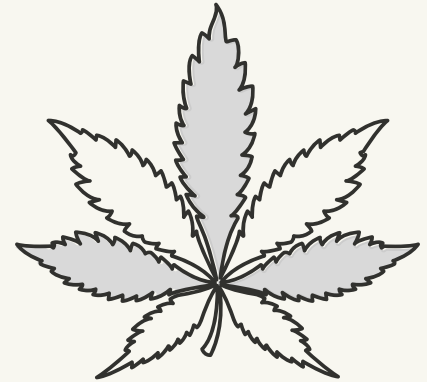


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# Hidden in Plain Sight: Inaccuracies in Labels and Microbiological Contamination of Cannabis Products

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# Disclosures

Analytical Challenges with Proliferating THC Analogues  
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No funding was obtained from any manufacturer of any product used in this study.



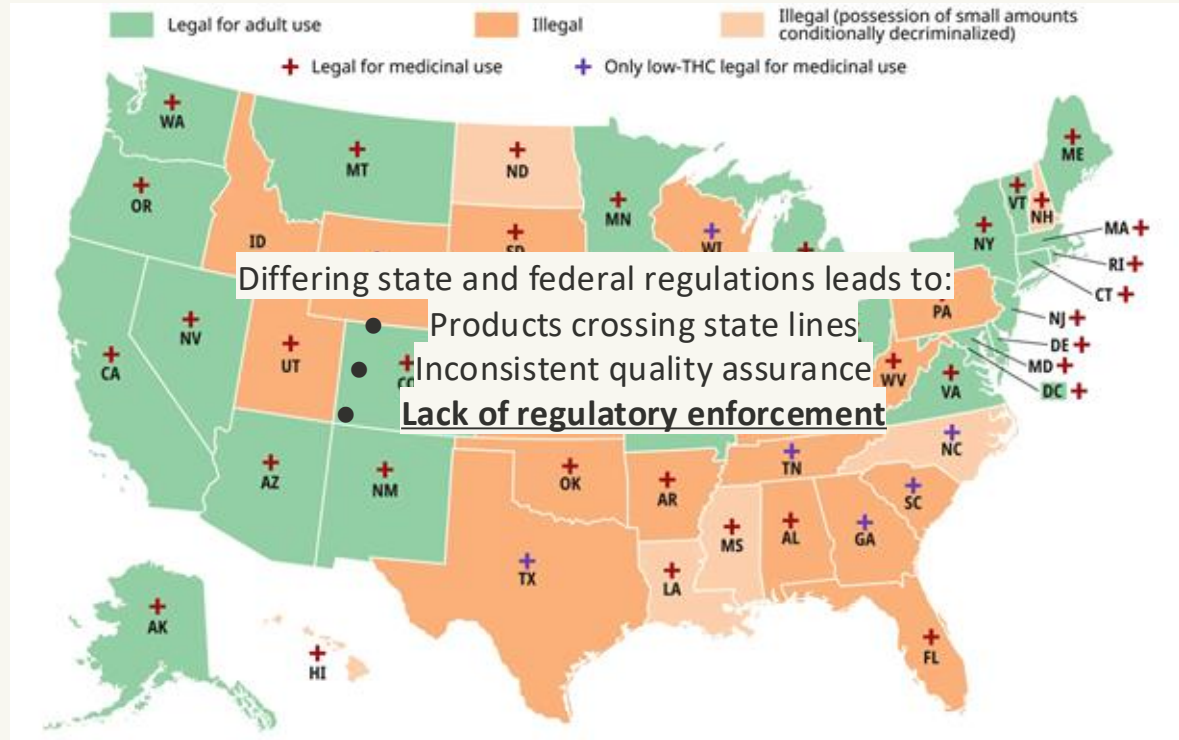
# Cannabis Sativa

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- Marijuana has been used since ~2700 BC for medicinal purposes
- Recognized for psychoactive and medicinal properties
- Properties are brought about by wide variety of chemical constituents
- Interact with endocannabinoid receptors

# Legalization Timeline

- Medical use legalized in 40 states and D.C.
- Adult-use legalized in 24 states and D.C.
- STILL FEDERALLY ILLEGAL



# Ongoing Consumer Poisonings and Quality Assurance Issues

> *Drug Test Anal.* 2023 Oct;15(10):1067-1076. doi: 10.1002/dta.3253. Epub 2022 Mar 28.

## **Cannabinoid-based vaping products and supplement formulations reported by consumers to precipitate adverse effects**

Alaina K Holt <sup>1 2</sup>, Kimberly N Karin <sup>1</sup>, Shelle N Butler <sup>1</sup>, Amanda R Ferreira <sup>1</sup>, Alex J Krotulski <sup>3</sup>, Justin L Poklis <sup>4</sup>, Michelle R Peace <sup>1</sup>



Talanta Open

Volume 10, December 2024, 100349



Evaluation of cannabis product mislabeling: The development of a unified cannabinoid LC-MS/MS method to analyze e-liquids and edible products

Ashleigh E. Outhous <sup>a</sup> ✉, Alaina K. Holt <sup>a</sup> ✉, Justin L. Poklis <sup>b</sup> ✉, Michelle R. Peace <sup>a b</sup> ✉

Case Reports > *J Anal Toxicol.* 2022 Oct 14;46(8):940-948. doi: 10.1093/jat/bkac036.

## **$\Delta$ 8-THC, THC-O Acetates and CBD-di-O Acetate: Emerging Synthetic Cannabinoids Found in Commercially Sold Plant Material and Gummy Edibles**

Alaina K Holt <sup>1 2</sup>, Justin L Poklis <sup>3</sup>, Michelle R Peace <sup>1</sup>

# Labeling Inconsistencies

## CANx - Cannabinoids

Analyzed Feb 27, 2025 | Instrument HPLC-VWD | Method SOP-001

The expanded Uncertainty of the Cannabinoids analysis is approximately  $\pm 7.81\%$  at the 95% Confidence Level

Analyte	LOD mg/g	LOQ mg/g	Result %	Result mg/g
Cannabinol (CBN)	0.047	0.16	1.47	14.68
Cannabidiophorol (CBDP)	0.016	0.049	ND	ND
exo-THC (exo-THC)	0.016	0.8	ND	ND
Tetrahydrocannabinol ( $\Delta 9$ -THC)	0.092	0.307	D9C	D9C
$\Delta 8$ -tetrahydrocannabinol ( $\Delta 8$ -THC)	0.044	0.16	82.98	829.81
$\Delta 9$ -Tetrahydrocannabinophorol ( $\Delta 9$ -THCP)	0.017	0.8	4.59	45.93
Total THC ( THCa * 0.877 + $\Delta 9$ THC )			D9C	D9C
Total THC + $\Delta 8$ THC + $\Delta 10$ THC ( THCa * 0.877 + $\Delta 9$ THC + $\Delta 8$ THC + $\Delta 10$ THC )			82.98	829.81
Total CBD ( CBDa * 0.877 + CBD )			ND	ND
Total CBG ( CBGa * 0.877 + CBG )			ND	ND
Total HHC ( 9r-HHC + 9s-HHC )			ND	ND
Total Cannabinoids Analyzed			89.04	890.42

**INGREDIENTS:**  
3000mg Diamond Sauce, CBD9-A, THC-P, and Cannabis Derived Terpenes

## D9C - D9 Confirmation

Analyzed Mar 09, 2025 | Instrument GC MS/MS | Metho

The expanded Uncertainty of the D9 Confirmation analy

Analyte	LOD ppb	LOQ ppb	Result %
$\Delta 9$ -Tetrahydrocannabinol ( $\Delta 9$ -THC)	1.462	4.432	0.00



PULL DOWN TO OPEN

# Goals

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01

Analyze the chemical composition of cannabis products purchased in Washington, D.C.



02

Assess microbial contamination

03

Determine how labelled concentrations vary from reality

# Methods

01



## Volatiles Analysis

Detection of volatiles (ethanol, methanol, acetone, isopropanol)

03



## Gas Chromatography Mass Spectrometry

Untargeted analysis to detect wide variety of compounds

02



## Microbiologicals

Detection of aerobic bacteria, yeast and mold, and coliform/*E. coli*

04



## Liquid Chromatography Mass Spectrometry

Confirm the presence of and quantify cannabinoids

# Retail Licensing

At time of purchase

- 0/16 shops were licensed to sell marijuana products
- Several had applied for permitting

As of 2026

- 8/16 shops were officially licensed
- 4/16 shops were temporarily or permanently closed
- 1/16 is still operating as a smoke shop
- 3/16 have new smoke shops open at the same location



# Vape Products



# Vape Products



26



11

$$\text{Total THC} = (\text{THCA} \times 0.877) + \Delta 9\text{THC}$$



Average Total THC in Product

**292.8 mg/mL**

Range: 0.0-790.2 mg/mL

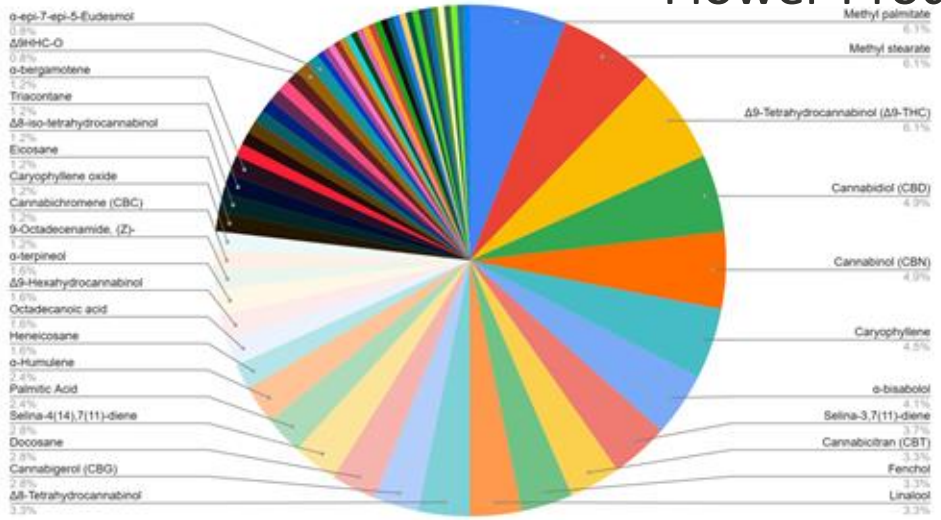
## Summary of Percent Differences for All Cannabinoids

+/- 20% Label	+/- 21-50% Label	+/- >50% Label
<b>2</b>	<b>4</b>	<b>14</b>

# Flower Products



# Flower Products



Irritant

22



Health Hazard

6

## Summary of Percent Differences for All Cannabinoids

+/- 20% Label	+/- 21-50% Label	+/- >50% Label
0	1	6

$$\text{Total THC} = (\text{THCA} \times 0.877) + \Delta 9\text{THC}$$



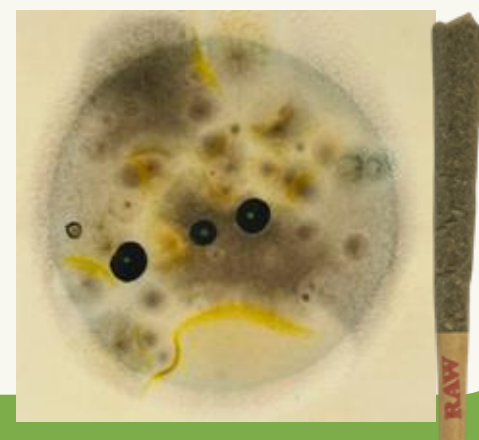
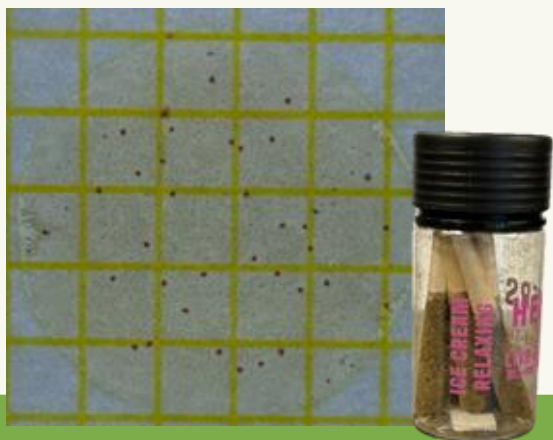
Average Total THC in Product

**8.0% (w/v)**

Range: 0.0-12.3%

# Flower Products

Microbial Analyte	# of Positive Samples	Average Concentration of Positive Samples (CFU/mL)	Range (CFU/mL)	Acceptable Limit (CFU/mL)
Total Aerobic	12	1880	250-9800	100
Total Yeast and Mold	10	130	20-440	10
Total Coliform	4	150	10-420	0





# Edible/Drink Products



13



2

$$\text{Total THC} = (\text{THCA} \times 0.877) + \Delta 9\text{THC}$$



Average Total THC in Product

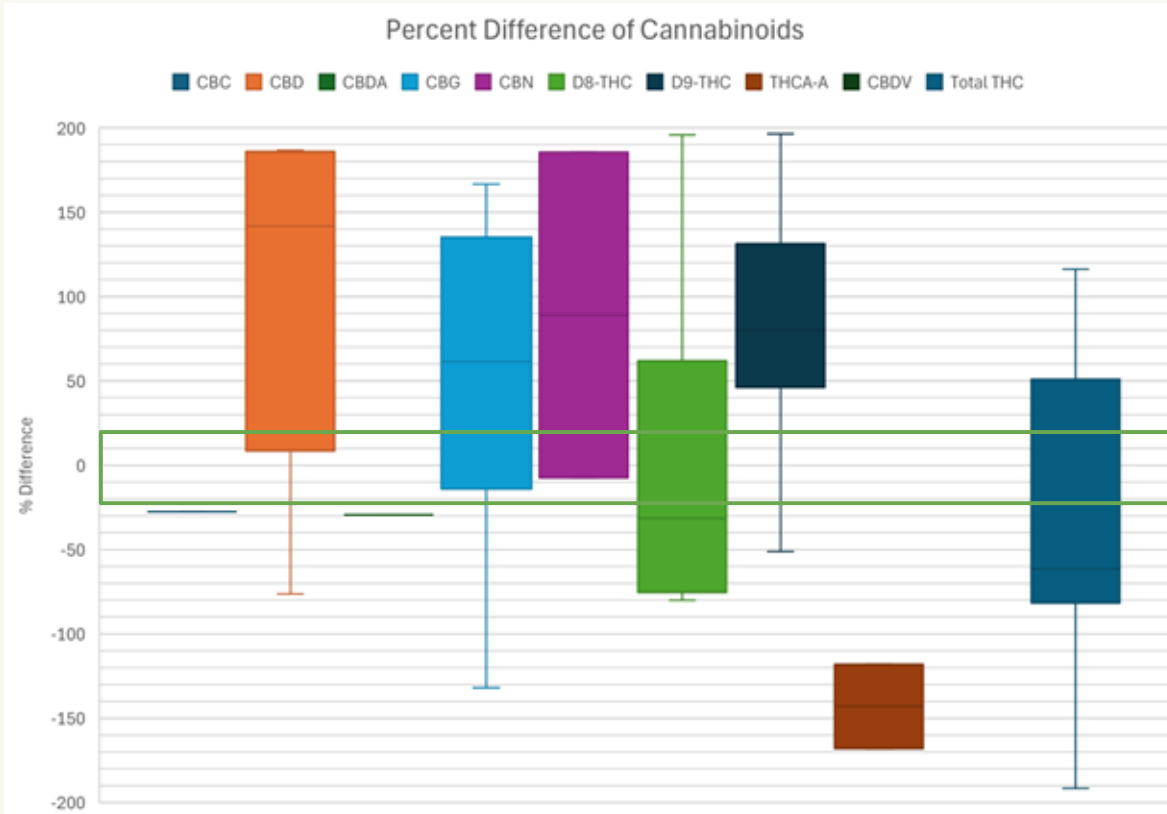
**56.0 (mg/serving)**

Range: 0.0-234.4 mg/serving

## Summary of Percent Differences for All Cannabinoids

+/- 20% Label	+/- 21-50% Label	+/- >50% Label
<b>3</b>	<b>2</b>	<b>14</b>

# Quantitation Summary



Recommended  
+/- 20% of Label

## Conclusion

- Identification of health hazards, irritants, and microbial contamination highlights significant gaps in quality control and regulatory oversight
- The prevalence of labeling inaccuracies underscores risks to consumers
- Need for greater regulatory oversight with *enforcement* to ensure safety of consumers

# Thank You

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Questions?

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