Effects of CBD/CBD-A Oral Extract on Resting-state EEG and Neuropathic Pain Symptoms After SCI

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Introduction

Neuropathic pain (NP) is one of the most common consequences associated with spinal cord injury (SCI). Current treatments are not consistently effective. Analgesic, anti-inflammatory, and anti-epileptic effects of cannabidiol (CBD) have been demonstrated in multiple clinical populations, including SCI. In our recent survey study, respondents with SCI and NP reported that cannabis, including CBD and tetrahydrocannabinol (THC), reduced their pain and their use of opioids, gabapentin and over-the-counter pain medications. However, to date the effects of CBD on neuropathic pain intensity, anxiety and electroencephalography (EEG) in participants with SCI remain still poorly understood. In this study (cross-over, double-blind, placebo-controlled phase I/II) we aim to: 1) compare changes in momentary pain intensity/unpleasantness of the worst NP and resting state EEG power between CBD/CBD-A and placebo administration; 2) explore changes in neuropathic pain symptoms severity, sensory function, state anxiety and subjective drug effects after CBD/CBD-A and placebo administration

Methods

Inclusion Criteria

-Men or women

18-64 years of age with an incomplete or complete acquired SCI

-Must have experienced neuropathic pain for a minimum of 3 months before entering the study

-Pain intensity must be in the moderate to severe category

-Must have previous experience with consuming cannabis and/or cannabinoids

Exclusion Criteria

-Current drug (DAST-10: >6) or alcohol abuse (AUDIT: >10)

-Current use of cannabis plant or cannabis products or any drugs of abuse (unless prescribed) including alcohol

-Presence of significant medical illness (e.g., diabetes, obesity, cardiovascular disease, hypertension, hepatitis) or other significant neurological trauma

-History of or current severe psychopathology (e.g., major depressive disorder, bipolar disorder, schizophrenia, post-traumatic stress disorder)

-Adults who are unable to consent, women who are pregnant, breastfeeding, or not practicing an effective form of birth control (condoms, diaphragm, birth control pill, IUD), and prisoners

-Have a history of renal or hepatic Have suicidal ideations

-Cannot abstain from the use of alcohol during the study period

-Have known or suspected hypersensitivity to cannabidiol or tetrahydrocannabinol

-Have a known or suspected hypersensitivity to sesame seed oil, lecithin, or bovine gelatin

Study timeline

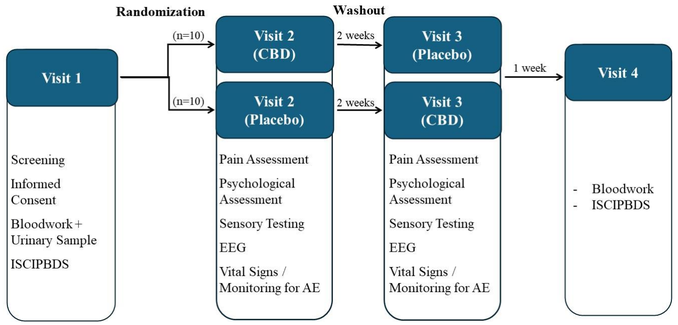

Figure 1 A: General timeline and associated assessments (described in detail under 1.3). Washout periods are indicated between visits 2 and 3 (2-weeks) and visits 3 and 4 (1-week). Abbreviations: International SCI Pain Basic Data Set (ISCIPBDS, version 3.0), Adverse Events (AE), Electroencephalogram (EEG).

Schedule

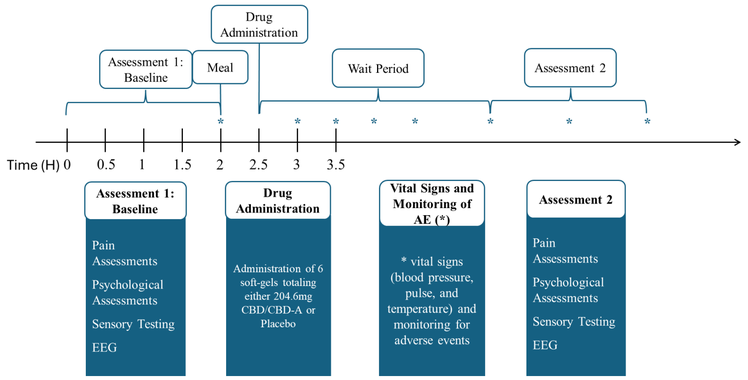

Figure 1 B: A comprehensive schedule for visits 2 and 3. Each block shows the assessments that will be conducted at that point (described in detail under 1.3). Assessment 1 is the participants baseline measurements. Following drug administration and a 3-hour wait period to ensure maximal absorption, per manufacturer we will conduct Assessment 2. The asterisk shown above the timeline indicates the time monitoring vital signs and any adverse effects. Abbreviations: Electroencephalogram (EEG).

Vital Signs and Physical (*)

Objectives:	Primary Objectives: Compare changes in momentary pain intensity and unpleasantness of the worst neuropathic pain and resting state EEG power between CBD/CBD-A and placebo administration. Secondary Objectives: Compare changes in neuropathic pain symptoms severity, sensory function, state anxiety and subjective drug effects.
Endpoints:	Primary Endpoint: Change in momentary pain intensity and unpleasantness and EEG responses between baseline and post-drug administration. Secondary Endpoints: Change in neuropathic pain symptom severity, sensory function, state anxiety, and subjective effects between baseline and post-drug administration.
Study Population:	This protocol will include 20 participants consisting of both men and women, between the ages of 18-64, and who have experienced an SCI. Participants will also have moderate to severe neuropathic pain symptoms for a minimum of three months.

Regulatory

IRB modification approved (2025)

2 participants enrolled

IND final approved (2025)

4 participants screened

Conclusions

Marijuana remains a Schedule 1 drug, requiring a lengthy regulatory process. Our IND was approved and reviewed by the UM IRB on July 1, 2024. Since then, we've submitted two major amendments to both the FDA and UM IRB. In spring, we transitioned to UM's new electronic system (Complion) and coordinated administrative updates with our clinical monitor. Due to resulting delays, our supplier (Cultivate) issued a new drug batch with slightly altered concentrations and an updated expiry. This led to a revised protocol submission to the FDA on April 10, 2025, and a new UM IRB submission on April 15, reviewed on May 19 and approved on May 21. To date we have 2 participants enrolled and we held several team meetings to clarify the protocol and prepare for swift study enrollment, covering logistics, regulations, equipment, and participant outreach.

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