Detecting THC Metabolites and other Cannabinoids

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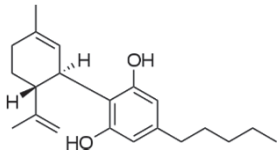
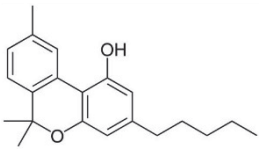
Introduction

Of the roughly 80 cannabinoids, delta-9-tetrahydrocannabinol (Δ9-THC) is the primary psychoactive molecule found in cannabis plants. In the first part of this study, Δ9-THC and its metabolites 11-hydroxy-Δ9-THC and 11-nor-9-carboxy-Δ9-THC are detected using a simple HPLC gradient. In the second part of this study, delta-8-tetrahydrocannabinol (Δ8-THC) and Δ9-THC are baseline separated. Δ8-THC is an isobaric isomer of Δ9-THC that differs by the position of a double bond. It has lower psychoactive potency, more chemically stable, and potentially better medicinal properties than Δ9-THC. Cannabinol (CBN) is used to monitor the freshness of the sample since Δ9-THC easily oxidizes to CBN. Cannabidiol (CBD) has no psychoactive activity but it has many potent medicinal properties. These four cannabinoids, CBD, CBN, Δ9-THC, and Δ8-THC were analyzed by two different HPLC columns. The C18 column produced co-eluting peaks of Δ9-THC and Δ8-THC. The COSMOCORE Cholester has rigid cholesterol functional groups that produces higher steric selectivity to resolve Δ9-THC and Δ8-THC peaks. The peak shapes were symmetrical using MS-compatible solvents as the mobile phase.

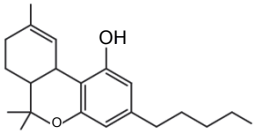
Cannabinoid Structures



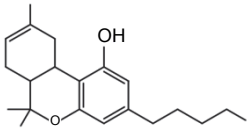
Cannabidiol (**CBD**)



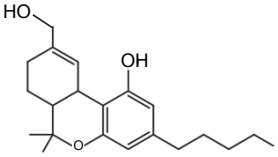
Cannabinol (**CBN**)



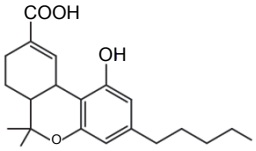
Δ9-Tetrahydrocannabinol (**Δ9-THC**)



Δ8-Tetrahydrocannabinol (**Δ8-THC**)



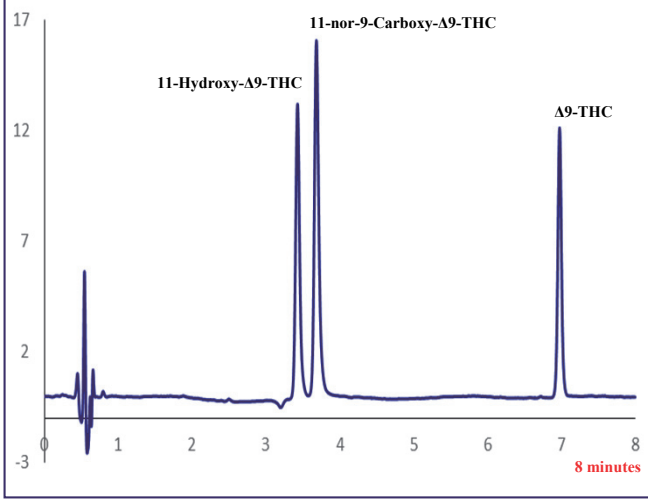
11-Hydroxy-Δ9-THC



11-nor-9-Carboxy-Δ9-THC

Δ9-THC Metabolites - 11-Hydroxy-Δ9-THC and 11-nor-9-Carboxy-Δ9-THC

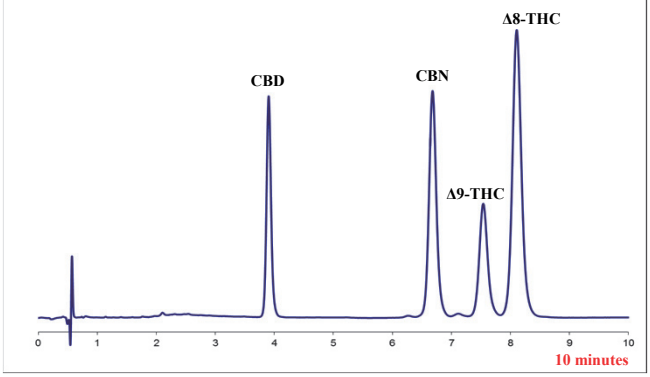
Columns: COSMOCORE Cholester
Column size: 2.1 mmI.D. x 100mm, 2.6 µm core-shell particles
Flow rate: 0.4 mL/min
Temperature: 30 °C
Detection: UV 220 nm
Mobile phase: linear gradient A: 0.1% acetic acid in H_2O B: acetonitrile
0min 45A:55B 8min 0A:100B
Data Process: Blank subtraction performed



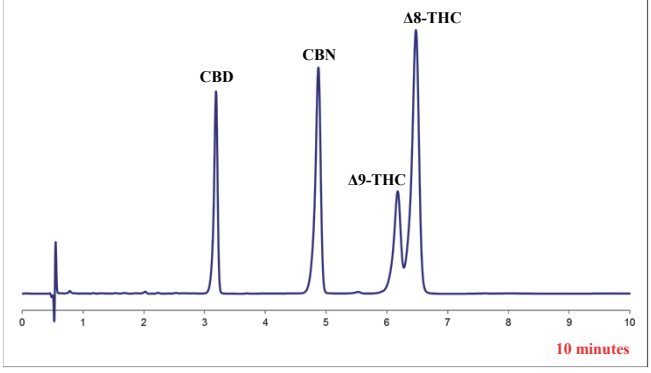
Cannabinoid Mixture Separation

Columns: COSMOCORE Cholester vs. a popular-brand C18
Column size: 2.1 mmI.D. x 100mm, 2.6 µm core-shell particles
Mobile phase: isocratic 35:65 0.1% acetic acid : acetonitrile
Flow rate: 0.4 mL/min
Temperature: 30 °C
Detection: UV 220 nm

COSMOCORE Cholester core-shell



A popular-brand C18 core-shell



Conclusion

- Simultaneous detection of Δ9-THC, 11-hydroxy-Δ9-THC and 11-nor-9-carboxy-Δ9-THC on one single gradient HPLC run
- COSMOCORE Cholester achieved baseline separation of the cannabinoid mixture in under 9 minutes using MS-friendly isocratic mobile phase
- Because of the rigid cholesteryl functional group, COSMOCORE Cholester exhibits greater shape selectivity than C18 for geometric isomers
- Other geometric isomers can be separated by COSMOCORE Cholester, e.g. vitamin D_2 and D_3