Cannabidiol as a Therapeutic Alternative for Treating Systemic Lupus Erythematosus Sollenberger, John R.*, M. Dana Harriger and Abigail Maley

Division of Integrated Sciences, Wilson College, Chambersburg, PA 17201

Abstract

Millions of people worldwide suffer from inflammatory diseases and for many there are no direct cures. Systemic Lupus is one such disease, there are currently no cures and many current treatment options cause secondary effects that can be just as harmful as the disease they attempt to ease. This project hopes to look at Cannabidiol (CBD) as a therapeutic alternative to many anti-inflammatory medicines. Cannabidiol was founded in 1940 as one of the 113 cannabinoids from the cannabis plant. It has been closely related by the masses to Tetrahydrocannabinol (THC) but in reality they are very different. CBD causes no side effects after usage and has shown to be a great anti-inflammatory agent. THC is the active ingredient in Marijuana and causes intoxicating effects when used. CBD is available almost anywhere in America rather it be from a local gas station or a state run dispensary, this leads to CBD in different strengths and purities. This study will use both CBD of a medical grade purity and of a drugstore grade purity with the addition of a group with no CBD to get a baseline measurement of Lupus inflammation. Both types of CBD will be used to test the effects they have on decreasing the inflammation on mice that have been genetically modified to show symptoms of Systemic Lupus Erythematosus. Overall the results hope to continue the push for CBD to be used as a therapeutic alternative to anti-inflammatory drugs that cause secondary effects.

Background

Systemic Lupus Erythematosus (SLE)

- · Systemic Lupus Erythematosus (SLE) is an autoimmune disease that causes inflammation and chronic pain in many parts of the body.
- · SLE commonly effects skin, joints, and internal organs such as ones kidney and heart (Figure 1).
- · SLE causes extreme fatigue, pain and swelling of joints, chest paints when breathing, and swelling in the hands, feet, and around the eyes.

Systemic lupus erythematosus



Figure 1: Effects of systemic lupus erythematosus

Causes and Current Treatments for SLE

- · The immune system attacks the host tissues and organs (Figure 2).
- · Difficult to diagnose due to similarity with other illnesses.
- · Treatment options such as steroid Prednisone induce harmful side effects
- · Treatments to help control flair ups include nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, antimalarial drugs, BLvS-specific inhibitors, and immunosuppressive agents/chemotherapy.

Background (Cont)



Figure 2: Initiation and progression phases of SLE on human cells

Cannabidiol (CBD)

- · Cannabinoids bind to the G-protein coupled receptors CB(1) and CB(2).
- · CB(1) receptors are mainly found within the brain and deal with the psychoactive effects of cannabinoids, CB(2) are found on immune cells and a few neurons.
- · Cannabidiol (CBD) is one of the 113 identified cannabinoids in cannabis.
- · CBD has been used to help with inflammation, cancer cell proliferation, anxiety, and pain relief.
- · CBD can be distilled to have different purities ranging from prescription/medical purity to ones available overthe-counter

Experimental Design

- NZBWF1/J mouse model will be utilized as they exhibit an autoimmune disease that resembles human systemic lupus erythematosus.
- · Animals randomly assigned to 3 groups: 1 control which will have mice with no CBD treatment, 2 experimental groups - 1 treated with over-the-counter CBD and 1 treated with prescription level CBD (Table 1).
- · The animals will be exposed to different concentrations of CBD by oral gavage.
- · All procedures involving the care and use of animals will be approved by the Institutional Animal Care and Use Committee (IACUC).

		Control Group 1	Experimental Group 1	Experimental
Ту	ype of CBD	No CBD applied	Over-the-counter	Prescription level
	Used		CBD	CBD

Table 1: A summary of the animal research groups that will be utilized

Methods

Oral Gavage Administration

- · Maximum volume is 1% of body weight.
- · The mouse will be restrained with the head and body extended as straight as possible to facilitate introduction of the gavage needle (Figure 3).
- · The gavage needle will be inserted along the side of the mouth and into the esophagus and toward the stomach.



Figure 3: Oral gavage administration in mice

Blood Collection

· Blood will be collected from the saphenous vein in the legs of each mouse (Figure 4).

- · The mouse will be restrained for the collection. A 22 gauge needle will be introduced through the skin at a shallow angle to withdraw blood from the saphenous vein.
- Blood samples (150 200 µl) collected every 2 weeks.



Figure 4: Blood collection from the saphenous vein of a mouse

Antinuclear Antibody (ANA) Count

- · Peripheral cells are found in almost all Lupus patients and are a hallmark sign of the disease.
- · A count will indicate Lupus is present and if a decrease in these cells are found after the course of the study it would point towards CBD reversing the effects of Lupus

Common Procedure | Antinuclear Antibody Test



Figure 5: Peripheral cells present in those suffering from Lupus



Methods (Cont)

- Euthanasia and Measurements
- · Mice will be euthanized at end of 16 weeks. · Spleen and kidney will be measured to look at inflammation
- · Peripheral cells will be counted

Flowchart of Experimental Design



Anticipated Results

Control Group 1	Experimental Group 1	Experimental Group
		2
No change in any	Subtle decrease in	Significant decrease
symptoms	symptoms	in symptoms

Table 2: A summary of expected results For the 3 groups

Significance

- · CBD could be used as a treatment for SLE for the pain caused and phycological symptoms.
- · Will show a measurable difference between Over the counter CBD and prescription level CBD.
- · Results will contribute to the medical potential of CBD

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