Introduction

Schizophrenia (SZ) is a risk factor for lifetime cannabis use. As many as 80% of patients will use cannabis in their lifetime. Clinical and preclinical studies report similar patterns of altered neural oscillations linked with SZ and cannabinoid exposure. Few studies have investigated altered oscillations in a highly translational, preclinical model of cannabis use and SZ. We investigated altered neural oscillations in the neonatal ventral hippocampal lesion (NVHL) rat model after exposure to different cannabis strains.

Hypotheses

1. Cannabis vapour exposure differentially suppresses corticolumbic oscillations in NVHL rats vs. controls.
2. The presence of cannabidiol (CBD) in the vapour opposes THC effects in NVHL rats.

Methods

Sprague-Dawley rats
- SHAM rats = Artificial cerebrospinal fluid infusion
- NVHL rats = Ibotenic acid lesion of neonate ventral hippocampus

Cannabis flower
- "THC-only" vapour = 10% THC and 0% CBD
- "Balanced THC:CBD" vapour = 10% THC and 10% CBD

Target brain regions
- PFC = Prefrontal cortex
- Cg = Cingulate cortex
- NAc = Nucleus accumbens
- HIP = Hippocampus

Impact of Vaporized Cannabis Constituents on Oscillatory Activity in a Neurodevelopmental Rat Model of Schizophrenia

Results

Figure 2. NVHL rats exhibit reduced baseline spectral power, especially in the gamma range (>32-100Hz), compared to SHAM rats (C-E). THC-only vapour reduced oscillatory power in all rats (A-E). Balanced THC:CBD vapour selectively reduced oscillatory power in all rats (A-E) and in some instances enhanced power above baseline in NVHL rats (D-E). *P<0.05; **P<0.01 compared to sham control baseline.

Figure 3. NVHL rats exhibited reduced baseline coherence between HIP-Cg (A); THC-only vapour worsened NVHL HIP-NAc coherence (B), and both exposures increased NVHL Cg-PFC delta coherence (C). NVHL rats exhibited reduced HIP theta to gamma coupling compared to SHAMs (D-F). THC-only vapour enhanced coupling for all rats (D-F) and balanced THC:CBD selectively enhanced coupling, for NVHL rats more than SHAM rats (D-F). *P<0.05; **P<0.01 compared to sham control baseline.

Conclusions

- NVHL rats exhibit reduced power and coherence compared to SHAM rats.
- THC-only vapour suppresses power/coherence in SHAM rats & worsens NVHL deficits; balanced THC:CBD vapour mitigates some of the THC-only vapour induced deficits.
- Cross-frequency coupling impacted by both types of cannabis vapour, with a greater magnitude of effect in NVHL rats.
- Acute cannabis vapour exposure without CBD worsens existing neural circuit dysfunctions in the NVHL rat model of schizophrenia.