

THC Isomers and Derivatives:
A Brief Explanation
by Smithville Community in Action
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In the United States of America, tetrahydrocannabinols are listed as a Schedule 1 drug by the federal Controlled Substance Act ([21 C.F.R. § 1308.11\(d\)\(31\)](#)) ([21 C.F.R. § 1308.11\(d\)\(58\)](#)). In 2018, a new agriculture bill was passed which provides specific protections for hemp and defines hemp as “the plant *Cannabis sativa* L. and any part of that plant, including the seeds thereof and all derivatives, extracts, cannabinoids, isomers, acids, salts, and salts of isomers, whether growing or not, with a delta-9 tetrahydrocannabinol concentration of not more than 0.3 percent on a dry weight basis.”¹ It is, in part, due to this definition which mentions one very specific tetrahydrocannabinol that has given rise to a new industry of THC isomers and derivatives in retail marketplaces across the nation.

Delta-9-tetrahydrocannabinol

It is recognized as the main psychoactive chemical in the *Cannabis Sativa* plant family.² It is the cannabinoid that appears most concentrated in the plant naturally, however, there are over a hundred cannabinoids present in the *Cannabis Sativa* plants, a plant family that includes Marijuana and Industrial Hemp.

What is an “isomer”?

Delta-8-tetrahydrocannabinol and Delta-10-tetrahydrocannabinol are both isomers of the Delta-9-tetrahydrocannabinol more commonly referred to as THC. In Chemistry, an isomer is each of two or more compounds with the same formula but a different arrangement of atoms in the molecule and different properties. In the case of these THC isomers, they occur naturally in the plant, but they are normally at insufficient concentrations in the plant to produce a psychoactive effect on the brain. These isomers have a double bond in a different place in the chemical structure, but still bind to the cannabinoid receptors in your body in the same way.

These isomers are being synthesized into greater concentrations than appear in nature in order to be marketed and sold as a THC product with similar effects to Delta-9-THC.

Other derivatives

THC O or THC O Acetate is also available in the area. Considered a derivative of THC, THC O Acetate doesn't appear in nature, but is acetylated from THC (this is the same process used to create Heroin from Morphine).

Hydrogenated Hemp Oil

Another process that has been developed is hydrogenating hemp oil. Hydrogenation is the same process that makes margarine from vegetable oil. The hydrogenation process removes the double bond from the chemical structure which makes it more stable and also makes a six hydrogen structure called Hexahydrocannabinol instead of the four hydrogens of tetrahydrocannabinol. Hexahydrocannabinol or HHC is a semi-synthetic compound that has had no human trial studies.

Agriculture Improvement Act of 2018

There is an argument that these THC isomers and derivatives are legal because of the Farm Bill passed during the Trump administration that makes hemp and hemp products legal. The bill defines hemp to include all parts of the plant with a delta-9-THC concentration of .3% or less on a dry-weight basis and removes hemp from the federal Controlled Substance Act scheduling. ³

The federal DEA established an interim rule in August of 2020 regarding implementation of the Agriculture Improvement Act of 2018. In that guidance, they say that the THC isomers should be treated just like a Substance 1 drug. That means the current DEA guidance for the ag bill remains that "For synthetically derived tetrahydrocannabinols, the concentration of Δ^9 -THC is not a determining factor in whether the material is a controlled substance. All synthetically derived tetrahydrocannabinols remain schedule I controlled substances." ⁴

Federal Analogue Act of 1986

A Congressional act that defines an analogue as a substance that is similar in chemical structure, has similar effects on the central nervous system and that is bought and sold to be used in the same way and for the same purpose as a controlled substance. This act was designed, in part, to protect consumers from the bad chemistry that led people to develop Parkinson's from poorly synthesized Demerol in the mid 1980s. ⁵ This act recognizes the dangers of drugs that have been synthesized with no regulated processes and without rigorous testing.

The FDA has issued a Serious Health Risk warning regarding Delta-8 THC. ⁶ The CDC has also issued an advisory. ⁷ No federal judge has ruled on the legality of THC isomers, however, it may take a judicial ruling to make it clear to the industry and to the consumers which side of the law THC isomers are on.

State laws

As of March 2022, as many as 20 states have regulated THC isomers. Some, like Michigan (which has legalized marijuana for non-medical use for users over 21) created a new law to regulate the THC isomers. ⁸ However, other states, like Kansas, has determined state laws governing controlled substance make all tetrahydrocannabinols controlled substances when they are bought or sold in concentrations greater than .3%. ⁹

Missouri laws

Like many states, Missouri defines tetrahydrocannabinols as controlled substances (Mo. Rev. Stat. § 195.017). In addition, it specifically regulates Chemical substances structurally similar to Schedule I controlled substances (Mo. Rev. Stat. § 195.022) ¹⁰ Moreover, Article XIV of the Missouri Constitution also fails to define Marijuana as specific to Delta-9-THC and instead defines Marijuana as to its general

tetrahydrocannabinol content. The definition says, “Cannabis indica, Cannabis sativa, and Cannabis ruderalis, hybrids of such species, and any other strains commonly understood within the scientific community to constitute marijuana, as well as resin extracted from the plant and marijuana-infused products. “Marijuana” or “marihuana” do not include industrial hemp containing a cropwide average tetrahydrocannabinol concentration that does not exceed three-tenths of one percent on a dry weight basis, or commodities or products manufactured from industrial hemp.”¹¹

Additional Resources

¹ <https://www.congress.gov/bill/115th-congress/house-bill/2/text>

²U.S. Department of Justice Drug Enforcement Administration “Schedule of Controlled Substances: Maintaining Marijuana in Schedule I of the Controlled Substances Act”, July 2016

<https://www.deadiversion.usdoj.gov/schedules/marijuana/Maintaining%20Marijuana%20in%20Schedule%20I%20of%20the%20Controlled%20Substances%20Act.pdf>

³ <https://www.congress.gov/bill/115th-congress/house-bill/2/text>

⁴ https://www.deadiversion.usdoj.gov/fed_regs/rules/2020/fr0821.htm

⁵ <https://www.washingtonpost.com/archive/lifestyle/wellness/1985/06/12/designer-drug-linked-to-parkinsons/904b1ff5-fc91-484b-9e79-37f4588e6057/>

⁶ <https://www.fda.gov/consumers/consumer-updates/5-things-know-about-delta-8-tetrahydrocannabinol-delta-8-thc>

⁷ <https://www.drugabuse.gov/news-events/emerging-trend/cdc-health-advisory-increases-in-availability-cannabis-products-containing-delta-8-thc-reported>

⁸ <https://www.michigan.gov/-/media/Project/Websites/mra/delta-8/2021-lara-mra-delta-8-sheet.pdf?rev=f96dacc961314586862fc41033765905>

⁹ https://ag.ks.gov/docs/default-source/ag-opinions/2021/2021-004.pdf?sfvrsn=791ea41a_6

¹⁰ <https://revisor.mo.gov/main/OneChapter.aspx?chapter=195>

¹¹ <https://www.sos.mo.gov/CMSImages/Publications/CurrentMissouriConstitution.pdf>