



By Aruna Earla, Ph.D.



Advancing Cannabinoid Therapeutics: A Synthetic Revolution

Innovative Solutions for Purified Cannabinoids in R&D

The growing use of cannabinoids in scientific and medical research has underscored a critical industry need: large quantities of highly purified cannabinoids to support analytical standards, clinical trials, and the development of novel therapies. As cannabis legalization expands globally, researchers and manufacturers face significant challenges with plant-derived cannabinoids, including variability in quality, scalability issues, and regulatory complexities.

To meet this pressing need, synthetic production offers a transformative solution. With precise multi-step processes, cannabinoids can be produced with unparalleled purity and consistency, making them ideal for analytical-grade standards and clinical research. Synthetic production also eliminates the limitations of plant-derived methods, ensuring reliable access to critical compounds for evaluating biological activity and potential therapeutic applications.

By pioneering innovative synthetic processes, the industry is empowered to explore cannabinoid-based treatments with greater efficiency, supporting advancements in healthcare and unlocking new possibilities in drug development.

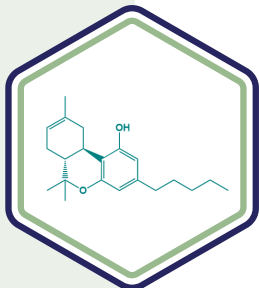
Aruna Earla, Ph.D., has approximately 20 years of experience in pharmaceutical research, development, and manufacturing within the CRO and CDMO sectors. As Director of AP R&D, She oversees API process development, specializing in cannabinoids and psychedelics.

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SUMMARY

Benuvia has innovated production processes for minor cannabinoids, including delta-8-THC, cannabinol (CBN), cannabigerol (CBG), cannabichromene (CBC), cannabidivarin (CBDV), and tetrahydrocannabidivarin (THCV), within a GMP-compliant environment. These advancements make the cannabinoids suitable for FDA-regulated clinical trials and also available as GLP material for preclinical toxicology studies or non-GMP research-grade material, addressing critical industry needs for quality and consistency.



**IUPAC Chemical Name**

(6aR,10aR)-6,6,9-trimethyl-3-pentyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromen-1-ol

Common Synonyms

Delta-8-THC, Delta-8-Tetrahydrocannabinol

CAS Number

5957-75-5

DEA Schedule

Schedule I

Controlled Substances**Code Number (CSCN)**

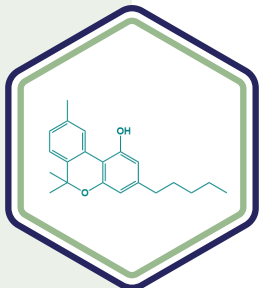
7370

Delta-8-Tetrahydrocannabinol (Δ 8-THC)

Delta-8-THC is an isomer of delta-9-THC, differing by the position of a double bond in its structure. Known for its milder psychoactive effects compared to Δ 9-THC, Δ 8-THC is being studied for potential benefits in antiemesis, anxiolysis, appetite stimulation, analgesia, and neuroprotection. It binds to CB1 receptors similarly to Δ 9-THC but with less potency, resulting in reduced psychoactive effects. Δ 8-THC can be produced under GMP conditions, making it suitable for FDA-regulated clinical trials.

At Benuvia, Δ 8-THC is synthetically produced and available as ICH-compliant GLP material for preclinical toxicology studies or as non-GMP research grade material.



**IUPAC Chemical Name**

6,6,9-trimethyl-3-pentyl-benzo[c]
chromen-1-ol

Common Synonyms

CBN, Cannabinol

CAS Number

521-35-7

DEA Schedule

Not Scheduled

Controlled Substances**Code Number (CSCN)**

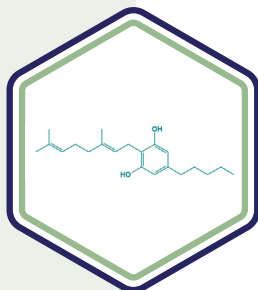
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Cannabinol (CBN)

Cannabinol (CBN) is a mildly psychoactive cannabinoid present in cannabis, typically formed through the oxidation of THC. It has been researched for its sedative effects and potential antibacterial properties. CBN interacts with CB1 and CB2 receptors, though with less affinity than THC.

CBN can be produced under GMP conditions, making it suitable for FDA-regulated trials. CBN is synthetically produced and available as GLP material for preclinical toxicology studies or as non-GMP research grade material.



**IUPAC Chemical Name**

(E)-2-(3,7-dimethylocta-2,6-dien-1-yl)-5-pentylbenzene-1,3-diol

Common Synonyms

CBG, Cannabigerol

CAS Number

25654-31-3

DEA Schedule

Not Scheduled

Controlled Substances

Code Number (CSCN)

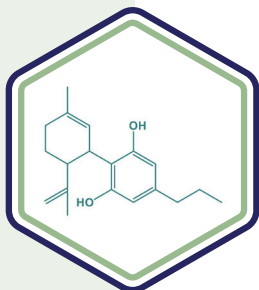
NA

Cannabigerol (CBG)

Cannabigerol (CBG) is a non-psychoactive cannabinoid found in cannabis plants, often referred to as the “mother of all cannabinoids”. Although it is typically present in low concentrations, CBG is gaining attention for its potential therapeutic benefits, including analgesic, anti-inflammatory, and neuroprotective effects. CBG interacts with the body’s endocannabinoid system, binding to CB1 and CB2 receptors, though with less affinity than THC. It is also known to act on other receptors, contributing to its diverse pharmacological actions.

At Benuvia, CBG is synthetically produced and available as GLP material for preclinical toxicology studies or as non-GMP research grade material.





IUPAC Chemical Name

2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-en-1-yl]-5-pentylbenzene-1,3-diol

Common Synonyms

CBDV, Cannabidivarin

CAS Number

24274-48-4

DEA Schedule

Not Scheduled

Controlled Substances

Code Number (CSCN)

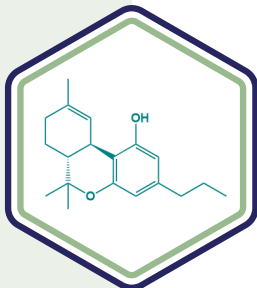
NA

Cannabidivarin (CBDV)

Cannabidivarin (CBDV) is a non-psychoactive cannabinoid found in the Cannabis plant, structurally like CBD. It has been studied for its potential in treating epilepsy and autism spectrum disorders. CBDV exhibits anticonvulsant properties and is being explored for its effects on neurodevelopmental disorders.

At Benuvia CBDV is produced in GMP-compliant facilities, ensuring its quality for FDA-regulated human trials. It is synthetically produced and available as GLP material suitable for preclinical toxicology studies or as non-GMP research grade material.



**IUPAC Chemical Name**

6,6,9-trimethyl-3-pentyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromen-1-ol

Common Synonyms

THCV, Tetrahydrocannabivarin

CAS Number

31262-37-0

DEA Schedule

Schedule I

Controlled Substances**Code Number (CSCN)**

7370

Tetrahydrocannabivarin (THCV)

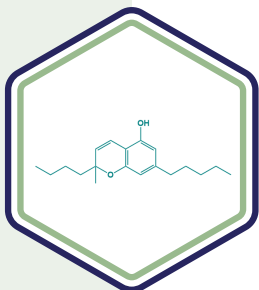
Tetrahydrocannabivarin (THCV) is a cannabinoid found in cannabis, like THC but with different effects, such as appetite suppression and potential antipsychotic properties. THCV acts as a CB1 receptor antagonist at low doses and a CB1 receptor agonist at higher doses, contributing to its unique pharmacological profile. It is produced under GMP conditions, suitable for FDA-regulated clinical trials.

THCV is synthetically produced and available as GLP material suitable for preclinical toxicology studies or as non-GMP research grade material.





CANNABINOIDS API WHITEPAPER



IUPAC Chemical Name

2-Methyl-2-(4-methylpent-3-enyl)-7-pentyl-5-chromenol.

Common Synonyms

CBC

CAS Number

20675-51-8

DEA Schedule

Not Scheduled

Controlled Substances

Code Number (CSCN)

NA

Cannabichromene (CBC)

Cannabichromene (CBC) is a non-psychoactive cannabinoid with significant therapeutic potential, including anti-inflammatory, analgesic, and neuroprotective effects. It has unique properties compared to other cannabinoids like THC and CBD. CBC interacts distinctively with the endocannabinoid system by modulating enzyme expressions and inhibiting the reuptake of anandamide, potentially offering benefits in managing pain, inflammation, and other health conditions without directly activating cannabinoid receptors.

At Benuvia, CBC is synthetically produced and available as GLP material for preclinical toxicology studies or as non-GMP research-grade material.

ABOUT BENUVIA

Benuvia Operations, LLC is a global Contract Development and Manufacturing Organization (CDMO) that helps pharmaceutical, and biotech companies deliver life-changing therapies to patients in need. The company provides end-to-end development and manufacturing services for

Active Pharmaceutical Ingredients (APIs) and finished dosage products and has extensive experience with cannabinoids, psychedelics, and other controlled substances. Benuvia operates an 83,000 square foot, best-in-class manufacturing facility in Round Rock, Texas that can produce Schedule

I-V compounds, offering comprehensive solutions for companies throughout the entire drug development lifecycle—from API Process Development, clinical trial supply to commercial production.

Visit us at www.benuvia.com

