

Testimony for Plain Jane

My name is Matt Guenther; I am the Co-Founder of the American Cannabinoid Association and I currently serve as the primary Chemical and Legislative Consultant for Plain Jane, LLC located in Medford, Oregon. I am submitting testimony pertaining to HB3000 which specifies Delta-8 and has the potential to impact the future of the Cannabinoid Industry throughout Oregon.

The purpose of the American Cannabinoid Association is to provide educational and legislative resources to members and affiliates of the Cannabinoid Industry. This includes retailers, wholesalers, farmers, processors, law firms, law enforcement professionals and the regulatory agencies that have been tasked with crafting the regulations and laws for our emerging industry.

This Association was founded with the intention of protecting the research, development, commerce and legislation pertaining to the industry. This includes the plant *Cannabis sativa* L., its chemical components and their federally protected derivatives. After over 70 years of scientifically invasive prohibition, Congress has finally provided us with an opportunity to cultivate the industrial, economic and medicinal potential of the Cannabis plant in its entirety. In order to fully realize the potential of this opportunity, we must work together to move the Cannabinoid Industry forward as safely and effectively as is possible.

I have reviewed the information provided by the OLCC regarding Delta-8-THC and find their positions to run parallel to the interests of our Association. We firmly believe that the language provided in the 2018 Farm Bill clearly established the legislative intent of Congress and are very content with the opportunity to pursue research and development throughout the Cannabinoid Industry. We are excited to see some of these minor cannabinoids be commercialized in a way that benefits Farmers, Entrepreneurs and Consumers; we firmly believe that these minor cannabinoids should be regulated by the Department of Agriculture and remain part of the Hemp Program as was intended by the 2018 Farm Bill. With that being said, our Association is firmly committed to following positions:

- We support age restrictions that would only allow these products to be purchased and/or sold by individuals aged 21 years or older
- We support limiting the concentration of edible products to no more than 25mg total Delta-8-THC per individual unit and no more than 200mg total Delta-8-THC per retail package; and
- We support regulatory standards that will allow qualified producers to continue manufacturing Delta-8-THC in high purity concentrations (85% or higher) for use in consumer products.

We understand that this issue has become a cause of concern due to the mislabeling, misinformation and deceptive marketing practices of a select group of individuals throughout the industry. It has become greatly concerning to see businesses advertise Delta-8-THC as an alternative to Delta-9-THC. This is not only ethically irresponsible but also scientifically inaccurate.

When properly produced, labeled and sold in the proper concentrations, Delta-8-THC has proven itself to be a safe and effective adult-use product that can greatly benefit the consumer and the economy in a way that Delta-9-THC cannot. This is because while seemingly similar in chemical structure, a true scientific breakdown shows an undeniable difference between these two compounds. From personal experience I can safely state that Delta-8-THC should not be equated to Delta-9-THC in structure or effect. Included at the end of this testimony is some more information about Delta-8-THC that I have provided in the past for various presentations. This will show some of the profound differences in the 3-dimensional molecular geometries and electronic structures of seemingly related cannabinoids in a manner which is rarely if ever discussed.

We firmly agree that the inexcusable actions of a select few have created a need to address this issue immediately. We only ask that this attention to the issue results in viable regulatory framework from the Department of Agriculture which will allow the Hemp Industry to thrive and prosper within the State of Oregon. An overcorrection of the issue at hand will indubitably result in disastrous social, economic and agricultural consequences. We greatly appreciate the time and consideration and we look forward to working together to establish a system that can serve as an example for other States in the future.

Respectfully submitted,

Matthew Guenther

Co-Founder of the American Cannabinoid Association

Delta-8-THC: An Overview

Matt Guenther

Plain Jane, LLC

Outline

- A Brief History of Delta-8-THC
- What is “Chemical Structure”
- 2-Dimensional Molecular Geometries
- 3-Dimensional Molecular Geometries
- Molecular Electrostatic Potential of Phytocannabinoids
- Production and Rearrangement via Isomerization
- Lab Testing
- Pharmacological Implications
- Contact Information

A Brief History of Delta-8-THC

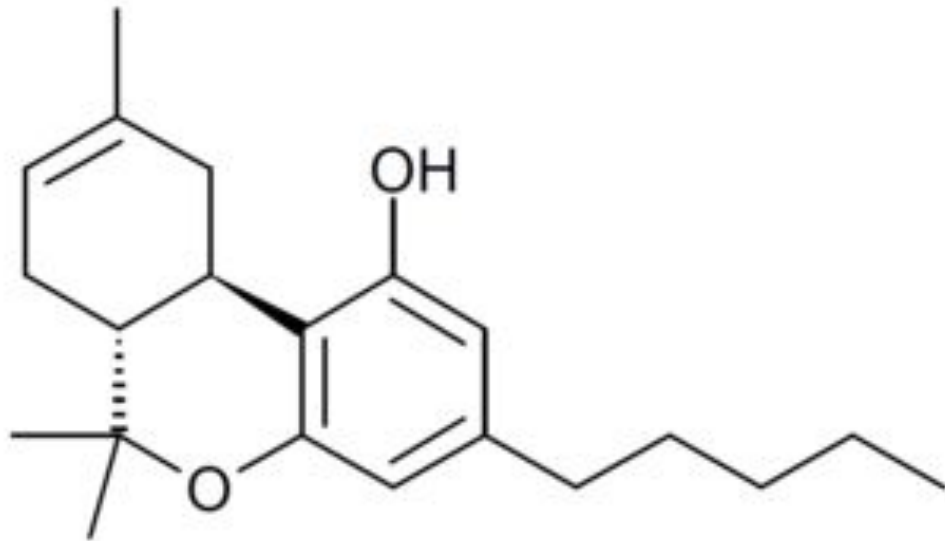
- First reported by the University of Illinois in the early 1940s
 - Isomerism from Cannabidiol
 - Considered a partial isomerization by modern standards
 - Human Volunteers were used to begin studying the effects shortly thereafter
- More developments throughout the 1960s
 - The chemical structure of Delta-8-THC isolated from Cannabis was characterized using modern methods
 - More complete, stereospecific methods of production begin to appear

What is “Chemical Structure”

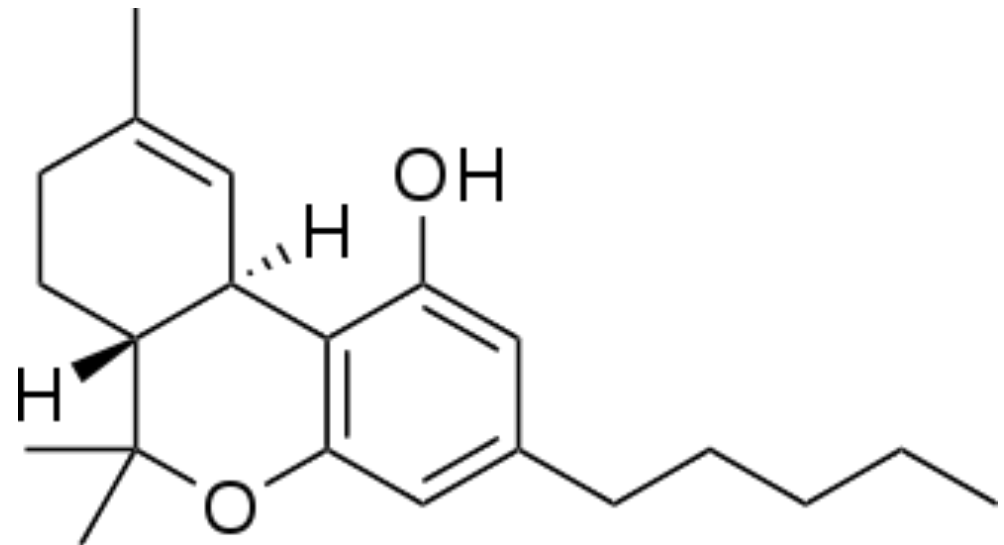
- There are three primary components to chemical structure
 - Molecular Geometry
 - The three-dimensional arrangement of the atoms that constitute a molecule
 - Includes shape, bond length, bond angles and torsional angles
 - Offers 2-Dimensional and 3-Dimensional geometric representations of the molecule
 - Most commonly associated with “chemical structure”
 - Electronic Structure
 - The state of motion of electrons in an electrostatic field
 - Molecular Electrostatic Potential is a convenient way of displaying similarities and differences in electronic structure
 - Crystal Structure
 - How the molecules are arranged within a crystalline structure
 - Polymorphism

2-Dimensional Molecular Geometry

Delta-8-THC

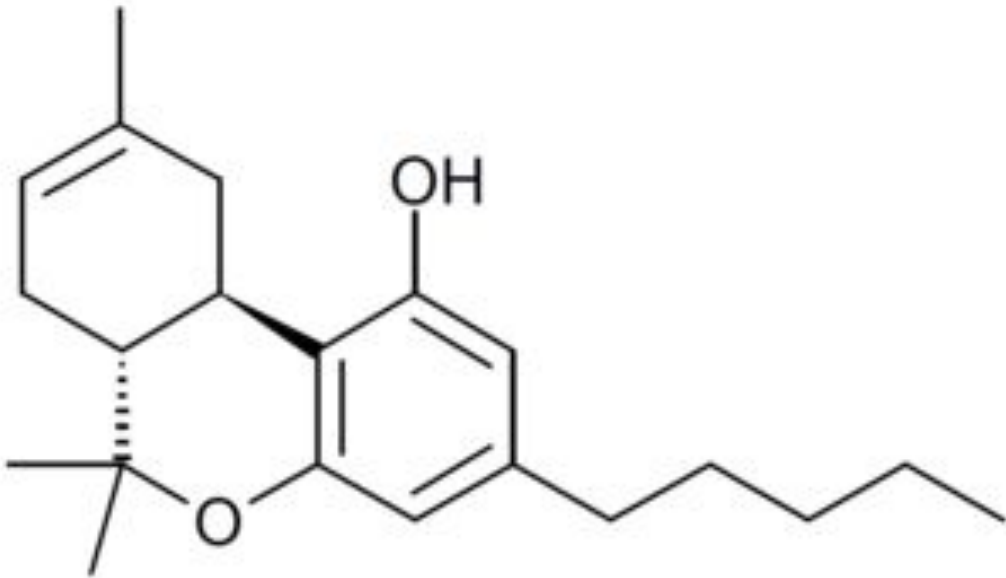


Delta-9-THC

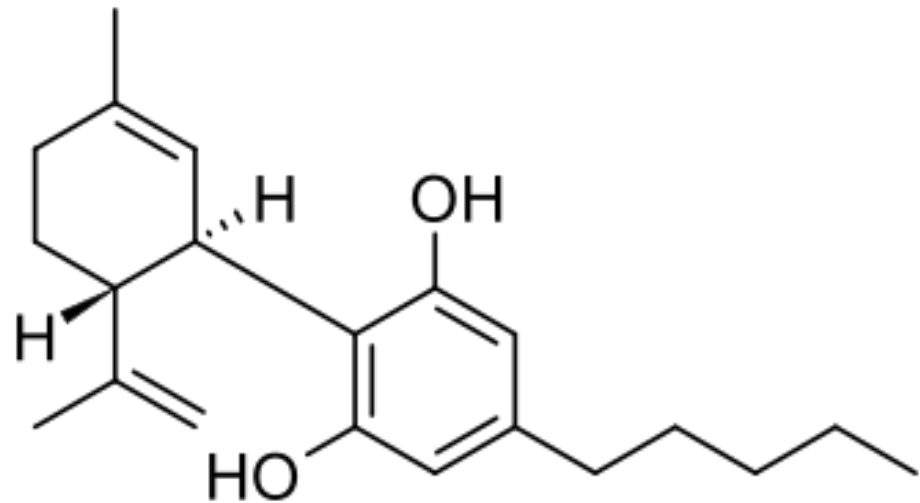


2-Dimensional Molecular Geometry

Delta-8-THC

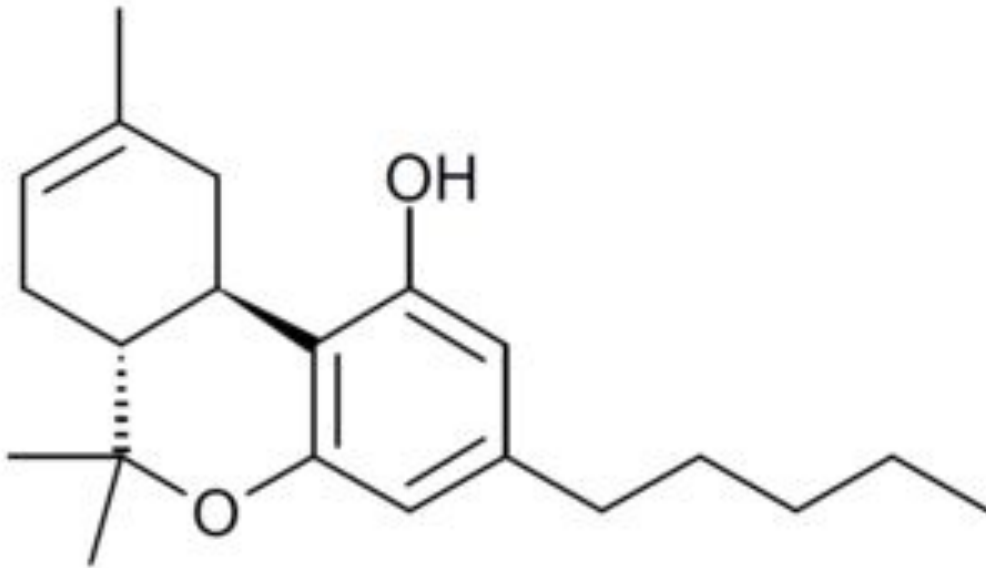


Cannabidiol (CBD)

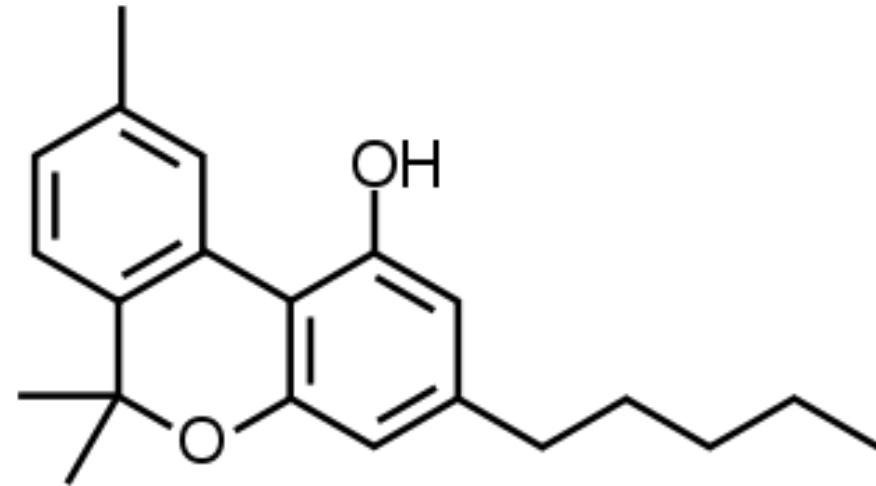


2-Dimensional Molecular Geometry

Delta-8-THC

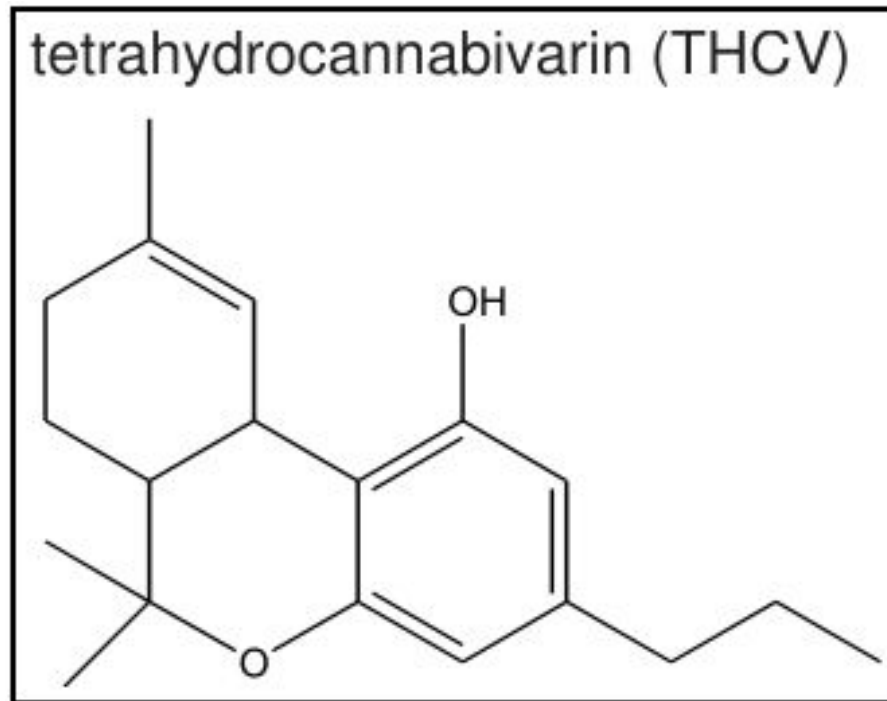


Cannabinol (CBN)

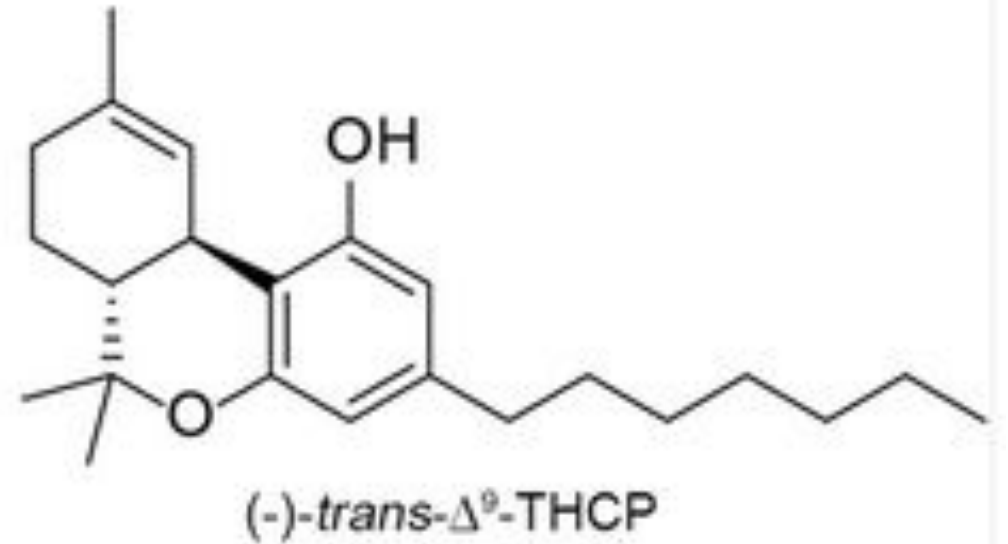


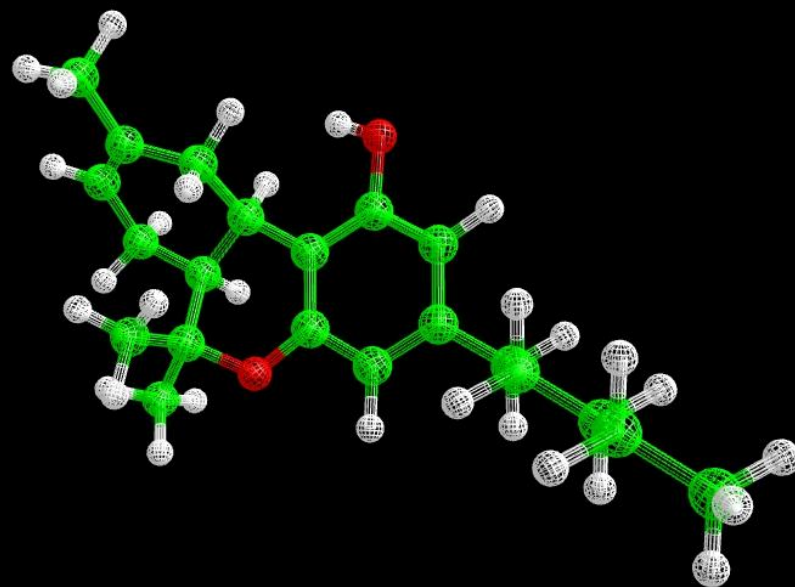
2-Dimensional Molecular Geometry

Delta-9-THCV



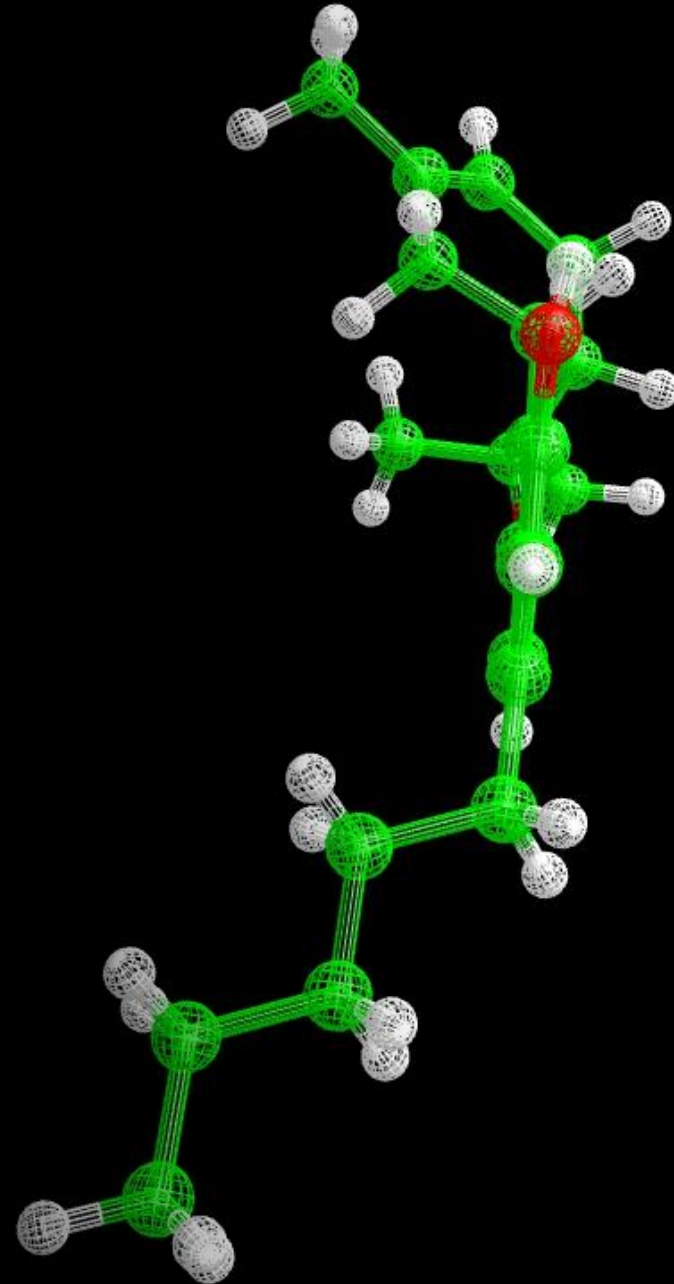
Delta-9-THCP

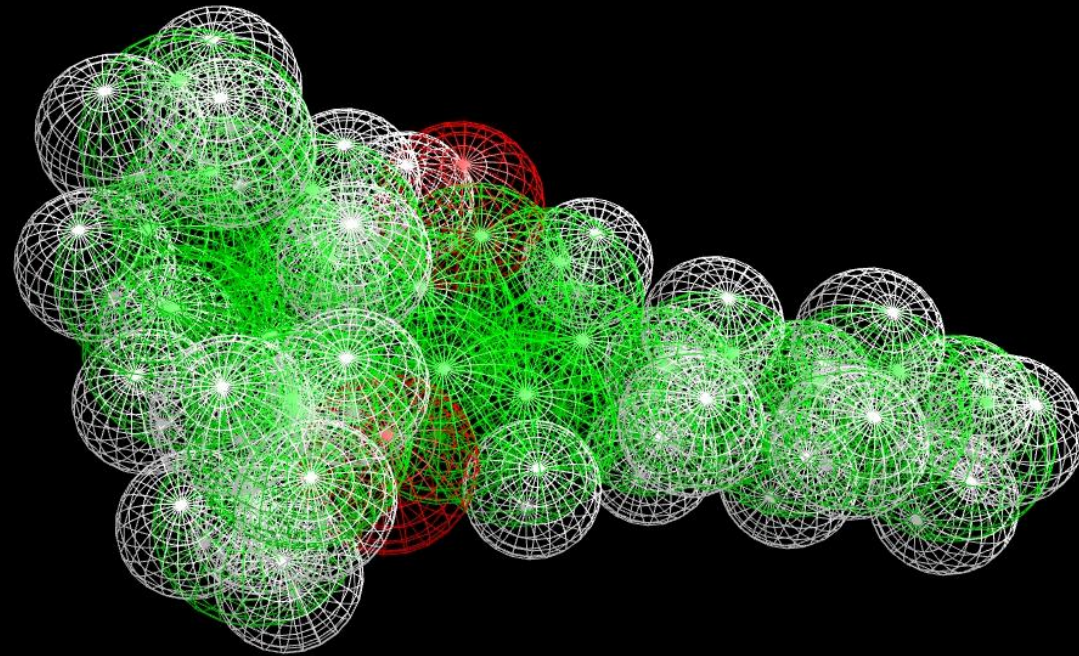




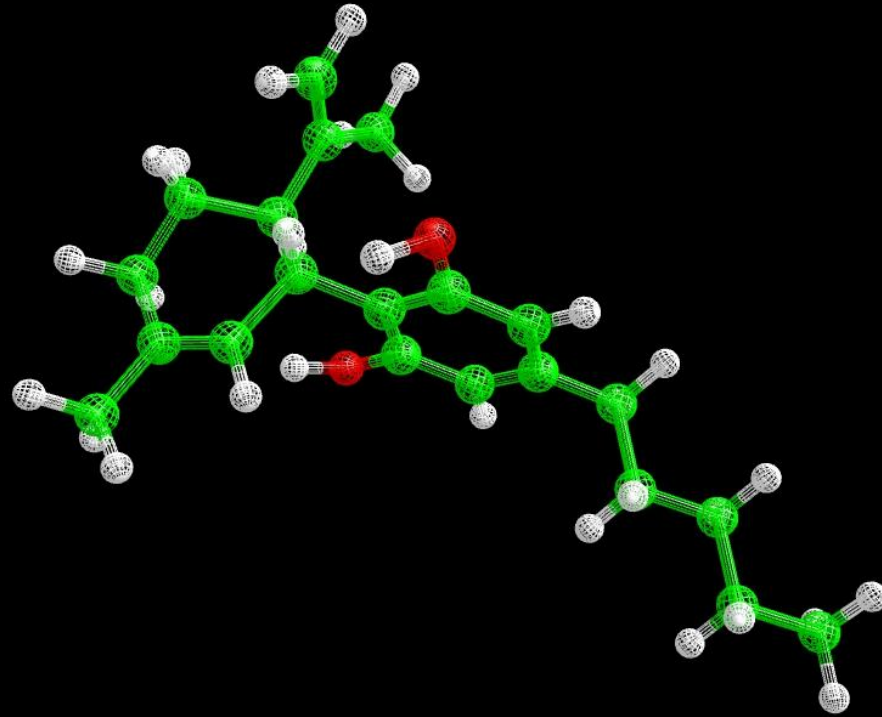
3-Dimensional Molecular Geometry of Delta-8

3-Dimensional
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Delta-8

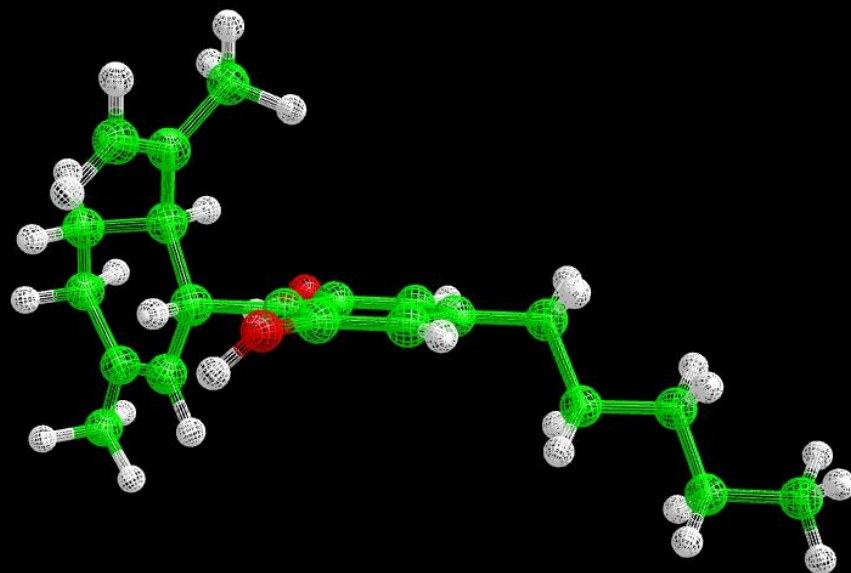




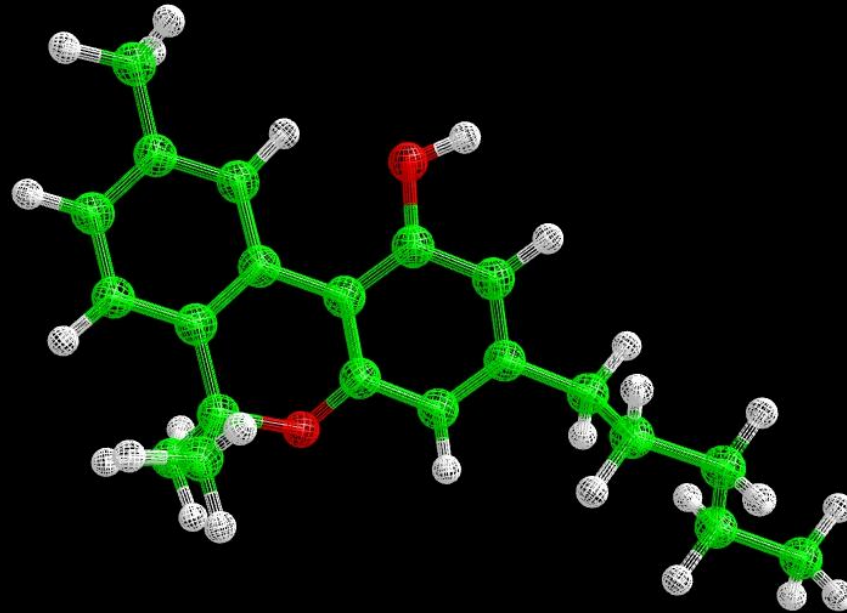
CPK Wire of Delta-8-THC



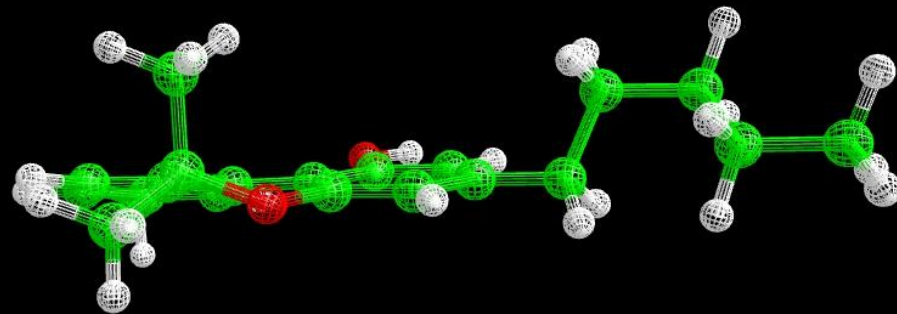
3-Dimensional Molecular Geometry of CBD



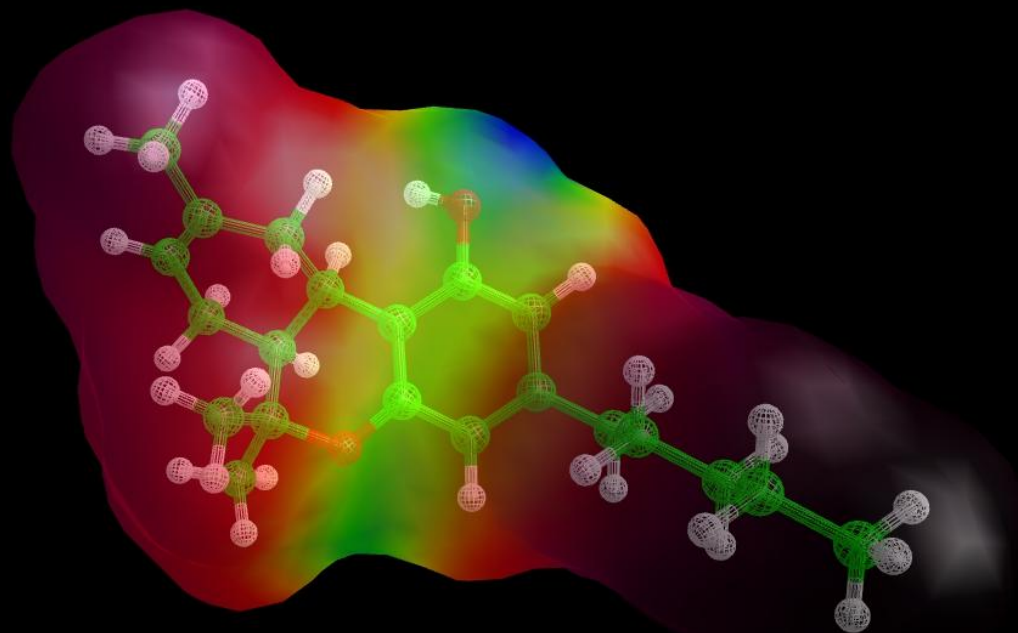
3-Dimensional Molecular Geometry of CBD (Flat)



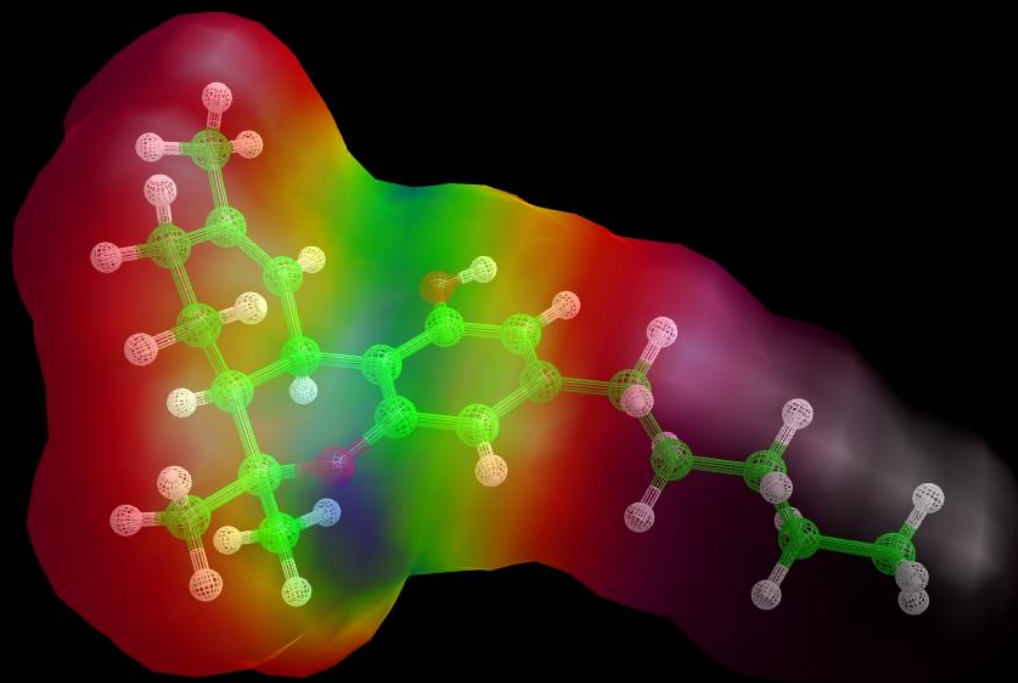
3-Dimensional Molecular Geometry of CBN



3-Dimensional Molecular Geometry of CBN (Flat)



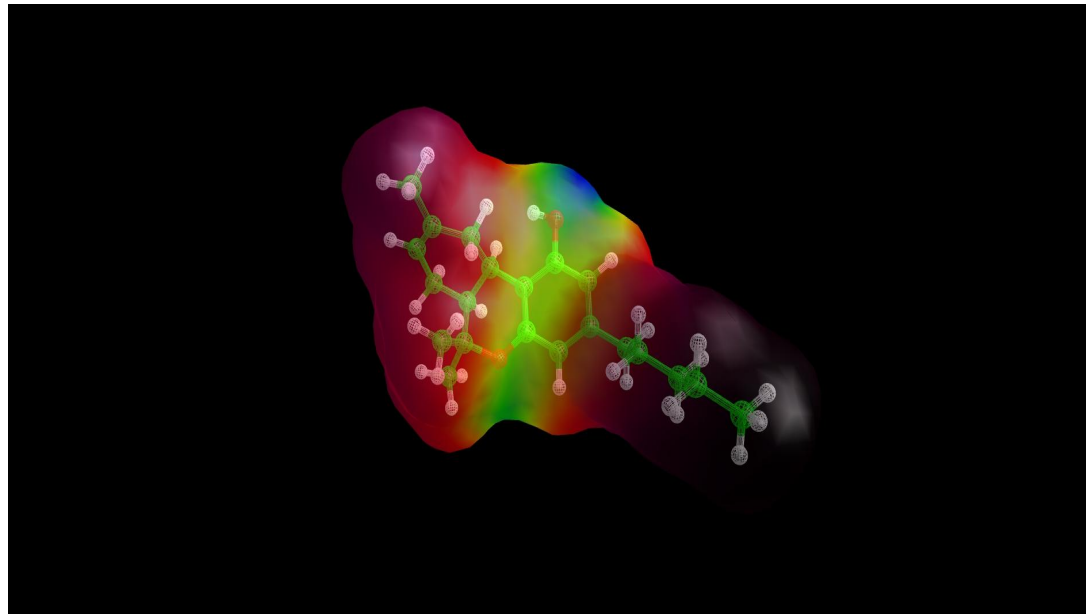
Molecular Electrostatic Potential of Delta-8



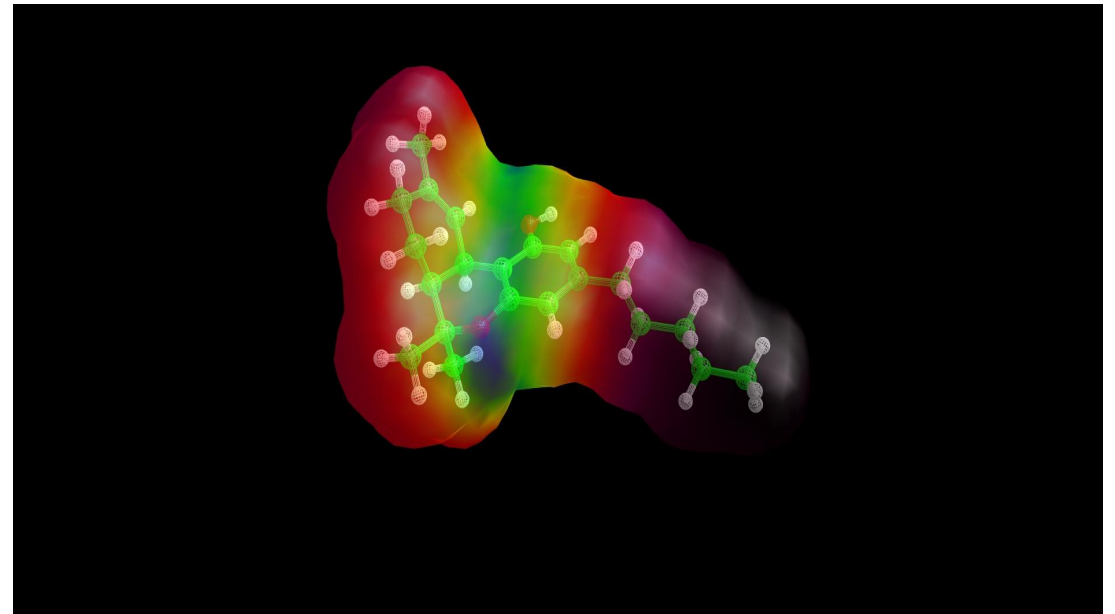
Molecular Electrostatic Potential of Delta-9

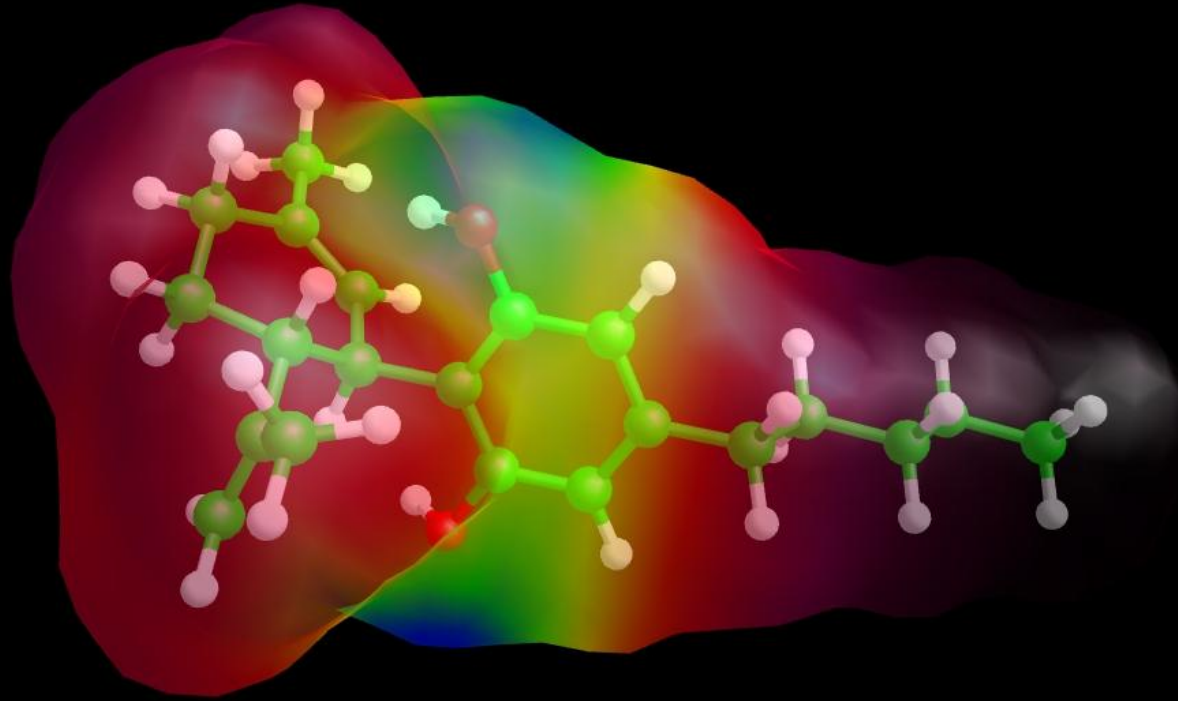
Comparing Electronic Structures

Delta-8-THC

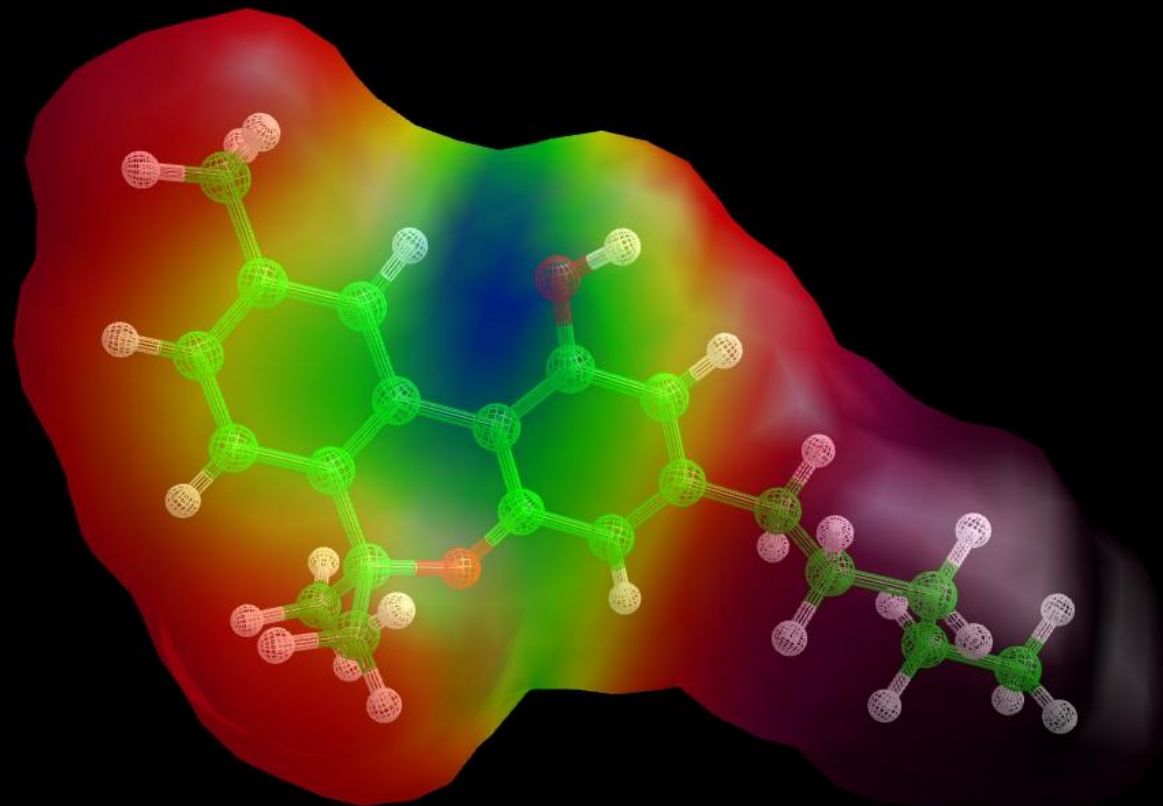


Delta-9-THC





Molecular Electrostatic Potential of CBD



Molecular Electrostatic Potential of CBN

Production and Rearrangement via Isomerization

- Delta-8-THC, Delta-9-THC and CBD are all “isomers” of one another
 - This means they all have the same number of the same individual atoms contained within their molecules
 - These three compounds are all characterized by the Formula $C_{21}H_{30}O_2$
- CBN is chemically related to those three isomers but has the Formula $C_{21}H_{26}O_2$
- As isomers, they can spontaneously rearrange themselves depending on environmental conditions

Current Methods of Production

- Multiple different routes can obtain nearly identical results
- Hemp-derived production of Delta-8 begins with the isolation of CBD from Hemp
- Generally involves pH modulation
- When CBD exists in an acidic environment and in the presence of the right conditions, it spontaneously isomerizes into a combination of tetrahydrocannabinols
- Different acids, catalysts and post-wash methodologies will all contribute to the final color of the product

Lab Testing

- Most labs are currently testing using some form of Chromatography combined with Mass Spectrometry
- Chromatography is used to separate a mixture
 - A mixture is dissolved in a fluid (mobile phase) and carries it through a column (stationary phase)
 - Different compounds have different affinities for the stationary phase, resulting in separation due various retention times
- Mass Spectrometry is used for identification
 - Ionizes the sample, allowing us to piece together the “fragments” and successfully determine the structure of a compound
- Many labs switched from GC/MS to LC/MS due to the unintentional decarboxylation of THCA into Delta-9-THC associated with that testing methodology

Issues with Lab Testing

- Delta-8-THC and Delta-9-THC have very similar retention times and post-ionization molecular fragments
 - As a result, many labs have had issues with erroneously reporting Delta-8-THC as Delta-9-THC
- Drug Testing
 - When sent in for lab analysis, it should confirm the presence of Delta-8-THC as opposed to Delta-9-THC
 - **HOWEVER!!!** If a testing facility has not been properly calibrated for the detection of Delta-8-THC *as well as its metabolites*, it could result in a false, false positive

Pharmacological Implications

- Delta-8-THC and Delta-9-THC are both classified as CB1 and CB2 receptor agonists
- Delta-8-THC has a K_i (inhibitory constant) of 44nm at both the CB1 and CB2 receptors
 - Delta-9-THC has a K_i of 10nm at the CB1 receptors and 24nm at the CB2 receptor
 - This makes Delta-8-THC significantly less psychotropic than Delta-9-THC
- Our knowledge of cannabinoid-based pharmacology is in its infancy
 - Science has yet to adequately model our endocannabinoid systems
 - More research into poorly understood cannabinoid receptors such as GPR18, GPR55 and GPR119 must be conducted

Contact Information

- For more information about Delta-8 the molecule and product formulation, please reach out to me at matt@delta8.science
- For more information about the ACA and our upcoming initiatives, please email the Hemp Industry Association directly and cc matt@americancannabinoids.org
- For more information about commercializing your endeavors with a vertically integrated hemp company, please contact me at matt@industrialhempfarms.com