

VAPING CANNABINOID ACETATES LEADS TO KETENE FORMATION

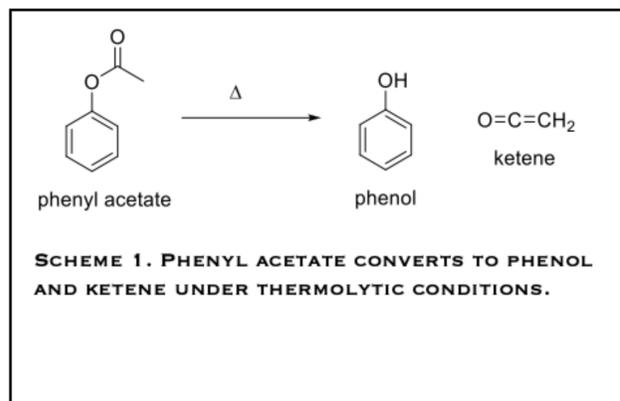
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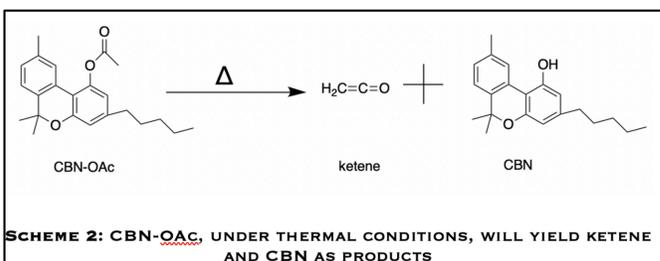
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ABSTRACT

POTENTIAL KETENE FORMATION FROM Δ^8 -THC ACETATE, AS WELL AS OTHER CANNABINOIDS ACETATES, CBN ACETATE AND CBD ACETATE, UNDER VAPING CONDITIONS WAS INVESTIGATED. KETENE WAS CONSISTENTLY OBSERVED IN VAPED CONDENSATES FROM ALL THREE ACETATES AS WELL AS FROM A COMMERCIAL DELTA-8 THC ACETATE PRODUCT PURCHASED ONLINE.



INTRODUCTION



THC ACETATES ARE SEMI-SYNTHETIC PSYCHOACTIVE CANNABINOIDS OBTAINED VIA ACETYLATION OF THE CANNABINOID PHENOL MOIETY.¹ THE ACETYLATION REACTION IS ANALOGOUS TO THAT USED FOR THE TRANSFORMATION OF MORPHINE TO HEROIN, TO AFFORD INCREASED LIPOPHILICITY AND BLOOD BRAIN BARRIER PERMEABILITY.³ Δ^8 -THC, AN UNREGULATED ISOMER OF Δ^9 -THC, ALONG WITH ITS ACETATE DERIVATIVE (Δ^8 -THC-OAc, FIGURE 1), HAVE BECOME INCREASINGLY AVAILABLE, PARTICULARLY IN STATES WHERE Δ^9 -THC IS ILLEGAL. HOWEVER, THERE IS A LACK OF PUBLISHED PEER-REVIEWED RESEARCH CONCERNING THE CANNABINOID ACETATES. THE HEALTH RISKS OF THESE COMPOUNDS ARE CURRENTLY UNKNOWN, DESPITE THEIR POTENCY AND READY AVAILABILITY.

METHODOLOGY & RESULTS

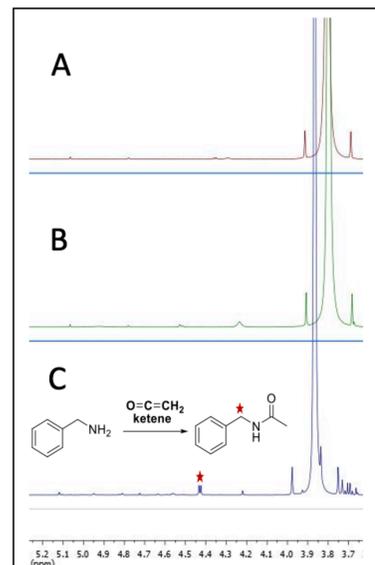


FIGURE 1. ¹H NMR SPECTRA OF: A) UNVAPED CBN-OAc; B) VAPED CBN AND C) VAPED CBN-OAc. ALL SAMPLES CONTAINED BENZYLAMINE. THE STAR INDICATES THE DOUBLET (4.43 PPM) CORRESPONDING TO THE N-BENZYLAMIDE METHYLENE PEAK. N-BENZYLAMIDE IS FORMED VIA THE REACTION OF KETENE AND BENZYLAMINE, AND IS ONLY OBSERVED IN THE VAPED CBN-OAc SAMPLE.

SAMPLES OF CBN-OAc AND CBD-OAc₂ WERE SYNTHESIZED BY DR. ROB JENSEN AND SUPPLIED BY FLORAWORKS™. THE CBN-OAc (99%) AND CBD-(OAc)₂ (95%) WERE USED AS RECEIVED. A COMMERCIAL FORMULATION CONTAINING Δ^8 -THC-OAc WAS PURCHASED FROM HYDRO-HEMP IN A PRE-PACKAGED SICKO™ BRAND VAPE CARTRIDGE AND USED AT 10 W. THE SAMPLE CONTAINED APPROXIMATELY EQUIMOLAR AMOUNTS OF Δ^8 -THC-OAc AND Δ^8 -THC, IN ADDITION TO TERPENES.

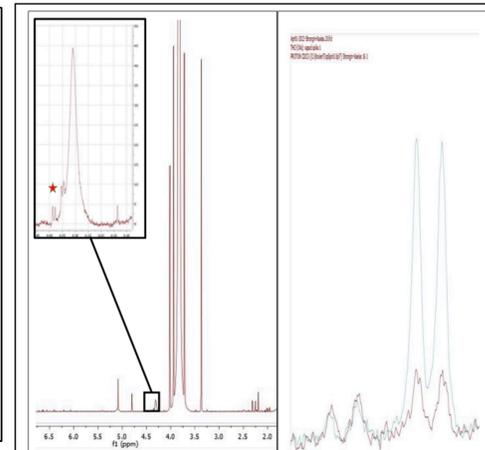


FIGURE 2. NMR SPECTRA OF THE CONDENSATE OBTAINED FROM VAPING WITH A COMMERCIAL CARTRIDGE CONTAINING Δ^8 -THC-OAc. LEFT: THE N-BENZYLACETAMIDE PEAK (STARRED, INSET) INDICATING KETENE FORMATION. RIGHT: THE LIGHT BLUE SPECTRUM CORRESPONDS TO ADDED N-BENZYLACETAMIDE STANDARD TO THE ORIGINAL NMR SAMPLE (RED), CONFIRMING THE PEAK ASSIGNMENT.

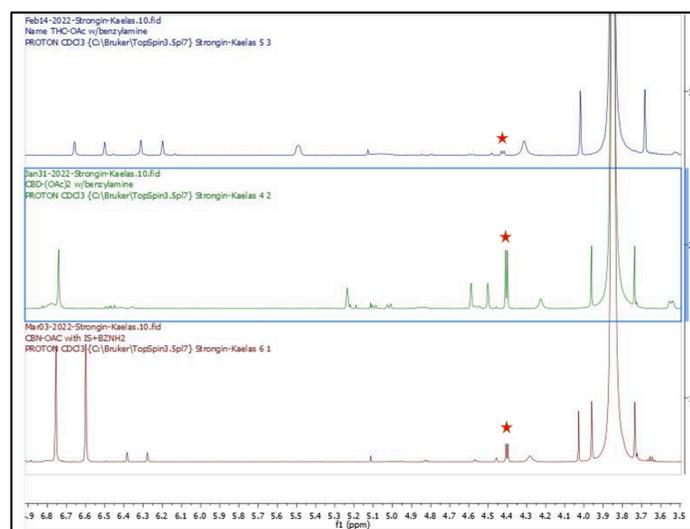


FIGURE 3. ¹H NMR SPECTRUM OF VAPED: (1) CBN-OAc, (2) CBD-OAc, (3) Δ^8 -THC-OAc. THE FORMATION OF N-BENZYLACETAMIDE WAS OBSERVED FROM DABBING EACH OF THE THREE ACETATE COMPOUNDS. THE CHARACTERISTIC N-BENZYLACETAMIDE METHYLENE PROTON PEAK IS DESIGNATED BY THE RED STAR.

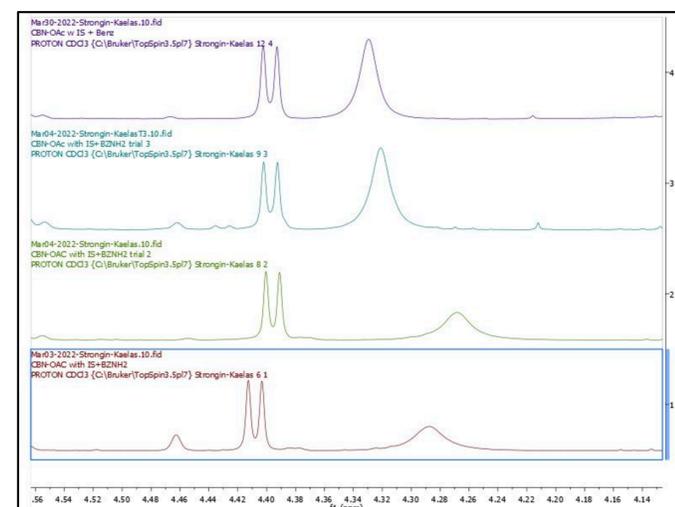
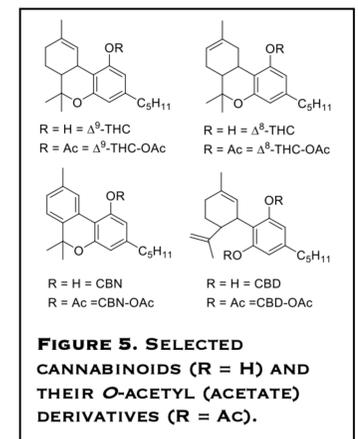


FIGURE 4: OVERLAY OF THE FOUR DIFFERENT QUANTITATIVE TRIALS THAT WERE RUN WITH CBN-OAc.

RESULTS

KETENE EMISSION AND EXPOSURE THRESHOLDS. THERE IS A LACK OF PEER-REVIEWED INFORMATION CONCERNING USER PREFERENCES AND VAPING TOPOGRAPHY REGARDING CANNABIS PRODUCTS. HOWEVER, IT IS WELL-KNOWN THAT DABBING INVOLVES LARGE INHALATION VOLUMES, APPROACHING FULL LUNG CAPACITY (~ 0.005 M³). THE 5.0 PPM THRESHOLD ESTABLISHED BY NIOSH FOR KETENE EXPOSURE EQUATES TO 8.6 MG/M³, USING 1 PPM = 1.72 MG/M³. IN A 0.005 M³ LUNG VOLUME, THE NIOSH THRESHOLD VALUE IS THUS 0.043 MG KETENE. THE 0.078 MG YIELD OF KETENE OBTAINED FROM A CBN-OAc DAB IS THEREFORE ABOVE THE NIOSH THRESHOLD. WHEN THE Δ^8 -THC-OAc SAMPLE WAS DABBED, THE AMOUNT OF KETENE PRODUCED WAS LOWER (0.022 MG).



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REFERENCES

• Munger, K., Strongin, R., and Jensen, R. (2022) Vaping Cannabinoid Acetates Leads to Ketene Formation. *ChemRxiv*.