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3-30-2022

### Marijuana for Parkinson's Disease

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#### Recommended Citation

Carrasco, Gonzalo, "Marijuana for Parkinson's Disease" (2022). *Cooper Medical School of Rowan University Faculty Scholarship*. 9.

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# Medical Marijuana for Parkinson's Disease?

**Gonzalo A. Carrasco, PhD**

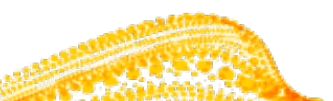
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Camden, NJ



## The Problem

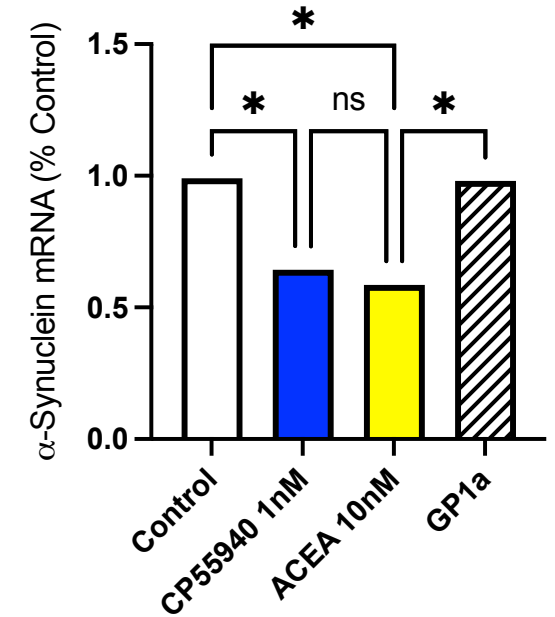
- Parkinson disease (PD) is a debilitating neurodegenerative movement and cognitive disorder caused by the gradual loss of **dopamine** producing nerve cells located in the substantia nigra (SN) region of the brain.
- **Dopamine** is a neurotransmitter that allows nerve cells to communicate with one another.
- NJ has one of the highest rates of PD in the nation which affects more than 25,000 people.
- Current treatments for PD are targeted at symptom relief by compensating for dopamine deficiency, but they do **NOT** alter the progressive damage to nerve cells and their circuits.
- Identifying new therapies that halt or slow the progression of PD would be a major advance in the field and provide a substantial benefit to this patient population.
- A 2020 review of 14 different studies reports that medical marijuana provides a reduction in tremors, and involuntary or erratic movements in PD.
- We are currently investigating the neuroprotective effects of marijuana-like compounds (cannabinoids) in PD.
- PD is **NOT** currently approved in the NJ Compassionate Use Medical Marijuana Act (CUMMA).

# The Approach to the Problem

## Approach 1: Looking at the neuroprotective properties of cannabinoids

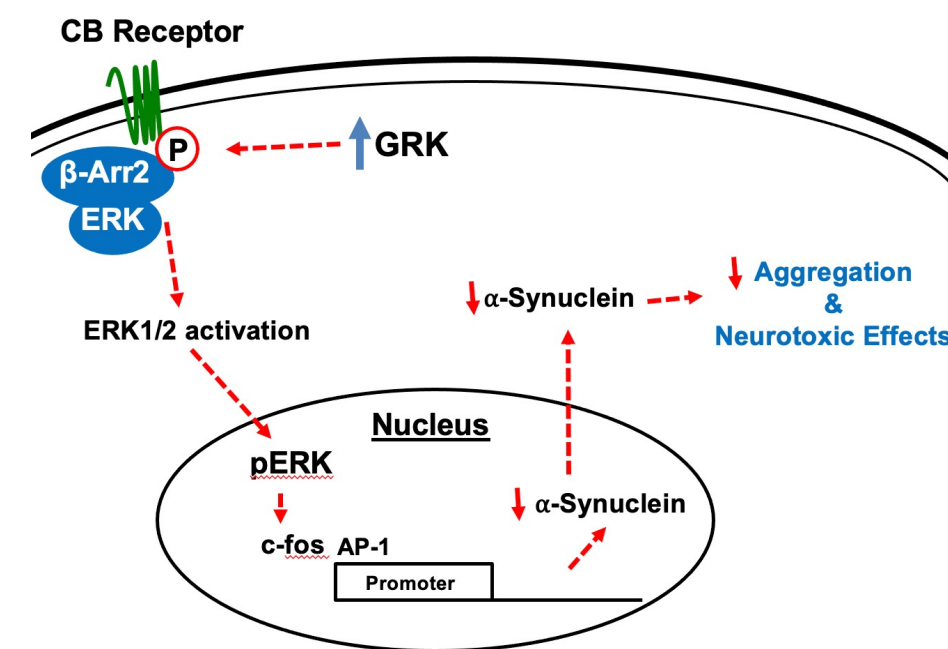
- α-Synuclein is a presynaptic neuronal protein that is linked genetically and neuropathologically to PD.
- α-synuclein aggregates (oligomers/protofibrils) are responsible for the neurotoxicity in Lewy body disorders such as in PD.
- Importantly, our preliminary data indicate that different marijuana compounds reduce the expression of α-synuclein in neuronal cells (qRTPCR, Western Blots).

Marijuana compounds reduce the mRNA levels of α-Synuclein



## Approach 2: Looking at the micro-environment of nerve cells in PD

- The neuronal microenvironment consists, primarily, of vascular elements and glial cells, all of which appear to change with age.
- Reduced oxygen levels (**Hypoxia**) is a central factor in brain aging and the development of age-related neurological diseases such as PD.
- We looked how reduced oxygen levels (hypoxia) modify the activity of cannabinoid receptors, the brain protein that mediate the effect of marijuana compounds (qrtPCR and confocal microscopy).
- Our results suggest that hypoxia modifies **the expression of cannabinoid receptors and their interaction with associated proteins** in their signaling network.



## The Challenge

- Get funded by local and federal agencies
- We propose to take advantage of mouse models of PD that are approved by the was Michael J. Fox Foundation to study PD.
- .We are proposing to use behavioral, neurochemical and molecular biology tools to quantify and characterize the progressive loss of brain cells and development of movement disorders in PD mice with and without treatment with marijuana-like compounds.
- The specific aims of these proposal are:
  - **Aim 1** Determine if marijuana-like compounds will prevent or slow the impairment of locomotor activity and loss of coordination in a well-accepted mouse model of PD
  - **Aim 2** Identify the molecular mechanism(s) by which marijuana-like compounds regulate the expression of genetic markers of PD in human and animal brain cell lines (neuronal and glial cells) and from cells derived from our mouse model of PD.
- **The purpose of our research proposal is to provide reliable scientific data to support the use of medical marijuana in the treatment of PD in the state of NJ.**