WHITE PAPER

The Great Hemp Hoax:

Much of what's sold as "hemp" today isn't hemp at all — it's a mix of synthetic intoxicants and illicit THC masquerading as a legal, natural product.

By Tiffany Devitt, *Groundwork Holdings, Inc.*
Josh Swider, PhD, *Infinite Chemical Analysis Labs*
Kristin Heidelbach, *United Food and Commercial Workers, Western States Council*
Robert Dean, Investigator *(Licensed California Private Investigator #189087, Retired San Bernardino County Sheriff's Homicide Sgt., Retired San Diego County District Attorney Investigator)*

A project of the San Diego/Imperial Counties Joint Labor Management Cannabis Committee, which includes UFCW Local 135 — representing over 13,000 unionized employees — along with March and Ash, Inc. and Embarc, two community-oriented dispensary chains employing over 600 union workers.

Testing provided by Infinite Chemical Analysis Labs (C8-0000047-LIC | ISO/IEC17025:2017 Accredited)

February 10, 2025

Executive Summary

This study examines the composition and potency of hemp products in California, focusing on chemically synthesized cannabinoids. Our analysis of 104 products from 68 brands found that 95 percent contained synthetics despite their prohibition under California law. These compounds, often far more potent than naturally occurring THC, present significant consumer safety concerns.

More than half of the tested products exceeded the federal 0.3 percent THC limit, classifying them as cannabis rather than hemp under federal law. Under California's stricter "Total THC" definition, 88 percent failed to meet state hemp standards. Many of these products also vastly exceeded THC potency limits imposed on regulated cannabis products. Some "hemp-derived" gummies contained up to 325 milligrams of THC per serving — more than 32 times the 10-milligram cap in California's legal market. On average, "hemp" vape products had THC equivalency levels 268 percent above the state's threshold for adult-use cannabis.

The widespread use of synthetic cannabinoids distorts consumer expectations regarding potency and safety. Nearly half the tested products contained THCP, a compound up to 30 times stronger than delta-9 THC, raising concerns about over-intoxication and adverse health effects, including strokes, seizures, and psychosis. Additionally, some products — such as *Cheech & Chong's Kosmic Chews* — contained psychoactive additives like kratom (an addictive, opiate-like herb), while others included hallucinogenic mushrooms, compounding health risks.

The reliance on synthetic cannabinoids in "hemp" products is not incidental — it is necessary. Extracting sufficient delta-8 or delta-9 THC from hemp is inefficient and cost-prohibitive. Producing a single 2-gram vape cartridge of *natural* delta-8 THC would require about 19 pounds of biomass. Extracting delta-9 THC from hemp is similarly impractical, requiring 50 times more plant material than cannabis to produce comparable amounts of THC. Because of these inefficiencies, most so-called "hemp-derived" THC products are, in reality, synthetic cannabis — reminiscent of illegal products like "Spice" that flooded California a decade ago.[1]

The absence of oversight also enables widespread tax evasion. A staggering 91 percent of products analyzed were sold without collecting California's required sales taxes, and none of the vendors remitted the state's cannabis excise tax when legally obligated to do so.[2] The failure to ensure tax accountability (tied to the lack of "track-and-trace") allows unregulated "hemp" products to undercut the legal cannabis market while depriving the state of revenue meant for public health, environmental mitigation, and enforcement. To restore order to the market and bring clarity and certainty to consumers, all THC-containing products should be regulated as cannabis within California's established framework. This will protect consumer safety, ensure tax compliance, and uphold the intent of the state's cannabis laws.

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Study Objectives

This study investigates the composition and potency of consumer hemp products available in California, with a specific focus on identifying chemically synthesized cannabinoids. These laboratory-engineered compounds are designed to mimic the effects of delta-9 THC but often undergo structural modifications to increase potency. These modifications intensify their intoxicating effects and amplify health risks, ultimately making these substances more similar to illegal designer drugs like Spice, Bath Salts, or K2 than to natural cannabis. This study aims to detect the presence of these compounds, evaluate their potency, and assess whether these products align with the legal definition of hemp while examining the potential health risks associated with their use.

Testing Scope, Criteria, Limitations & Exclusions

Scope

This study tested 104 consumer "hemp" products from 68 distinct brands to evaluate their composition and potency. We focused on two popular product categories: "hemp-derived" vapes and gummies. These categories were chosen because of their widespread availability and high consumer demand, making them representative of the broader market for "hemp" products.

Criteria

This study evaluated the presence and quantity of chemically manufactured cannabinoids, specifically synthesized (rather than naturally extracted) delta-8 THC and delta-9 THC, as well as THCO Acetate, THCP, HCC, and HHC-O Acetate, which do not naturally occur in the plant in meaningful quantities, if at all.

Additionally, we assessed the estimated aggregate potency of these products. Many chemically synthesized cannabinoids are designed to be more potent than naturally occurring delta-9 THC. To accurately compare the potency of "hemp" products containing these compounds to natural cannabis products sold in licensed dispensaries, we applied a multiple based on the relative binding affinity of each compound to CB1 receptors compared to traditional (delta-9) THC. This methodology was informed by the scientific literature cited below. In cases where scientific data was unavailable, anecdotal reports from industry were used to inform our analysis.

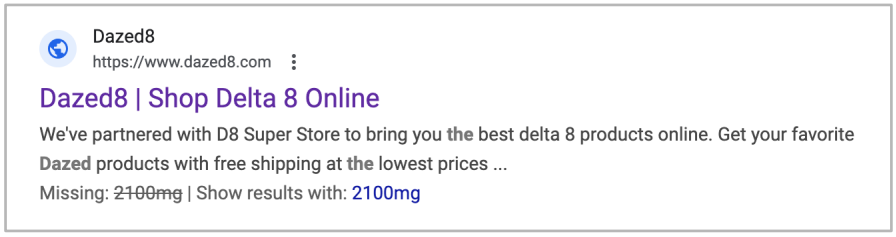
Limitations

On September 23, 2024, the California Office of Administrative Law approved regulations proposed by the California Department of Public Health (CDPH) requiring that hemp products intended for human consumption have no detectable THC per serving. Additionally, under Assembly Bill 45 (Aguiar-Curry), signed into law in 2021, hemp products must not include cannabinoids produced through chemical synthesis. These regulations create a legal framework that, in theory, should prevent the sale of hemp products containing THC and chemically synthesized cannabinoids in the state.

Despite these legal restrictions, we were able to easily purchase hundreds of "hemp" products online, most of which were delivered via the U.S. Postal Service[a] without age verification.[b] This raises concerns about potential selection bias in our sampling, as all products included in this study were shipped illegally to California. As a result, the findings may disproportionately reflect the practices of "bad actors" who flout regulatory compliance.

However, this issue is not limited to lesser-known or rogue operators. While not the focus of this investigation, well-established brands in the hemp-infused beverage space — such as CANN and St. Ides (owned by Pabst) — also sold us THC-infused products in violation of state law. This challenges the assumption that only bad actors are engaging in the illegal sale of intoxicating hemp products in California.

Additionally, the distribution practices of some companies further influenced the sample composition. While certain companies, such as Cheech & Chong[3] and Cookies,[4] sell intoxicating "hemp" products directly to consumers through their websites, many prominent brands in the intoxicating hemp space rely on third-party distributors and online "superstores" to market their products. This group includes well-known brands like 3Chi, Cake, Cali Extrax, Dome Wrecker, ELF, Exodus, Torch, and TRE House. Some of these companies disavow any knowledge that third parties in California are selling their products in violation of state laws. Others, like Dazed, explicitly advertise their partnerships with online "hemp" superstores.



[a] We asked experts why these companies primarily use USPS to deliver these products. They explained that this is common in the illegal narcotics trade because private carriers like FedEx have user agreements allowing them to inspect packages, while USPS requires reasonable suspicion or a warrant to do so.

[b] None of the companies shipping to us required a signature or age verification upon delivery. All but two relied solely on an online checkbox for purchasers to self-verify their age as being over 21.

In summary, the distribution strategies of "hemp" companies could have influenced the composition of our sample. But while the study may overrepresent products from companies that openly disregard state law, this does not mean such products are rare exceptions. The widespread availability of intoxicating hemp products, including from brands with mainstream credibility, suggests that our findings reflect broader market trends rather than an anomaly caused by selection bias alone.

Exclusions

This study did not examine pesticide, solvent, or heavy metal contaminant levels. Researchers and legal experts investigating the unregulated hemp market have extensively documented these problems.[5,6,7,8] The lack of mandatory third-party testing, batch tracking, and accurate product labeling in this marketplace makes the presence of such contaminants unsurprising.

Definitions

For this paper:

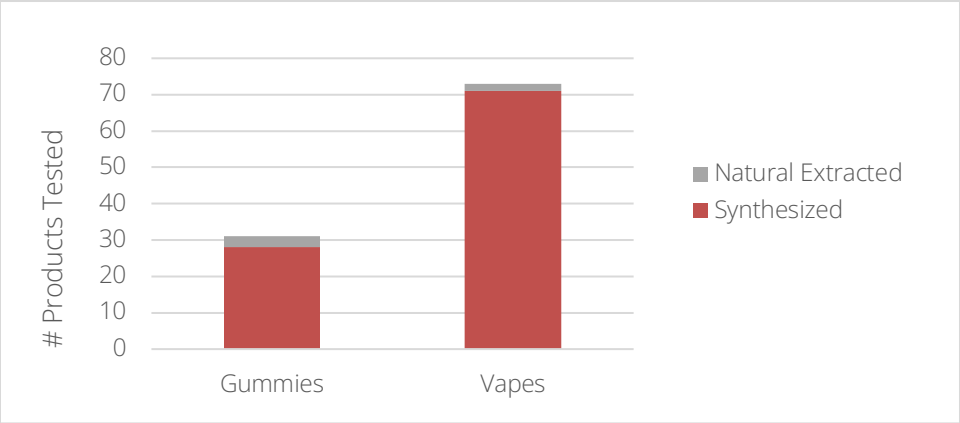
- **Synthetic cannabinoids or chemically synthesized cannabinoids** refer to compounds that are chemically manufactured rather than naturally extracted from the plant. These include synthetic delta-8 and delta-9 THC, which are typically made by isolating CBD from hemp and converting its molecular structure through an acid-catalyzed reaction that relies on corrosive solvents and heavy metal catalysts. Synthetics also include those likely made from non-hemp starter materials.
- **Delta-9 THC** (also known as D9, THC, traditional THC, or natural THC) refers to *delta-9 tetrahydrocannabinol*, the primary psychoactive component of cannabis.
- **Intoxicating hemp** is colloquially used to describe products marketed as "hemp" that contain concentrated THC, chemically synthesized cannabinoids, and/or non-cannabinoid psychoactive agents like kratom, psilocybin, and *amanita muscaria*.
- **THCA** (also known as delta-9-THCA or *tetrahydrocannabinolic acid*) is a chemical found in cannabis plants. In its raw form, it is non-intoxicating. However, it serves as a precursor to THC. When heated — as occurs when THCA flower is smoked or vaped — or decarboxylated, it converts to the intoxicating agent delta-9 THC at a rate of 87.7 percent. State cannabis markets, such as California's, include THCA in the definition of THC and the calculation of total THC content,[9] as does the United States Department of Agriculture (USDA).[10]

Results

Prevalence of Synthetics

Assembly Bill 45 (Aguiar-Curry, 2021) plainly states: "'Industrial hemp' does not include cannabinoids produced through chemical synthesis."[11] In accordance with this, hemp products cannot legally contain compounds like delta-8 THC that have been chemically synthesized from CBD isolate. Only cannabinoids naturally extracted from the plant are permitted. Yet, our analysis of 104 products showed that 95 percent contained synthetics, including 97 percent of vapes and 90 percent of gummies.

Products with Synthesized vs. Naturally Extracted Cannabinoids:

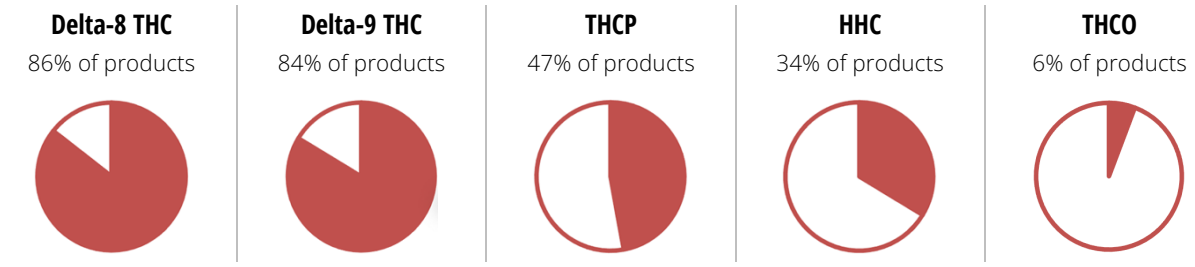


The most common chemically synthesized cannabinoid was delta-8 THC (found in 86 percent of all products), followed closely by delta-9 THC. Although both can theoretically be extracted from hemp, doing so at a commercially viable scale is wildly impractical. To obtain enough delta-8 THC from natural extraction, manufacturers would need a jaw-dropping 19 pounds of hemp biomass to produce a single 2-gram vape cartridge.[12,13] Similarly, if manufacturers source delta-9 THC from hemp rather than cannabis, they will need 50 times more biomass,[14] making it an unlikely approach, which is why "hemp" brands so often turn to synthetics or old-fashioned marijuana.

The next most popular synthetic, found in almost half of products, was the ultra-potent THCP, followed by HHC. Neither can be found in cannabis in commercially meaningful amounts, if at all. The once popular THCO, which ran afoul of the DEA in 2023,[c] was found in six percent of products.

[c] Three years ago, THCO was a dominant synthetic in the hemp market. After the DEA ruled in 2023 that THCO is a controlled substance, manufacturers pivoted to THCP and HHC. See *DEA THCO Response to Kight*. (2023, February).

Prevalence of Specific Synthesized Cannabinoids:

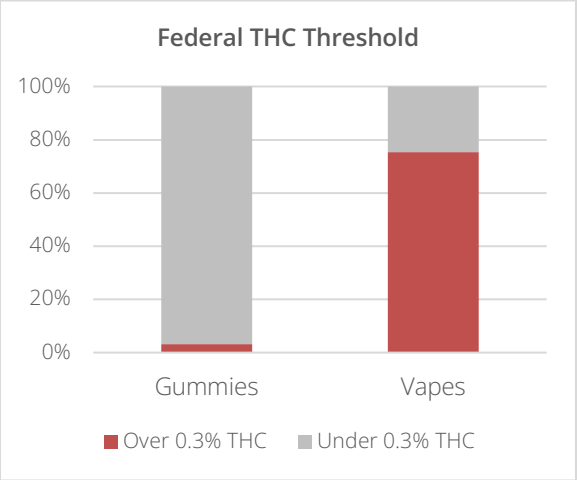


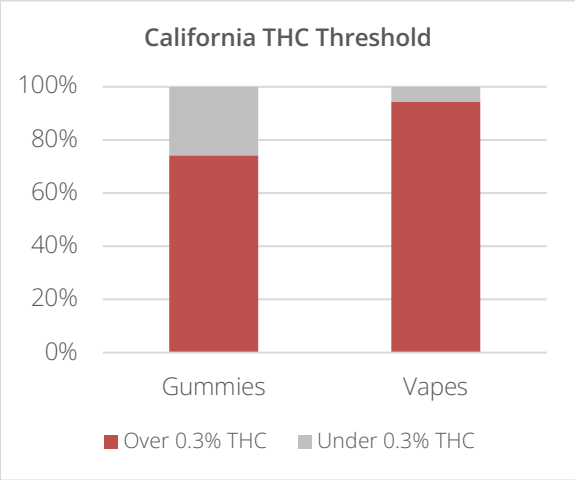
These products are often marketed to consumers on the basis that they are more potent and cheaper than products in the regulated cannabis industry.

Crossing the THC Line

Beyond the widespread use of synthetic cannabinoids, our analysis found that over half of the tested products (56 of 104 products) exceeded the federal THC limit for hemp (0.3 percent). Under federal law, these products do not qualify as hemp and should be classified as cannabis. Furthermore, under California's stricter "Total THC" definition, which includes delta-8 THC,[15] 88 percent of products failed to meet state hemp standards.

Percentage of Products Exceeding Hemp THC Limits by Category:





State cannabis programs impose strict potency limits on THC levels in edibles and vape products. In California, edible products may contain a maximum of 10 milligrams of THC per serving and 100 milligrams per package.[16] Vape cartridges may contain up to 1,000 milligrams of THC per package for non-medical consumers and 2,000 milligrams for medical patients.

Despite these regulations, the "hemp" products tested in our study frequently exceeded these limits:

- 84 percent of gummies exceeded the THC per serving cap.
- 81 percent surpassed the total THC per package cap.
- The average package of "hemp" gummies contained 1,388 mg of THC — nearly 14 times California's legal limit for cannabis products.
- The average THC per gummy was 89 mg — almost 9 times the per-serving cap in California's cannabis market.
- Over one-third of the gummies (11 of 31) contained between 100 and 325 mg of THC per piece.

These findings suggest that many of the "hemp" products contain significantly higher THC levels than permitted in the regulated cannabis market.

The True Potency of "Hemp" Vape Products

The presence of synthetic cannabinoids in these products doesn't just challenge their classification as "hemp" — it also fundamentally distorts consumer expectations around potency. Many of the lab-made cannabinoids found in our analysis are far more potent than natural delta-9 THC, meaning a product's psychoactive effects may be dramatically understated if potency is assessed solely by delta-9 THC content.

A prime example is THCP, which was detected in roughly half the tested products. Research suggests that THCP is up to 30 times more stronger than delta-9 THC due to its substantially higher binding affinity to CB1 receptors.[17] As a result, a THCP product with little to no delta-9 THC could be exponentially stronger than consumers or regulators assume, leading to a dangerous underestimation of its effects.

After adjusting for the higher potency of synthetic cannabinoids,[d] the effective THC strength of many of the vape products appeared to exceed what their "hemp" designation implied:

- The average THC equivalency for vapes in our study was 2,682 mg per cartridge — 268 percent above the California limit for adult-use cannabis products.
- Over half (38 of 71) contained between 2,000 and 14,000 mg of THC equivalent per vape.

These results indicate that "hemp" products are often far more potent than natural products sold in the regulated cannabis market.

[d] See Appendix A for an explanation of our methodology for calculating THC potency equivalencies.

Discussion

Safety Concerns with Synthetics

Designed to mimic the effects of natural cannabinoids like THC, synthetic cannabinoids do not have the same pharmacological safety profiles as natural cannabinoids.

1. **Potency and Efficacy Concerns:** Synthetic cannabinoids can be significantly more potent than THC, but potency alone does not determine their impact. The key factor is *efficacy* — how strongly a substance activates human receptors. Unlike natural THC, which is a partial CB1 agonist, many synthetic cannabinoids are full agonists, driving receptors to much higher levels of activity. This heightened activation increases the risk of severe psychological[18] and physiological[19,20] reactions, including cardiovascular distress,[21] stroke,[22] seizures,[23] and psychosis.[24,25] Additionally, some synthetic cannabinoids have been linked to lung injuries[26] (as seen during the 2019 "vaping crisis"), cardiotoxicity,[27] and genotoxicity.[28] The Safety Data Sheet for delta-9 THCP specifically warns that the compound is "harmful if swallowed or inhaled" and "may cause anemia, cough, CNS depression, drowsiness, headache, heart damage, lassitude (weakness, exhaustion), liver damage, narcosis, reproductive, and teratogenic effects."[29]

2. **Novel and Unknown Isomers:** Novel and unknown isomers associated with chemically synthesized cannabinoids, like delta-8 THC, may present significant risks due to their unpredictable chemical and physical properties. Commercially available delta-8 THC is typically produced through an unpurified chemical reaction that generates multiple non-natural isomers, including Δ8-iso-THC and Δ4(8)-iso-THC, which are not found in cannabis and whose effects on human health are unknown. These byproducts are difficult to measure and almost impossible to remove from the final product. Moreover, additional abnormal isomers like regioisomers, along with degradation products such as olivetol and chlorinated compounds, can form during the conversion process. Lastly, the chemical conversion process (from CBD isolate to THC) can leave solvent and heavy metal remnants.[30] Without proper regulatory oversight and stringent testing, these unregulated processes result in unsafe products.[31,32,33]

3. **Risk of Over-Intoxication:** Our findings reveal that the actual psychoactive potency of these products is often magnitudes stronger than natural cannabis products found in licensed dispensaries. Coupled with inaccurate labeling and a lack of proper testing, consumers cannot be certain about what they are vaping, increasing the risk of over-intoxication.

Examples of inaccurate labeling:
Half of the vape products marketed as "THCA vapes" contained no THCA whatsoever, including the products shown below.

4. **Potential Addiction and Behavioral Effects:** Some synthetic cannabinoids, including Mepirapim, have been linked to addictive behaviors. Studies suggest that these drugs activate the CB1 receptor at much higher levels than natural cannabinoids, contributing to changes in brain chemistry that may promote addiction.[34] The use of synthetic cannabinoids has also been associated with significant neurocognitive impairment and impulse control disorders.[35]

In sum, synthetic cannabinoid products pose significant safety risks due to their increased potency and efficacy, novel chemical structures, and lack of safety data. Ironically, they are often marketed as a "safe," "100% natural," and "100% legal" alternative to state-regulated cannabis.

Psychoactive Additives

A recent trend in the industry involves the addition of kratom and hallucinogenic mushrooms to products sold as "hemp." These additives are marketed to enhance the intoxicating effects of the product, thereby increasing their appeal to consumers seeking intensified psychoactive experiences.

The inclusion of kratom, hallucinogenic mushrooms, or similar substances in "hemp" products directly violates Section 17300 of California's state cannabis regulations, which explicitly prohibits the use of "any non-cannabinoid additive that would increase potency, toxicity, or addictive potential." More critically, adding these substances poses additional risks to consumer safety by triggering unpredictable and potentially hazardous interactions and increasing the likelihood of addiction, particularly due to the opioid-like properties of kratom. The lack of testing and contaminant standards for these unregulated intoxicants further exacerbates these dangers.

Examples of "hemp" products with non-cannabinoid intoxicants:

Don't Trip Dozo's *Vape Cartridges, which features kid-friendly flavors like Mushy Marshmallow, Hubble Bubble, Cosmic Donut, and Smurf's Dream, combine hallucinogenic mushrooms, THCA, and an alphabet soup of chemically synthesized cannabinoids.*[36]

Cheech & Chong's *Kosmic Chews promise a "deeper high" with 15mg of THC plus 25mg of kratom per piece. While marketed for the amplified high, the fine print notes that "some people have developed kratom dependency after prolonged daily use."*[37]

Tax Compliance Issues

Our analysis of online "hemp" retailers revealed widespread tax evasion among vendors selling in California. A staggering 91 percent of the products we ordered were shipped tax-free, with vendors failing to collect required state and local taxes, including California's Sales and Use Tax. Additionally, no vendor collected and remitted the state's cannabis excise tax, despite being obligated to do so under Section 34015.1 of the California Revenue & Tax Code,[38] which specifies that operators are liable for all state cannabis taxes, fees, and penalties even if they are operating without a state cannabis license.

Major "hemp superstores" uniformly failed to collect any taxes,[39] while direct-to-consumer brand websites showed slightly better compliance. This widespread failure to collect and remit taxes imposes a significant financial cost on the state, depriving it of critical revenue and exacerbating regulatory and enforcement challenges within the online "hemp" market. Given this rampant tax fraud, the "hemp" industry's claim that a more permissive regulatory approach would generate substantial tax revenue for the state appears highly dubious.

Conclusion

When the hemp industry engaged with policymakers on AB 45 in 2021, they insisted it was about "rope, not dope," claiming their focus was on CBD wellness products rather than intoxicants. But the industry's rapid evolution has made clear that this narrative no longer holds. Today's "hemp" market isn't about wellness — it's about peddling counterfeit cannabis, the ultra-processed junk food of weed, under a different name. Promotional emails with subject lines like "Make America High Again"[40] make it abundantly clear that these companies are selling intoxicants, not health products.

Now, proponents of the "hemp" industry are pushing to overturn California's emergency regulations banning THC and synthetics in hemp products. They present their case as a carve-out for "full-spectrum" wellness products with "a touch of therapeutic THC" or "low-dose" THC beverages. But given the industry's track record, such assurances warrant deep skepticism.

In reality, the unregulated "hemp" market poses a far greater risk to public health than California's regulated cannabis industry. While the hemp market remains chaotic and opaque, the state's cannabis framework provides critical safeguards for consumers, workers, and the broader community. This system ensures accountability at every stage — from tracking cannabinoid inputs and outputs to full transparency about where, when, and by whom products are made. With mechanisms for instant recalls, rigorous third-party testing, strict lab oversight, and a comprehensive seed-to-sale "track-and-trace" system, California's regulations are crucial to ensuring that only safe, accurately labeled products reach adult consumers.

Additionally, the regulated cannabis system offers vital protections that the "hemp" market cannot. These include tax compliance records, proper medical oversight for high-dose products, clear packaging, advertising and labeling standards, robust age-gating, and sensible THC caps. The accountability embedded in this system fosters consumer and community confidence — something entirely lacking in the hemp market.

Beyond public health, California's cannabis industry also supports strong labor protections and well-paying union jobs. By contrast, many "hemp" companies manufacture products out of state or import inputs from China, bypassing labor standards, evading state and local taxes, and contributing nothing to California's economy.

The regulated cannabis market is not just a business — it's a critical safeguard for public health. California voters established this system to ensure transparency, safety, and accountability. Allowing counterfeit THC products to masquerade as "hemp" undermines that framework. Keeping all THC within the state's cannabis regulations isn't just good policy; it's essential for public health and consumer trust.

Appendix A: Methodology for Identifying Chemically Synthesized THC

To determine whether delta-8 or delta-9 THC was synthesized or naturally occurring, the lab tested for byproducts typically produced during synthetic conversion but not native to hemp or cannabis plants,[41,42] including:

- 4,8-epoxy-*iso*-tetrahydrocannabinol
- 8-hydroxy-*iso*-tetrahydrocannabinol
- 9*α*-hydroxyhexahydrocannabinol
- 9*β*-hydroxyhexahydrocannabinol
- D4-*iso*-tetrahydrocannabinol
- D8-*iso*-tetrahydrocannabinol
- D8-*cis*-*iso*-tetrahydrocannabinol
- D4,8-*iso*-tetrahydrocannabinol

Appendix B: Methodology for Calculating THC Potency Equivalencies

To account for synthetics' amplified potency, we evaluated their total psychoactive strength by converting each synthetic compound to its delta-9 THC equivalent. This adjustment facilitates a more accurate comparison between "hemp" products and natural cannabis products available in dispensaries. The equivalencies were determined using a THC Potency Equivalency Factor (PEF) based on each compound's relative CB1 receptor binding affinity compared to natural delta-9 THC.

The THC equivalencies for synthetics are supported by the scientific literature (cited below) and supplemented with anecdotal reports where peer-reviewed data was unavailable.

After applying these equivalencies, we converted the amount of each synthetic cannabinoid into its delta-9 THC equivalent, aggregating these values to determine each product's total effective THC content.

Potency equivalency of synthetic cannabinoids relative to delta-9 THC:

Compound	Scientific Name	Delta-9 THC Equivalency (multiple)
Delta-9 THCP	*Trans-delta-9-tetrahydrocannabiphorol*	30.00[43]
Delta-8 THCP	*Trans-delta-8-tetrahydrocannabiphorol*	20.10[44]
Delta-9 THCO	*Delta-9-THC-O-acetate*	3.00[45]
Delta-8 THCO	*Delta-9-THC-O-acetate*	2.01[46]
HHCO Acetate	*Hexahydrocannabinol-O-acetate*	1.50[47]
HHC	*Hexahydrocannabinol*	1.00[48]
THCA	*Tetrahydrocannabinolic acid*	0.877[49,50]
Delta-8 THC	*Delta-8-Tetrahydrocannabinol*	0.67[51]
CBN	*Cannabinol*	0.25[52]

Appendix C: Reference Materials

1. Certificates of Analysis for all products (Request access)
2. Raw Data (Request access)
3. References
4. Photo of Received Product (Request access)
5. White Paper: Pandora's Box: The Dangers of a National, Unregulated, Hemp-Derived Intoxicating Cannabinoid Market (2022)

Endnotes

[1] Karlamangla, S. (2016, August 26). "*The cheapest buzz you can get on Skid row": Officials try to stop homeless from smoking spice after dozens sickened.* Los Angeles Times. https://www.latimes.com/local/lanow/la-me-spice-skid-row-20160824-snap-story.html

[2] In California, products that contain more than 0.3% of the psychoactive compound delta-9 tetrahydrocannabinol *or* that are chemically synthesized (irrespective of the level of THC) fall outside of the State regulations for industrial and raw hemp and are by default under California law cannabis products that are therefore subject to the laws and regulations governing commercial cannabis activities including California's 15% cannabis excise tax. Cal. Health & Safety Code § 11018.5 *et seq*.; Cal. Health & Safety Code, §§ 111921; 111925.2; Cal. Bus. & Prof. Code § 26000 *et seq*. The narrow carveout for industrial or raw hemp products under California's laws is intended to support and promote agricultural activities in the State by allowing for the commercialization of *naturally* derived products therefrom that *do not have the psychoactive traits* of regulated cannabis products or the chemical composition of designer drugs. Specifically, any unlicensed person engaging in the sale of cannabis products (e.g., that do not quality as industrial or raw hemp) is required to pay the State's cannabis excise tax as if the products were sold at a licensed cannabis retailer together with penalties and interest. Cal. Rev. & Tax. Code §34015.1(a)(1).

[3] Product sample purchased from https://cheechandchong.com on January 13, 2025.

[4] Product sample purchased from https://hemp.cookies.co on January 15, 2025.

[5] Gidal, B. E., Vandrey, R., Wallin, C., Callan, S., Sutton, A., Saurer, T. B., & Triemstra, J. L. (2024). Product labeling accuracy and contamination analysis of commercially available cannabidiol product samples. *Frontiers in Pharmacology*, 15. https://doi.org/10.3389/fphar.2024.1335441

[6] US Cannabis Council. (2021, June 2). *The US Cannabis Council support the safe and regulated sale of Cannabis Products.* Docslib. https://docslib.org/doc/9236682/the-us-cannabis-council-support-the-safe-and-regulated-sale-of-cannabis-products

[7] Meehan-Atrash J, Rahman I. Novel Δ8-Tetrahydrocannabinol Vaporizers Contain Unlabeled Adulterants, Unintended Byproducts of Chemical Synthesis, and Heavy Metals. *Chem Res Toxicol.* 2022 Jan 17;35(1):73-76. doi: 10.1021/acs.chemrestox.1c00388. Epub 2021 Dec 10. PMID: 34889611; PMCID: PMC8898185.

[8] American Council of Independent Laboratories. (2024). *ACIL hemp market study*. June 2024. https://cdn.ymaws.com/www.acil.org/resource/resmgr/cannabis/P2_2024_ACIL_Product_Study_r.pdf.

[9] California Code of Regulations Title 4, Division 19. *Sec. 15700(rrr).*

[10] Agricultural Marketing Service, Department of Agriculture (USDA). (2021, January 19). Establishment of a Domestic Hemp Production Program. *The Federal Register.* https://www.federalregister.gov/documents/2021/01/19/2021-00967/establishment-of-a-domestic-hemp-production-program

[11] Bill text. Bill Text - AB-45 Industrial hemp products. (2021, October 6).

[12] Delta-8 THC occurs naturally in cannabis at levels below 0.1 percent. *Oregon Liquor and Cannabis Commission.* (n.d.-b). Delta-8-THC: Regulatory Issues Presented by Artificially Derived Cannabinoids. https://www.oregon.gov/olcc/Docs/commission_minutes/2021/OLCC-Delta-8-THC-Presentation.pdf

[13] To produce 1 gram of THC oil, we first determine the extraction efficiency from 15% THC biomass, where 1 pound (453.6g) contains 68.1g of THC and yields 16g of oil, giving an extraction efficiency of 23.5% (16 ÷ 68.1). Using this efficiency, 4.26g of THC is required to produce 1g of oil (1 ÷ 0.235). With 0.1% THC biomass (0.001g THC per gram),

this means 4,260g (or ~9.39 pounds) of plant material is needed to supply the required delta-8 THC for a 1-gram cartridge and 18.78 pounds for a 2-gram cartridge.

[14] Cannabis typically has about 15 percent THC (15 ÷ 0.3 = 50).

[15] From Sec. 15007(rrr) of the California Code of Regulations Title 4, Division 19: "'Total THC' means the sum of THC, delta 8 THC, and THCA. Total THC is calculated using the following equation: Total THC (mg/g) = [(delta 8-THCA concentration (mg/g) + delta 9-THCA concentration (mg/g)) x 0.877] + [delta 8-THC concentration (mg/g) + delta 9-THC concentration (mg/g)]."

[16] California Code of Regulations Title 4, Division 19. *Sec. 17304.*

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