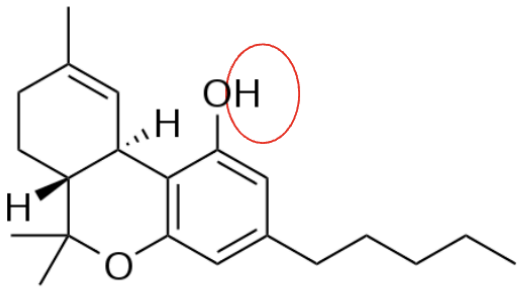
BOOJUM

What is THC-O?

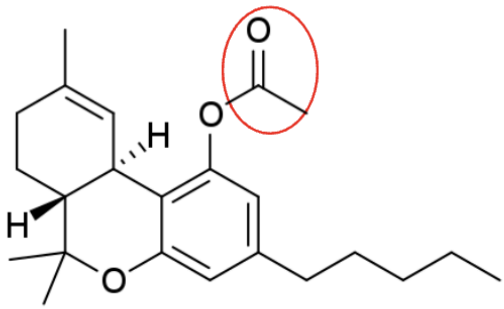
Known as THC-O, THC-O acetate, THC acetate ester, or AcO-THC, this molecule can be synthesized from either Δ9-THC or Δ8-THC, with the resulting molecules named Δ9-THC-O or Δ8-THC-O, respectively. Pharmacological differences between the two are unknown. It is hypothesized to be a prodrug, meaning it becomes active after metabolism. (*Holt et al 2022*, *Zawatsky et al 2024*)

How is THC-O made?

In order to synthesize THC-O, either Δ9-THC or Δ8-THC must go through the acetylation process, in which it is turned into an ester (THC-O). This means that a hydrogen atom is replaced by an acetyl group.These are commercially synthesized using acetic anhydride (THC-O uses this reagent), acetyl chloride, or ketene. (*Benowitz et al 2023, Holt et al 2022*)



Δ9-THC



Δ9-THC-O Acetate

What does THC-O do?

Because it can be made from Δ8-THC, which can be made from hemp, THC-O has survived in a legal gray area in much of the United States, with conflicting accounts of its psychoactivity or other properties. There is little scientific evidence of its potency; and while reports that it is three times as powerful as Δ9-THC are purely anecdotal, it's prodrug status (and hypothesized improved ability to cross the blood brain barrier) makes it likely to be at least as potent as Δ9-THC. (*Kruger et al 2023, Zawatski et al 2024)*

Importantly, in a 2022 study, THC-O was shown to break down into ketene gas when heated. Inhaled ketene is known to produce a physiologically negative response at 5 ppm. Ketenes from Vitamin E acetate in vaping products was strongly linked to the sometimes fatal lung injury, EVALI. It is not a leap to assume that THC-O acetate could have a similar effect. (*Benowitz 2023, Bone 2023, Munger 2022*)

Our Stance

At Boojum Med, we have always stood against synthetic cannabinoids in the Utah market. We strongly support a ban on THC-O, and believe that at this point in time the risks far outweigh the benefits of this molecule in our market. It has never been documented in nature, or through processes outside of acetylation. Utah patients deserve evidence-based medicine, and THC-O has too many potentially harmful effects. At the least, it needs to be banned in any amount in any vaping products, and we encourage this position to be presented to policy makers.

The Problem

Boojum Med, along with many other processors in the Utah market, have had products held up in testing at two Utah labs for two weeks now. We've been told that it is due to THC-O being found, but have been told it cannot be quantified. We have spoken to experts across the country, and not one has been able to tell us that THC-O could be an accidental byproduct of extraction (or distillation). It is well-known among researchers and testing labs in more mature markets of the industry that THC-O is an artificial cannabinoid synthesized through acetylation, and no researcher or paper we could find suggested it could be made otherwise, especially accidentally.

The Solution

We had our sample independently tested, and were told it had no *quantifiable* amount of THC-O, or in other words, the THC-O levels were below the LOQ, or Limit of Quantitation and thus indistinguishable from machine noise. Our sample came back with small chromatogram peaks at concentrations of 0.086% and 0.0027%, where Δ8-THC-O and Δ9-THC-O are traditionally found (a quick reminder that we do not produce any form of Δ8-THC at our facility). However, this was well below the LOQ or 0.2%, which the lab considered reportable. **According to the lab director - and the other experts we've spoken with - this concentration is also below the lowest calibration point, meaning it is not indicative of there being THC-O in the samples at all, but rather interference due to machine noise**. An "LOQ is the lowest concentration at which an analyte can not only be reliably detected but at which predefined goals for bias and imprecision are met"[1], and tells us that trends in the data are real and not just simply the result of machine noise. Many states, in fact, consider a detected result under the LOQ to be legally unreportable, as it is not scientifically accurate. ([1] *Armbruster and Pry 2023*)

We have no idea what amounts of THC-O are being detected in our products as we have yet to be given any quantifiable data by Utah labs, but we are willing to bet that it is below the LOQ, based on our confidence in our products and processes, and what we know of THC-O synthesis pathways.

Until more research is conducted on the health repercussions of THC-O, we believe it should remain illegal. That said, we recommend that the policy makers be advised to change the wording of R68-29-7(2)(c) from "*it is found to contain a detectable amount of any of the artificially derived cannabinoids listed*" to instead state that anything above the LOQ should fail. This ensures that no THC-O makes it into the market, while also accounting for discrepancies in testing protocols and false positives due to background noise.

<u>Resources</u>

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