

# UREAP APPLICATION FORM

First Name: Elliot

Last Name: Hansford

Student ID: Start Date of Project: 06/001/2026 (DD/MMM/YYYY)

Please complete all sections of this application form.

## 1. FACULTY MENTORS INFORMATION

1.1 Who is your Primary Faculty Mentor? Kingsley Donkor

1.2 Who is your Secondary Faculty Mentor? Jessica Allingham

*NOTE: Your Primary and Secondary Faculty Mentors must each complete a Faculty Mentor Support Form. Forms can be found under the attachments tab within your TRU Romeo UREAP application and on the TRU UREAP webpage under information and Forms for Faculty Mentors..*

## 2. PROJECT DESCRIPTION

2.1 Provide an abstract of your proposed research: (maximum 1500 characters)

Cannabidiol, or CBD is a compound found in hemp and cannabis plants (1). Since CBD's legalization in Canada in 2018, it has grown in popularity for its therapeutic uses for health conditions such as epilepsy, schizophrenia, anxiety, and post-traumatic stress disorder (1-2). As a result of CBD's positive effects on treating health conditions in humans, CBD products are now commercially available for pets. However, there are currently no authorized veterinary drugs containing cannabis due to lack of testing (3). Consequently, there is a need for the monitoring of the unregulated commercially available pet treats for their CBD content. Currently, the most commonly used quantification methods for analyzing CBD content include high-performance liquid chromatography (HPLC) and gas chromatography (GC) coupled with either mass spectrometry (MS) or flame ionization detection (FID) (4). These methods, however, are costly and can require extensive sample preparation. Therefore, this study will make use of capillary electrophoresis, a method that offers cost effective sampling, little sample preparation, and rapid analysis times. Establishing this method for the purpose of monitoring CBD content in pet treats will protect consumers and support product regulation in the expanding field of CBD use for therapeutic treatments in pets.

2.2 Provide a brief literature review for your proposed research: (maximum 3500 characters)

As of 2018, Cannabis has been legalized in Canada, and it has become a popular drug for its main components of  $\Delta^9$ -tetrahydrocannabinol (THC) and cannabidiol (CBD) (2-3). THC is responsible for the psychoactive, "high" effects related to hallucinations and delirium symptoms, while CBD has more use for its therapeutic effects that include anti-inflammatory and antiepileptic properties (5). As CBD has been found to be a potential treatment for medical conditions such as epilepsy, chronic pain, anxiety, and inflammation in humans, CBD products have been introduced to the pet industry (5). However, due to lack of testing, there are currently no licensed veterinary CBD products; therefore, pet owners must

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purchase over the counter products that are not regulated (3). Additionally, THC is toxic to pets, highlighting the need for regulation (6).

An area in this field that requires more attention is the regulation of CBD products put into the market for pets. Commercially available CBD products that are not approved by the FDA are often mislabelled for their CBD content. According to Evans, of a sample size of 102 CBD containing products analyzed by the FDA, 18% of CBD products contained less than 80% of the amount of CBD displayed, 37% of products contained more than 120% of the amount displayed, while only 45% of the products were within 20% of the amount of the CBD displayed (7). Additionally, the FDA found that 49% of the tested products contained THC (7). While this study analyzed CBD products not intended for pets, the lack of licensed veterinary CBD products could mean that labelling inconsistencies are likely apparent in the pet market too. If available CBD products are misrepresenting their CBD content, pets' health could be in danger.

The most common methods for quantifying cannabinoids in various matrices include gas chromatography (GC) and high-performance liquid chromatography (HPLC) (4). Methods using GC often supplement it with mass spectrometry (MS) or flame ionization detection (FID) (4). Methods coupling GC with MS often require deuterated standards however, which are expensive and require extensive sample preparation (4). Additionally, it is preferred to do two-dimensional gas chromatography for analyzing complex matrices as one-dimensional gas chromatography does not show adequate resolution (4). Methods using HPLC have good selectivity as it can be used to differentiate both acidic and neutral cannabinoids while GC can only analyze neutral ones. However, HPLC requires lots of organic solvents to run, needs more sample preparation, and has a very high initial cost for the instrument (4). The challenges present with popular methods of CBD quantification call for a more cost-effective, greener, and faster method, such as capillary electrophoresis (CE).

Capillary electrophoresis achieves high separation by carrying the sample through a capillary via an electroosmotic flow. Differences in charge and size of the molecules cause them to migrate at different speeds, thereby separating and detecting the analyte (8). CE is also an advantageous method for its qualities of low operation costs, relatively short analysis time, and consuming very little analytes and buffers, making it more cost-effective and greener than other methods (9). This proposed study will fill a gap in the literature by providing a method with appropriate conditions such as buffer composition for the quantification of CBD in pet treats using CE.

2.3 What is the hypothesis or research question for your proposed research? Include any specific objectives: (maximum 500 characters)

The research questions I aim to answer with my proposed project are:

1. What are the optimized conditions for running capillary electrophoresis with the intent of CBD quantification in CBD products?
2. Is the labelled CBD content in CBD pet treats accurate, and if not, to what extent is it inaccurate?

2.4 Provide a description of the research methodology/methodologies and analysis that you intend to employ in completing this research: (maximum 1500 characters)

The CBD extracted from pet treats will be analyzed by capillary electrophoresis (CE). To prepare the samples, pet treats will be sourced from a commercial retailer. The samples will then be homogenized to

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ensure equal concentration. The CBD will be extracted from the treats and preconcentrated. Calibration standards ranging from 5 to 100 ppm will be prepared for sampling.

The samples will then be run on the CE. CE achieves high separation by applying a voltage through the buffer that flows through a 15 cm capillary. The properties of the different analytes, particularly, the mass and charge will cause them to be attracted to either end of the capillary. With the differences in attraction, the migration times of the compounds will be staggered for when they exit the capillary and are detected by the UV detector. Throughout the project, buffer composition and pH will be optimized, but the base buffer models will be micellar electrokinetic chromatography (MEKC) and an organic buffer of 70:30 acetonitrile: water. The CE voltages will be tested for 20kV and 254 nm but may be changed for optimization.

Figures of merit will also be determined during the project, including, limit of detection and quantitation (LOD, LOQ), precision by intraday and interday runs, and percent recovery by spiking the sample with a known amount of analyte. The data will be analyzed by comparing analyte signal to the standards' calibration curve.

2.5 Provide a description of how your research will significantly impact your field of study:

(maximum 1500 characters)

As pet treats containing CBD aiming to provide medical treatments have become popular, it is important that these products are being monitored and regulated to ensure that the labelled CBD content is accurate for pets' safety. This study not only aims to provide insight to the accuracy of pet treats' CBD content to protect animals' safety, but it also aspires to provide a cost-effective alternative method for the quantification of CBD content in these treats. As cannabinoid composition can vary up to 25% within plants of the same strain and CBD products for pets are not highly regulated, it is important that companies have access to a quick and cost-effective method to quantify the CBD content in their products to ensure they are accurate and safe for pet consumption (4).

This study will also fill a gap in the literature. This project will provide a reliable method for CBD quantification while outlining CE parameters, buffer composition, and sample preparation.

2.6 Describe your plans to disseminate your research findings: (maximum 500 characters)

Preliminary results will be presented at the TRU Undergraduate Conference in March 2026, and then in May 2026 at the Western Canadian Undergraduate Chemistry Conference (WCUCC) at UBC's Vancouver campus with the final results. Findings of this project will also be written up as a manuscript and submitted for publication in a peer reviewed scientific journal.

2.7 List the references that you have cited throughout your research proposal observing the appropriate citation style for your discipline: (maximum 3500 characters)