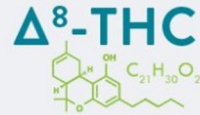
What can be found on a cannabis plant?

- 500 ingredients*
 - ~100 Cannabinoids
 - 120 Terpenoids
 - Glycoproteins
 - Alkaloids
 - Not all compounds are found on every variety
- *And compounds that remain completely unidentified



CANNABINOID GROUP	COMMON ABBREVIATION	NO. OF VARIANTS IN EACH GROUP
Δ^9 -tetrahydrocannabinol	Δ^9 -THC	9
Δ^8 -tetrahydrocannabinol	Δ^8 -THC	2
Cannabichromene	CBC	5
Cannabicyclol	CBL	3
Cannabidiol	CBD	7
Cannabielsoin	CBE	5
Cannabigerol	CBG	6
Cannabinidiol	CBND	2
Cannabinol	CBN	7
Cannabitriol	CBT	9
Miscellaneous Types		11

Delta 8 Prices Continue to Slip



Prices for delta-8 THC have remained in steady decline in 2022, having dropped nearly 53% year-over-year from May 2021.

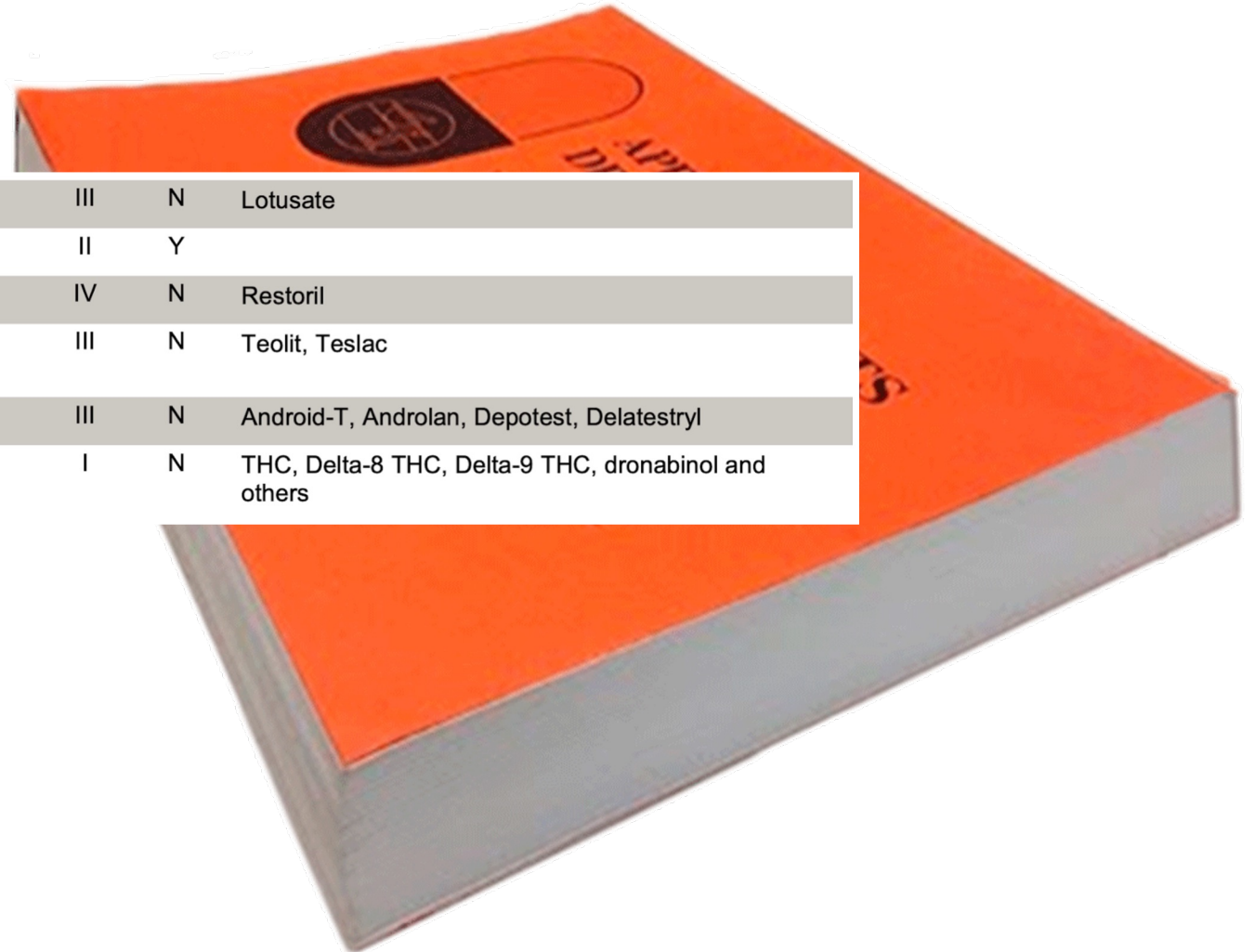
-53%



Going by the [Orange] Book



Talbutal	2100	III	N	Lotusate
Tapentadol	9780	II	Y	
Temazepam	2925	IV	N	Restoril
Testolactone (13-hydroxy-3-oxo-13,17-secoandrosta-1,4-dien-17-oic acid lactone)	4000	III	N	Teolit, Teslac
Testosterone (17beta-hydroxyandrost-4-en-3-one)	4000	III	N	Android-T, Androlan, Depotest, Delatestyl
Tetrahydrocannabinols	7370	I	N	THC, Delta-8 THC, Delta-9 THC, dronabinol and others





The Issues Part 1

The chemical process to create delta-8 THC and other isomers utilizes harsh and toxic chemicals.

These processes produce many other chemicals leaving residuals of varying risks to consumer health including the creation of delta-9 THC and other isomers.

Products using this process are being manufactured, distributed, and sold in a completely unregulated marketplace – amplifying the risks and unknowns.

There is uncertainty regarding the legality of these products based on the language in the 2018 US Farm Bill, DEA Analogues Act, and others.

Synthetic cannabinoid market estimated to be \$10 billion by 2025, amplifying the need for standardization and regulation of delta-8 and other cannabinoids that are actively being researched and isolated.



The Issues Part 2

Delta-8 products can now be found in gas stations, convenience stores, and even some cannabis dispensaries across the US and beyond

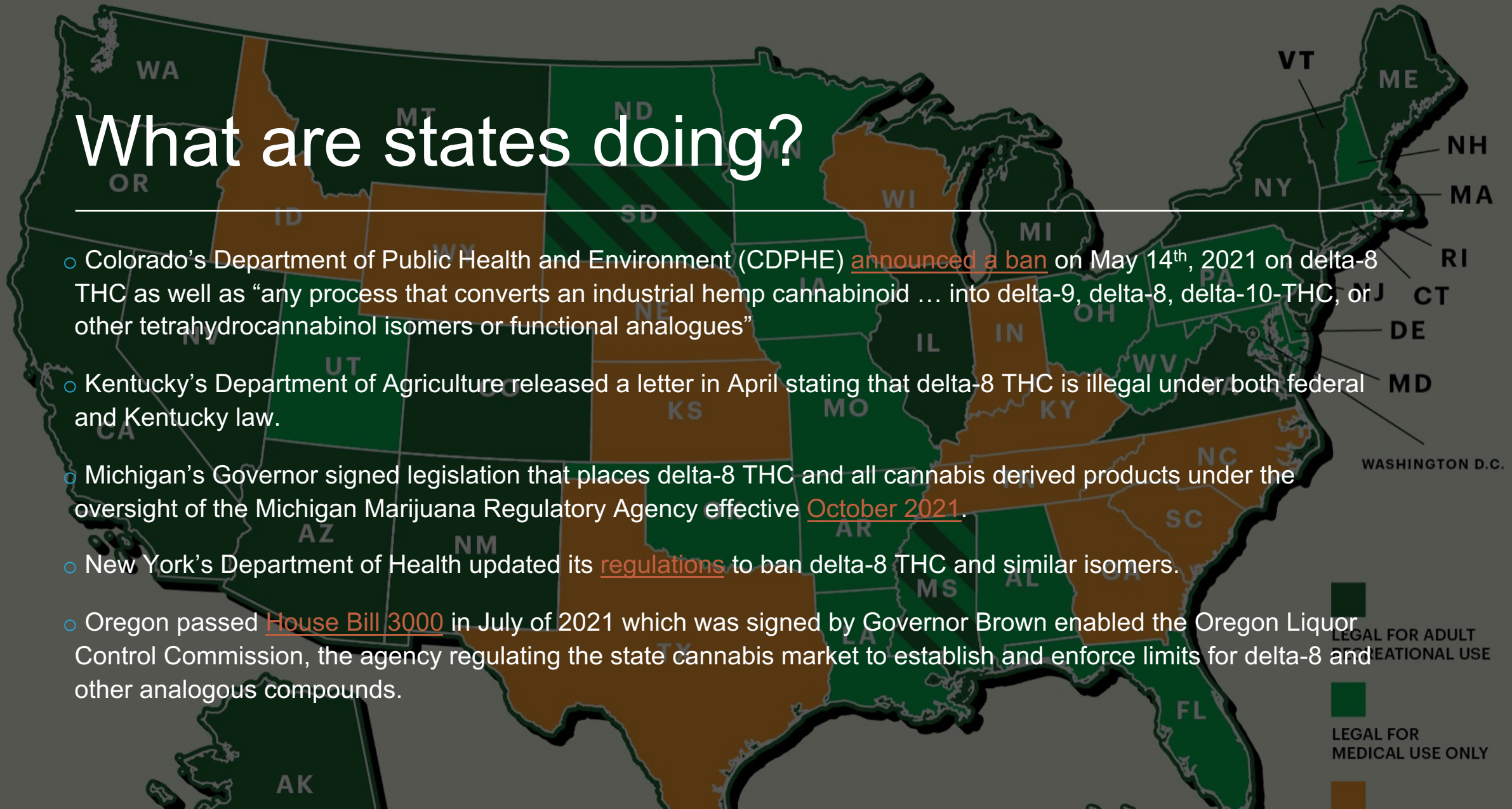
Added to gummies, vaporizer cartridges, tinctures, and more.

Its rise is **largely attributed to the oversupply of CBD** shortly after the passage of the Farm Bill in 2018

While known to be present in some chemotypes of the *Cannabis sativa L.* plant (both classically known 'hemp' and 'marijuana' varieties), delta-8 THC has not been found in sufficient concentration to be naturally derived and added to products we see in the marketplace

What are states doing?

- Colorado's Department of Public Health and Environment (CDPHE) announced a ban on May 14th, 2021 on delta-8 THC as well as "any process that converts an industrial hemp cannabinoid ... into delta-9, delta-8, delta-10-THC, or other tetrahydrocannabinol isomers or functional analogues"
- Kentucky's Department of Agriculture released a letter in April stating that delta-8 THC is illegal under both federal and Kentucky law.
- Michigan's Governor signed legislation that places delta-8 THC and all cannabis derived products under the oversight of the Michigan Marijuana Regulatory Agency effective October 2021.
- New York's Department of Health updated its regulations to ban delta-8 THC and similar isomers.
- Oregon passed House Bill 3000 in July of 2021 which was signed by Governor Brown enabled the Oregon Liquor Control Commission, the agency regulating the state cannabis market to establish and enforce limits for delta-8 and other analogous compounds.



What is the consensus?

- Schedule 1
- At least 18 states have banned delta-8 THC.
- Trade organizations have also weighed in with The US Hemp Roundtable being the first group to take a firm stance against delta-8 THC in the marketplace .
- The American Herbal Products Association (AHPA) approved a guidance policy discouraging the marketing of goods containing synthesized cannabinoids – including delta-8 THC.
- Meanwhile, groups such as the Hemp Industries Association has publicly supports delta-8 THC products.

<https://hempsupporter.com/news/u-s-hemp-authority-announces-it-will-not-certify-hemp-products-that-are-marketed-for-intoxication>

https://www.ahpa.org/Portals/0/PDFs/Policies/Guidance-Policies/2021_AHPAGuidance_policy_for_cannabinoids_Final.pdf

<https://thehia.org/the-hia-stands-for-all-parts-of-the-hemp-plant-including-delta-8-thc/>

LEGAL FOR ADULT
RECREATIONAL USE

LEGAL FOR
MEDICAL USE ONLY

NO PROGRAM
FOR LEGAL THC

WHO Expert Committee on Drug
Dependence
Critical Review

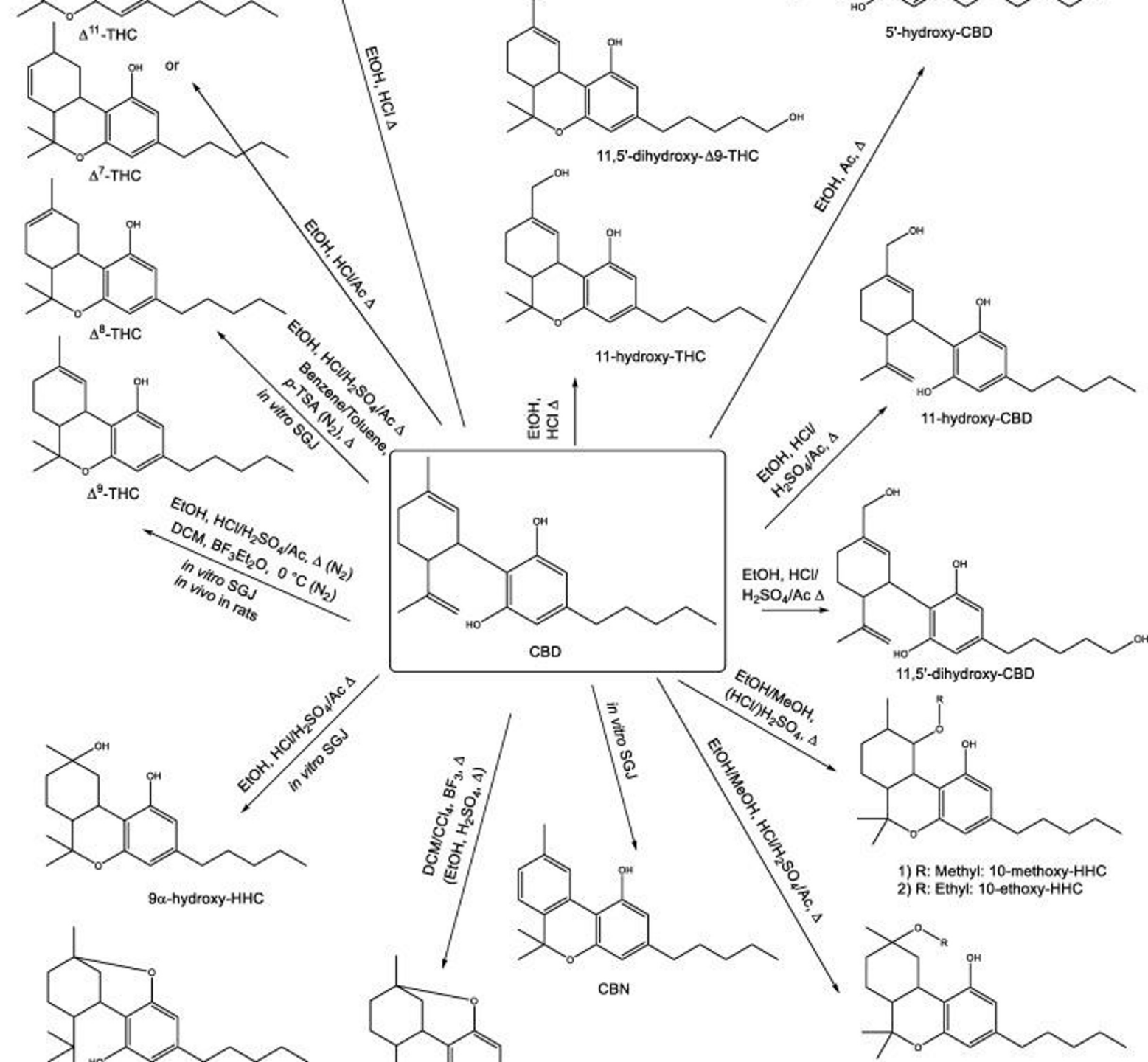
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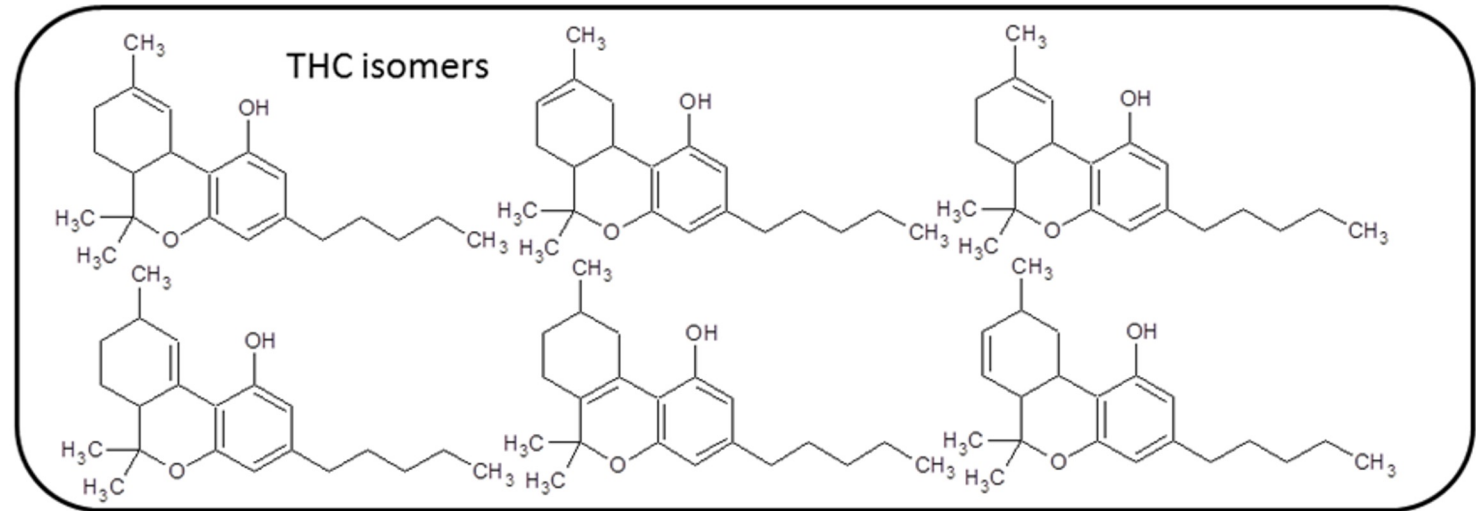
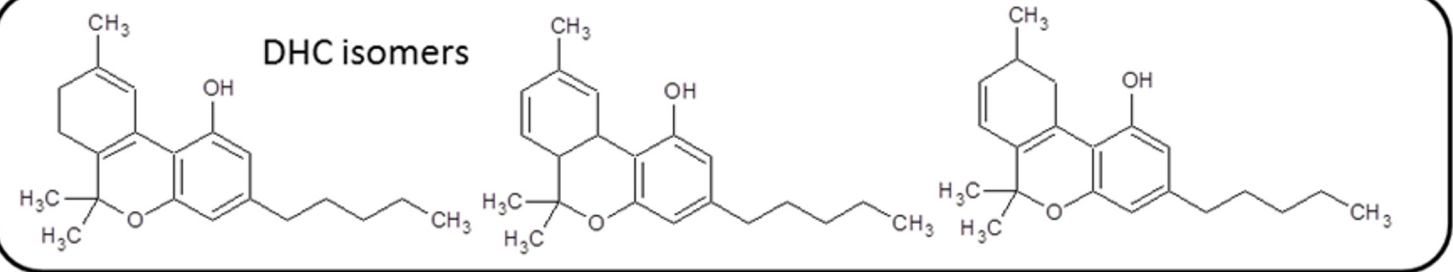
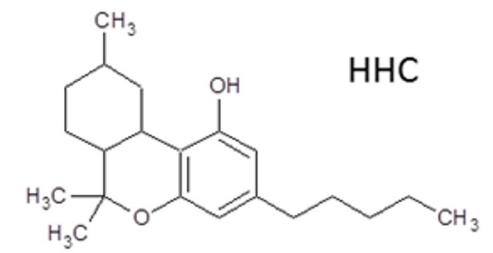
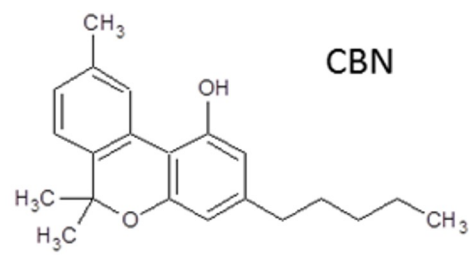
Isomers of THC



*This report contains the views of an international group of experts, and does not necessarily represent the decisions
or the stated policy of the World Health Organization*

Conversion of Cannabidiol (CBD) into Psychotropic Cannabinoids Including Tetrahydrocannabinol (THC): A Controversy in the Scientific Literature.





There is no known safety or efficacy data.

Reality has a surprising amount of detail.

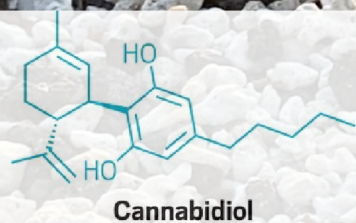
ANYWAY, LIKE I WAS SAYIN'



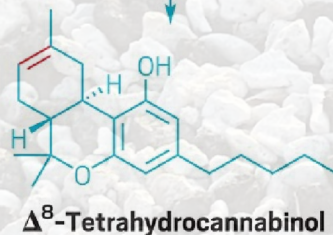
THERE'S DELTA 8 THC, DELTA 9 THC, THCA, THCV



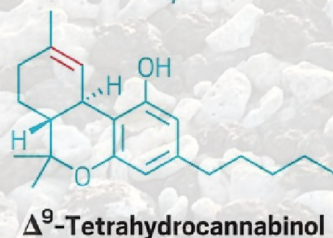
How are these isomers made?



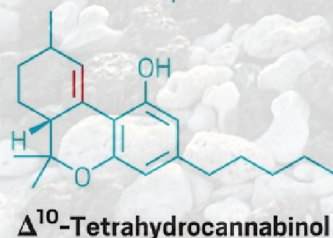
Acid catalyst,
solvent, heat



+



+



The conversion of cannabidiol into delta-8-tetrahydrocannabinol (delta-8-THC) also produces small amounts of delta-9-THC and delta-10-THC.

The conversion of CBD to delta-8-THC involves refluxing CBD in an organic solvent, such as toluene or heptane, with *p*-toluenesulfonic acid or another acid that serves as a catalyst. The reaction is typically run for 60–90 min. “You basically close the ring on the CBD molecule,” Coffin says.

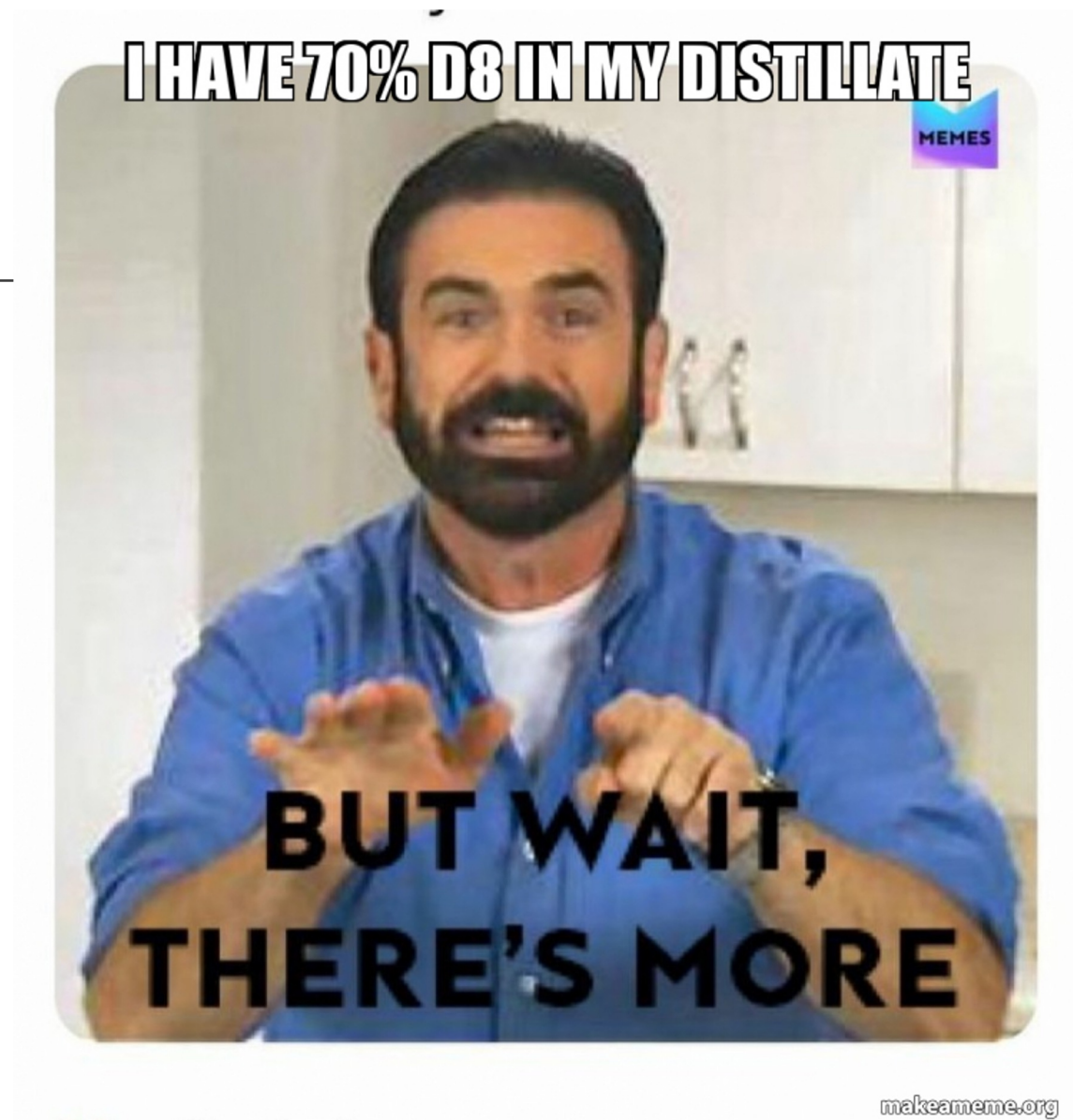
“**L**ike making methamphetamine from cold medicine, just because the starting materials are legal does not make the resulting product legal (or safe).

— **Christopher Hudalla**, president and chief scientific officer,
ProVerde Laboratories

<https://cen.acs.org/biological-chemistry/natural-products/Delta-8-THC-craze-concerns/99/i31>

Cannabinoid	Result (%)	Result (mg/g)
CBDV	ND	ND
CBDA	ND	ND
CBD	ND	ND
THCV	ND	ND
THCA	ND	ND
Δ9 THC	8.553	85.528
Δ8 THC	76.859	768.590
CBN	ND	ND
CBC	ND	ND
CBGA	ND	ND
CBG	ND	ND
Total THC	8.553	85.528
Total CBD	ND	ND
Total Cannabinoids	85.412	854.118

THCV	0.317	3.168
THCA	ND	ND
Δ9 THC	7.257	72.571
Δ8 THC	72.084	720.843



Residual Solvents Profile

Test Conditions: 20°C

Extraction Technician: SH

Analytical Chemist: CB

Extraction Date(s)	Analysis Date(s)
1/12/2021	1/12/2021

Residual Solvents (GC/MS)	Results
	ug/g
Propane	<87.0
Isobutane	<87.0
Methanol	<87.0
Butane	<87.0
Isopropanol	>2000
Ethanol	<87.0
2-Methyl Butane	<87.0
Acetonitrile	<87.0
Acetone	<87.0
n-Pentane	<87.0
n-Hexane	<43.5
Tetrahydrofuran	<87.0
Benzene	<0.870
n-Heptane	<87.0
Toluene	<87.0
Ethylbenzene	<87.0
m+p Xylene	<87.0
o-Xylene	<87.0

There is no such things as natural D8-THC flower. It is cannabis sprayed with solvents containing drugs and by products from derivatization.



Thousands of CBD and Delta 8 THC Products Contaminated With Bleach Warns Industry Experts

“The color variations relate to the pH level and different acid activated media used as bleaching agents used to remove the color from the distillate. This causes the pH level to be acidic, which makes the product unstable. Over time, the distillate will turn pink and even purple. The lack of color in Delta-8 distillate is popular and is desired in the industry. However, if you are going to smoke Delta-8 distillate in a vape cart, keep in mind there is likely some of the bleaching acid still present, which I, personally wouldn't want to inhale. Who wants to smoke bleach?”



<https://www.globenewswire.com/news-release/2020/10/06/2103964/0/en/Thousands-of-CBD-and-Delta-8-THC-Products-Contaminated-With-Bleach-Warns-Industry-Experts.html#>

Not Clorox type bleach -
bleaching acid vs bleaching clay

Public Health Issues

From a practical standpoint, **there is no safe amount**, because there is no guarantee of purity (due to lack of regulation)

Thousands of adverse event reports involving D8THC-containing products.

Most common AEs being respiratory

Delta-8 THC has psychoactive and intoxicating effects.

D8THC products often involve use of potentially harmful chemicals to create the concentrations of D8THC claimed in the marketplace.

D8-THC products have reportedly up to 5,000% over the legal limit of THC (0.3%)

Bleaching agents, isopropanol, residual solvents, and other adulterants



Due to adverse events reported in a national database we conducted a small survey of retailers

- No purchasing restrictions or requirements were documented
- Operations were photographed along with products
- Label information indicates delta-8 THC, and other isomers being sold
- No chemical confirmation is available at this time (COA of products)
- Multiple storefronts selling isomers were found using google maps
- Shops sell THC containing products (See image on next slide, 2mg THC per serving)

Le hemp boutique

Wide variety of isomer products and dosages

Ex) D8THC 23mg, D9THC 2mg

Dabs, smokables, edibles

Wide variety of cannabinoids available

No purchasing restrictions visible

Across the street from Fire Department



Effects of D8-THC

Risks Related to
Artificially
Derived Delta-8
THC



BEFORE

AFTER

What
manufacturers
and retailers of
isomers say:

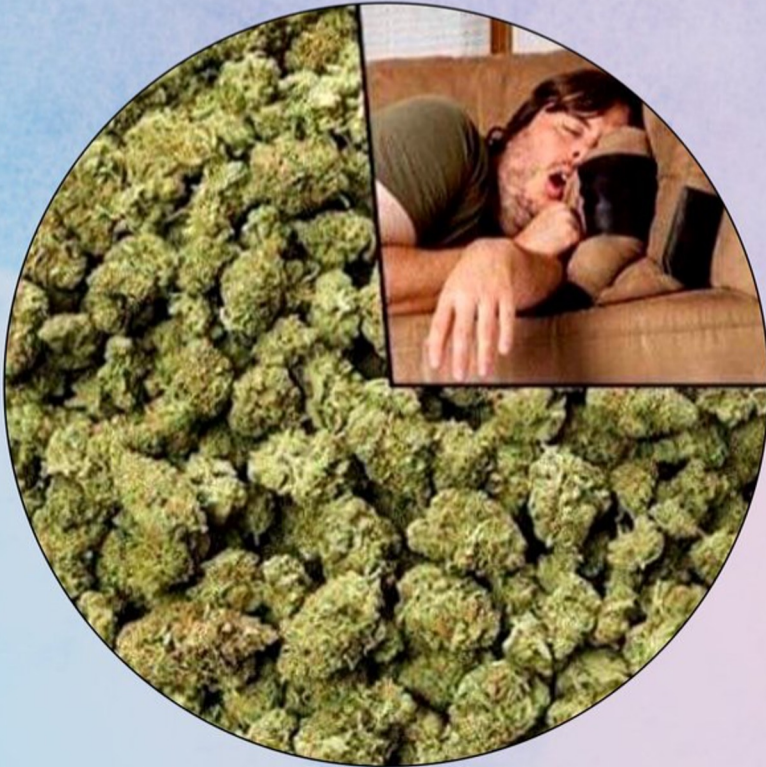
“Consumers commonly find delta-8 THC to *present pleasant potency/efficacy*. They *do not experience quite the psychoactivity or impairment* that they might from delta-9 THC, and it does not last as long. The result is *a generally lighter experience* for consumers.”



8-DELTA

Co-worker : What did you do over the weekend?

Me : Oh you know, this and that



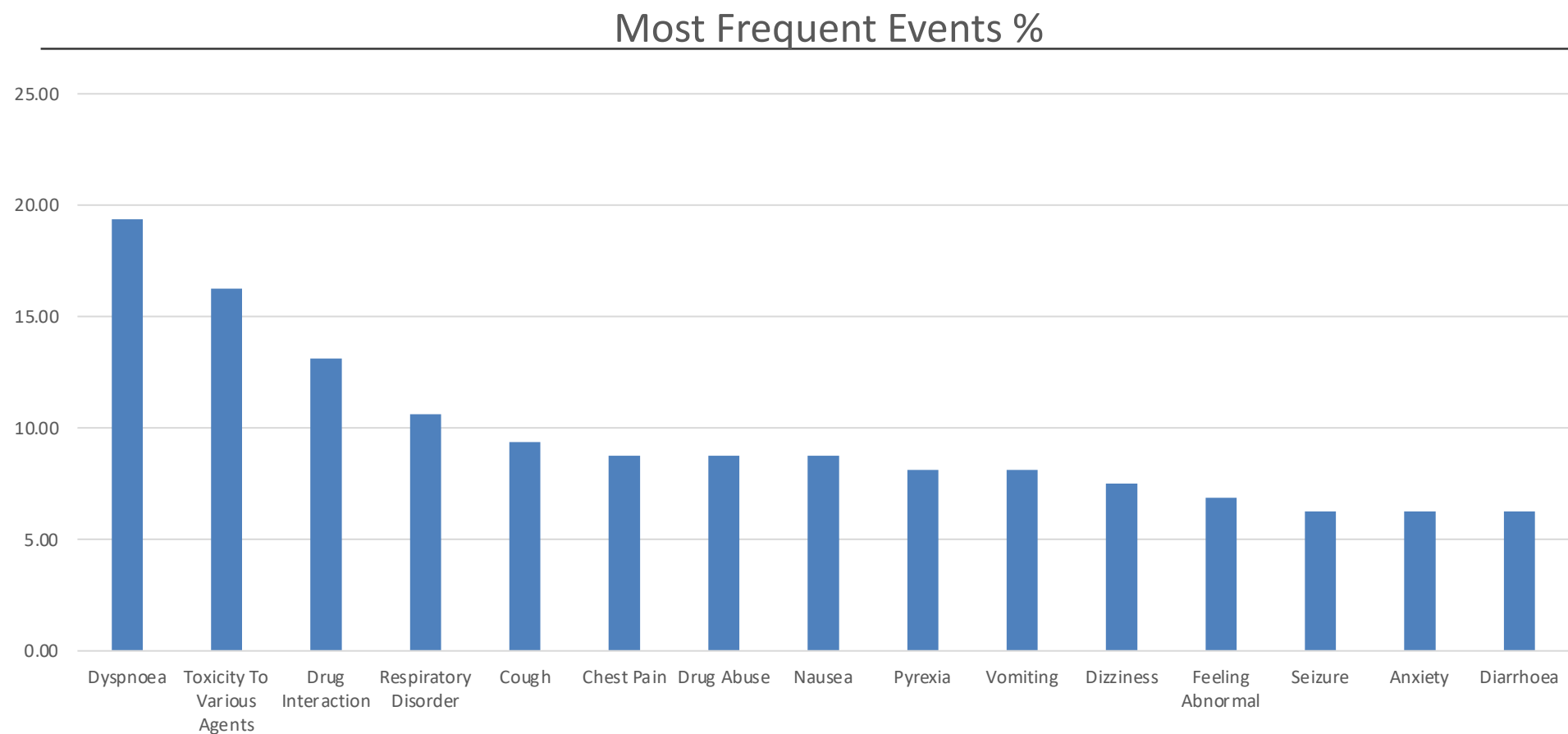
THIS



THAT

D8 Marketing

Most frequently reported events on Delta-8



Summary of Public Health Issues

From a practical standpoint, **there is no safe amount**, because there is no guarantee of purity (due to lack of regulation)

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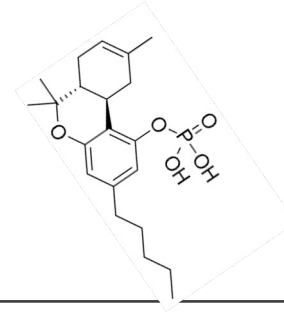
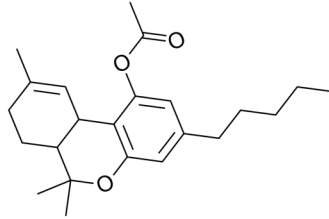
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Next Steps



- Be cautious about unregulated products
- No age limits, product (your) safety is not a priority in the illicit market
- FAERs – our only national sentinel system
- Budsinfo.com – designed by cannabis researchers
- Education people to utilize it!
- Generate data and information on d10, THC-O-acetate, and other isomers



THC Isomers Summary

Delta-8 THC's pharmacology is nearly identical to Delta-9 THC

Delta-8 and other isomers are produced through synthetic chemistry that converts CBD found in legal hemp that is being actively sold across the nation and the world in a regulatory void.

Rapid increase in popularity of synthetic THC isomers is generally attributed to the crash of CBD prices shortly after the passage of the US Farm Bill in 2018

Delta-8 THC is just one of many synthetically derived cannabinoids of concern

If not addressed from a holistic product safety standpoint, will just be one of many compounds that businesses will create and market

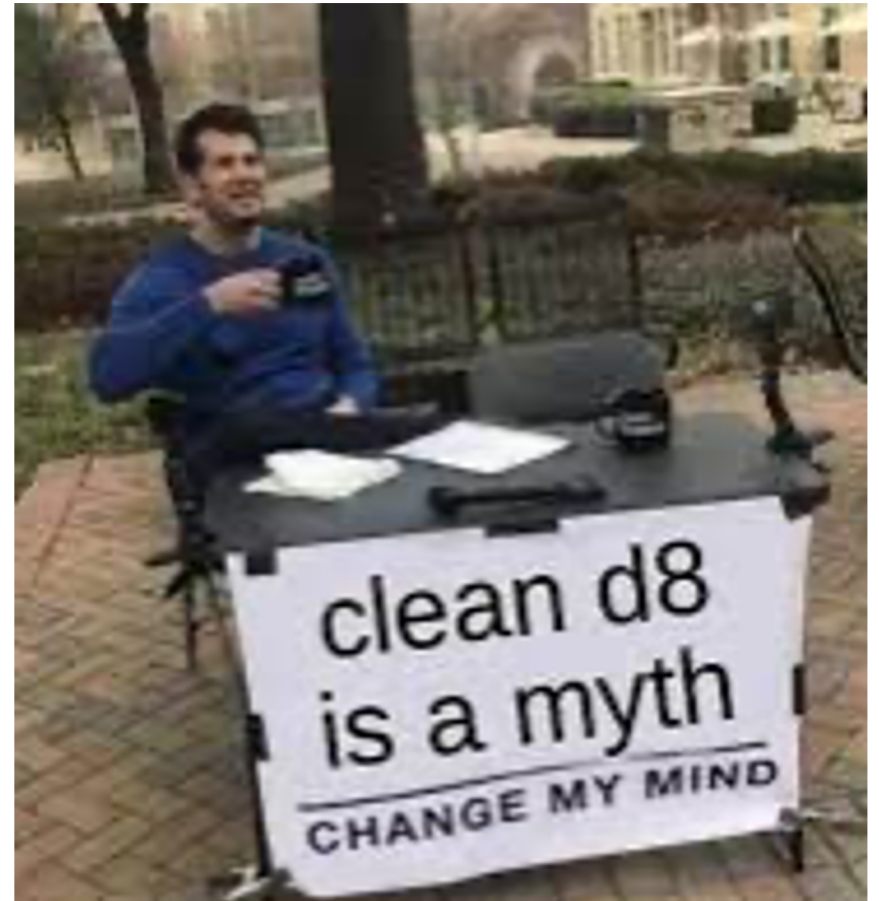
Forcing an arms race and/or cat and mouse game with regulators and businesses

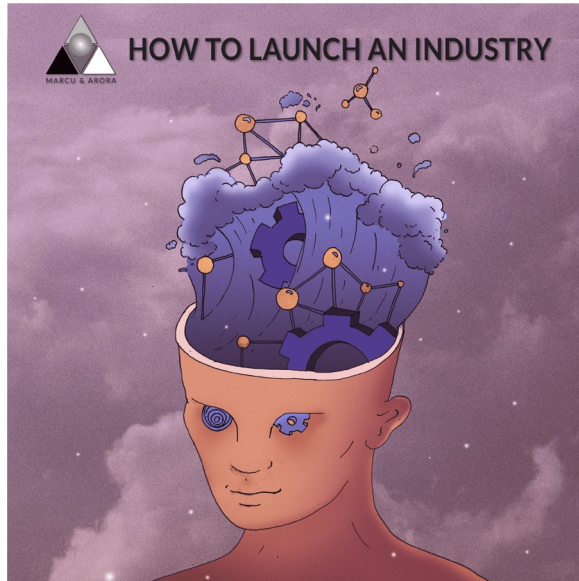
Common sense solutions exist in already established frameworks to proactively address how to ensure products are evaluated and regulated to keep consumers safe without adversely impacting businesses and the global supply chain

Closing Quotes

“All these loopholes are going to close. And loopholes turn into nooses. So, I think there are gonna be a lot of people who are in these loopholes are not going to be comfortable.”

“If you get caught with a bunch of Delta-8 products, how can you prove it came from hemp? It’s like the producers of hemp products and delta-8 THC decided to strap a bunch of consumers in front of a train and said ‘Go have fun with your collision with law enforcement. We’re done.’”





Podcast: www.howtolaunchanindustry.com

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Cannabis and Hemp AE Tool

For reporting experiences, complaints and unexpected effects



HOW TO LAUNCH AN INDUSTRY

