

# Dietary Protein & Parkinson's Disease Treatment

---

KATIE MACCOUX



# Presentation Overview

---



PERSONAL  
INTEREST



BACKGROUND  
INFORMATION



STUDIES (3)



NEXT STEPS



AUDIENCE  
QUESTIONS



# Personal Interest

---

# Parkinson's Disease

---

- Second most common neurodegenerative disease
- Most common movement disorder
- Chronic and progressive
- Neurons in the brain gradually break down or die
  - Decreased dopamine levels cause abnormal brain activity



# Common Symptoms

---



- Tremors- rhythmic shaking
- Stiffness or rigidity of the muscles
- Bradykinesia- slowness of movement
- Postural instability
- Impaired gait
- Altered speech

# Disease Diagnosis

---

- No specific clinical test
- Diagnosis based on symptoms and patient medical history
  - Trained neurologists look for at least two of the three core motor symptoms
- May confirm diagnosis with Parkinson's disease medication carbidopa-levodopa
- Brain imaging used to rule out other diseases

# Treatment

---

- No cure
- Medication can help control symptoms
  - Effectiveness of drugs typically decreases as disease progresses
  - Dosage must increase
- Surgery may be recommended for advanced cases
  - Deep Brain Stimulation

# Common Medications

---

## Carbidopa-Levodopa

- Levodopa is the precursor of dopamine
- Carbidopa used to prevent Levodopa breakdown in blood

## Dopamine Agonists

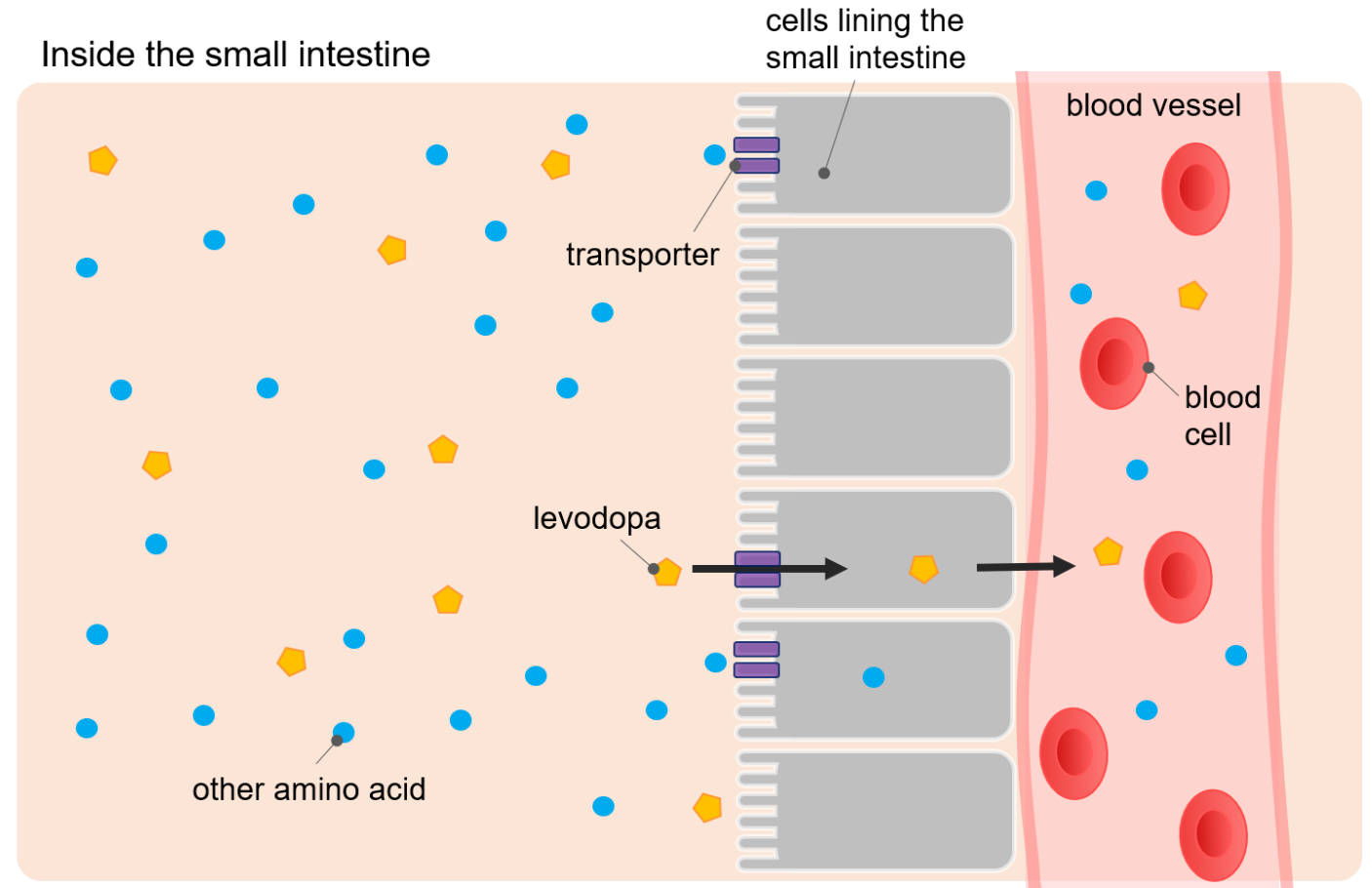
- Mimic dopamine in the brain
- May be used in conjunction with Levodopa





# Carbidopa-Levodopa Protein Effect

- Concern for subset of Parkinson's patients
- Large neutral amino acids from dietary protein favored over Levodopa for absorption



# Suggested Parkinson's Diets

---

## Protein Restricted Diet

- Limits protein
- Concern for malnutrition



## Protein-Redistribution Diet

- Consuming majority of protein with evening meal when motor activity is less important

# Study 1

---

Dietary habits and neurological features of Parkinson's disease patients: Implications for practice

# Objective

---

- To investigate the association between Parkinson's disease patients' diets and their neurological features
- Terminology:
  - PD = Parkinson's disease
  - L-dopa = Levodopa
  - FFQ = food frequency questionnaire
  - TDEE = total daily energy expenditure

# Methods

---

- Study Design: cross-sectional case-control
- Participants:
  - 600 patients diagnosed with idiopathic PD with a suggested protein-redistribution diet
  - Subjects seen at the Parkinson Institute in Milan, Italy
  - Controls matched 1:1 by gender, age ( $\pm 1$ ), physical activity level, and geographical area
- Assessment:
  - Anthropometry
  - Dietary habits: 66-item FFQ
  - Bowel habits
  - PD features

# Results: Energy Balance and Body Weight

---

	PD Patients (n=600)	Controls (n=600)	p-value
Body Weight (kg)	71.8	78.0	<0.001
BMI (kg/m <sup>2</sup> )	26.2	28.5	<0.001
TDEE (kcal/day)	1,938	2,098	<0.001
Calorie Intake (kcal/day)	2,246	2,084	<0.001

# Results: Disease Progression

---

- BMI inversely associated with disease duration and severity

	Disease Duration			p-value
	≤5 years (n=202)	6-11 years (n=218)	≥12 years (n=180)	
Body Weight (kg)	73.1	72.2	70.0	0.046
BMI (kg/m <sup>2</sup> )	26.6	26.5	25.5	0.040
Calorie Intake (kcal/day)	2,166	2,224	2,362	0.002

# Results: Disease Progression

- Correlation between greater protein intake, L-dopa dosage, and adverse side effects
- Patients adhering to protein-redistribution diet had higher body weights and lower L-dopa dosages

	Disease Duration			p-value
	≤5 years	6-11 years	≥12 years	
<b>Protein Intake (g/kg/day)</b>	1.1	1.1	1.2	<0.001
<b>L-dopa Dosage (mg/kg/day)</b>	5.3	7.9	9.4	<0.001
<b>OFF state</b>	0.5	1.0	2.1	<0.001
<b>Dyskinesia</b>	0.5	1.1	1.9	<0.001
<b>Constipation</b>	35.6%	50.9%	54.4%	<0.001



# Conclusion

---

- Nutritional care is an important element of PD patient care
- Emphasis on calorie intake and adequate though not excessive protein consumption
  - Minimize risk of malnutrition and maximize effect of L-dopa

# Analysis

---

## Strengths

- Controls closely matched to study subjects
- Large sample size
- Authors have no conflicts of interest

## Limitations

- Cross-sectional study design
- All patients from same movement disorders clinic
- Limited number of food items on FFQ

EAL Rating: **Positive**

# Study 2

---

Motor fluctuations due to interaction  
between dietary protein and levodopa in  
Parkinson's disease

# Objective

---

- To determine which PD patients are more likely to experience motor fluctuations related to protein interaction with L-dopa
- Terminology:
  - PIL = protein interaction with levodopa
  - FOG = freezing of gait
  - Dysk = dyskinesia (involuntary muscle movements)
  - Ortho = orthostasis (lightheadedness upon standing)

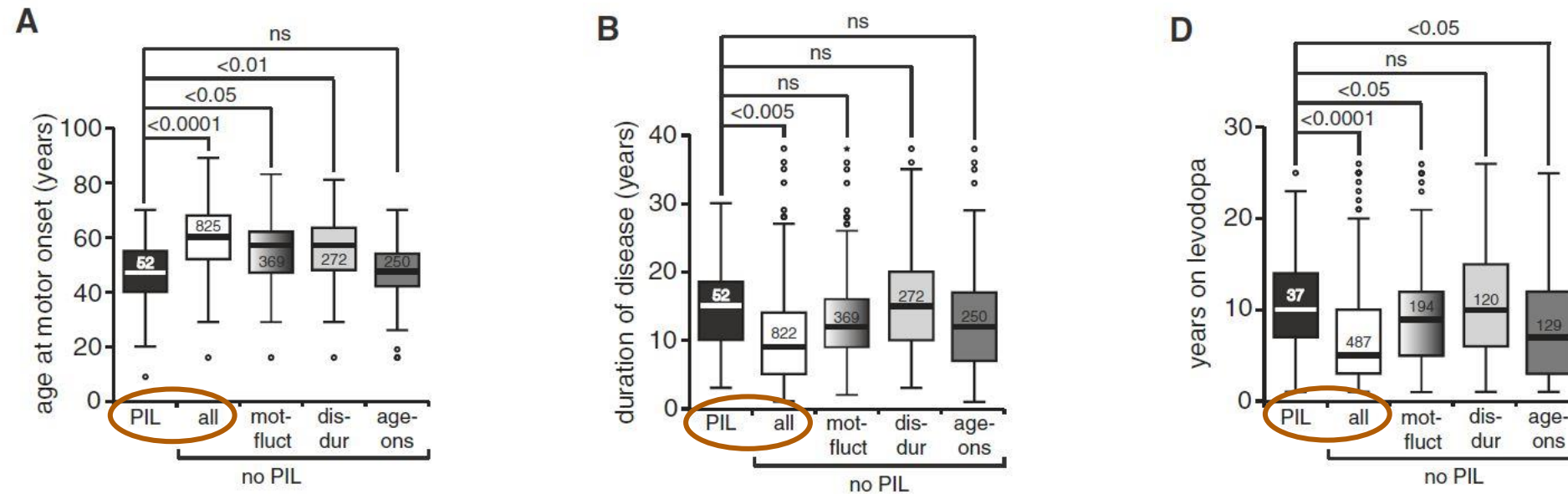
# Methods

---

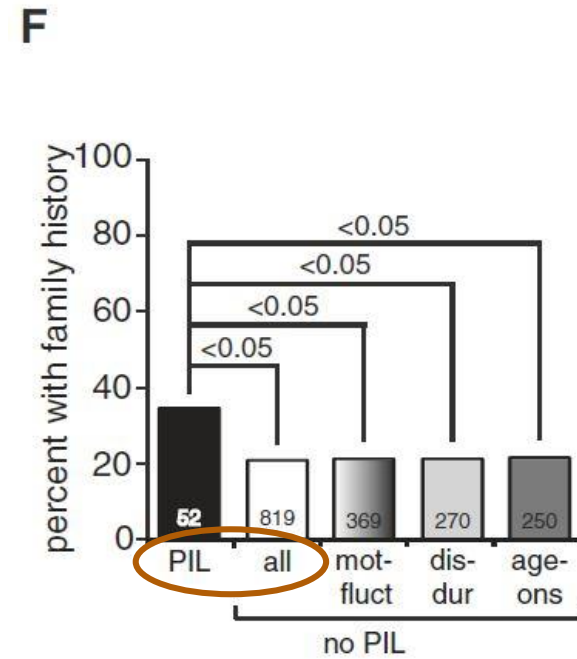
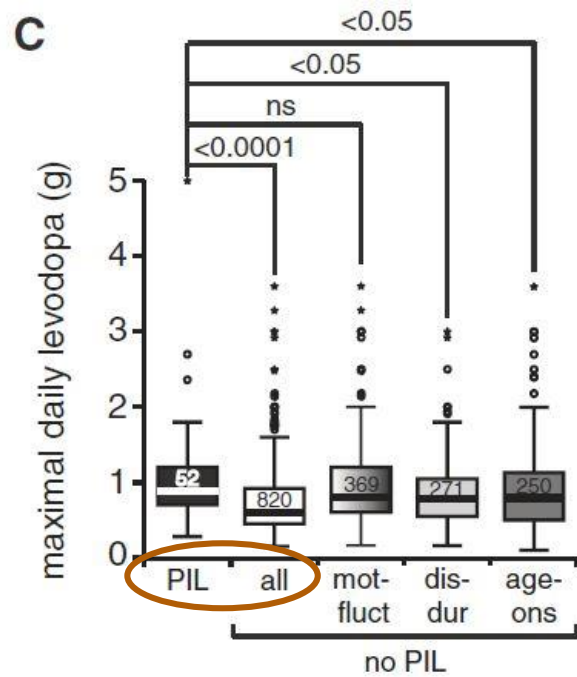
- Study Design: Retrospective cohort study
- Participants: 1,037 PD patients seen at the Columbia University Movement Disorders center between 2000 and 2012
  - Idiopathic PD diagnosis according to UK Brian Bank criteria
- PIL Motor Fluctuations:
  - Longer time to L-dopa effectiveness
  - Reduced benefit or duration of benefit
  - Dose failures
  - Earlier wearing off from a previously effective dose

# Results

- 5.9% of patients taking L-dopa met criteria for motor fluctuations related to PIL

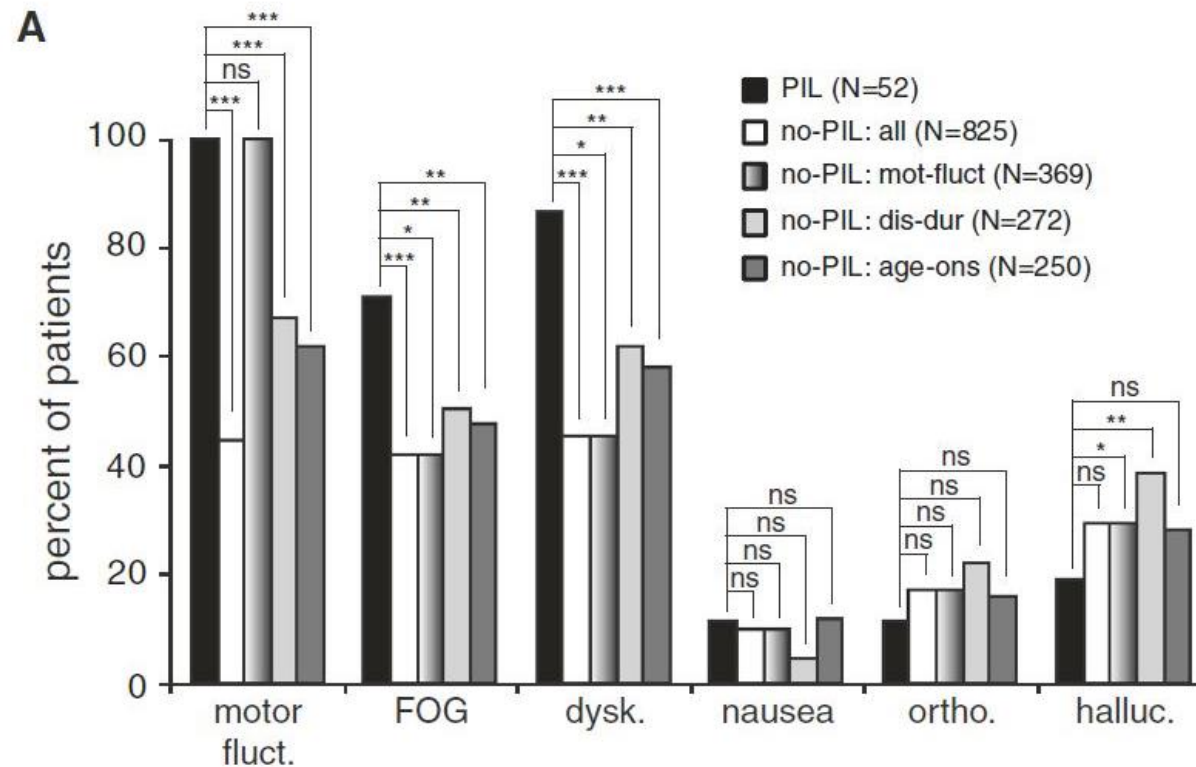


# Results



# PD Symptoms

- Motor symptoms more severe in patients experiencing PIL





# Dietary Modifications

---

- 20 PIL patients reported making dietary modifications
  - Decreased total daily protein
  - Redistribution of protein to the evening meal
  - Small frequent meals
- 60% reported weight loss following diet changes

# Conclusion

---

- Protein interactions with L-dopa most often occur in patients with earlier disease onset and those with a family history of PD
- Disease symptoms worse among patients experiencing PIL
- Dietary modifications should not be recommended to all patients with PD
  - Other factors including weight loss must be monitored

# Analysis

---

## Strengths

- Critical of previous findings
- Only patients reporting motor fluctuations associated with high-protein intake were included in PIL group
- Authors did not have any competing interests

## Limitations

- Retrospective study design
- All participants from the Columbia University Movement Disorders center
- Subjective data largely based on patient recall and consistency of physician questioning

EAL Rating: **Neutral**

# Study 3

---

Amino acid supplementation in L-dopa treated Parkinson's disease patients

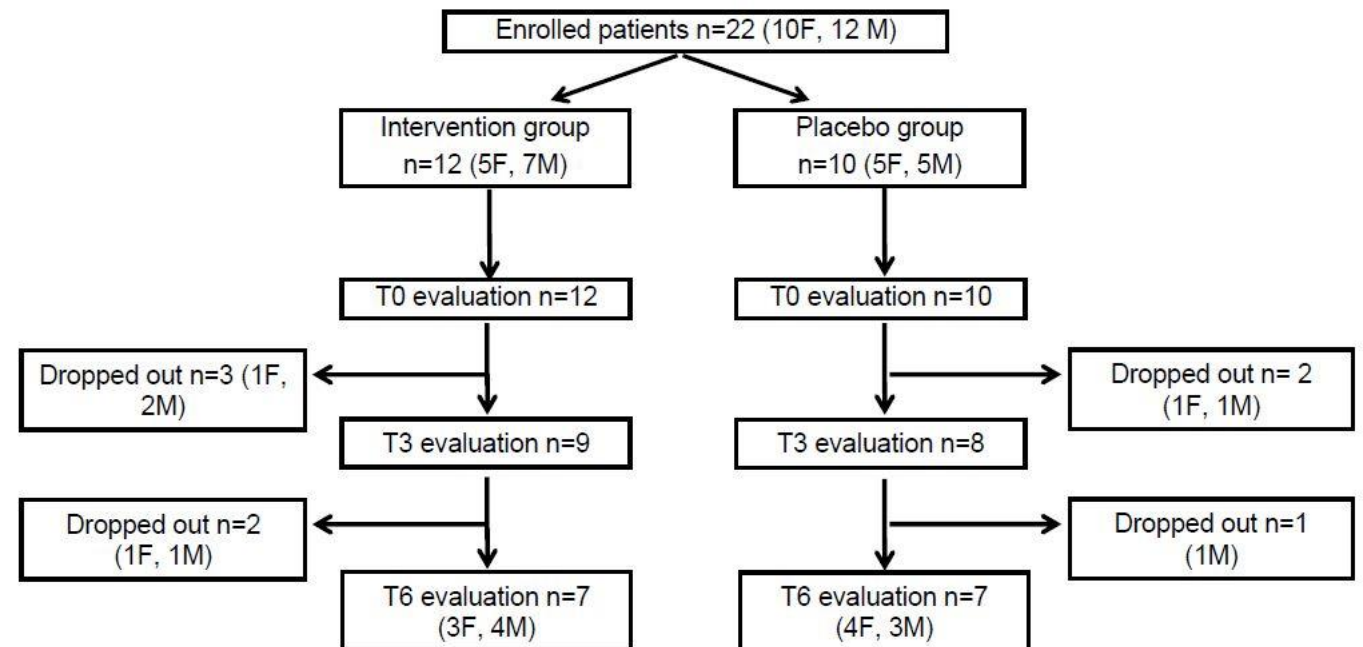
# Objective

---

- To evaluate the effect amino acid supplementation has on nutritional status and motor performance of PD patients taking L-dopa along with a suggested protein-restricted diet
- Terminology:
  - RCT = randomized controlled trial
  - AA = amino acids

# Methods

- Study Design: prospective RCT
- Participants: Randomly assigned to either Intervention or Placebo group
  - Enrolled n=22
  - Analyzed n=14
  - Diagnosed based on UK PD Brain Bank criteria
  - On L-dopa therapy for  $\geq 2$  years
  - Patients seen at Centre for Parkinson's disease and Movement Disorders at Cattinara University-Hospital in Trieste, Italy
- Intervention Duration: 6 months



# Participants at Baseline

---

	Intervention	Placebo	p-value
Number	7	7	
Sex (F/M)	3/4	4/3	
Age (y)	74±1	74±4	0.98
BMI (kg/m <sup>2</sup> )	25±1	26±1	0.30
Waist circumference (cm)	95±3	100±2	0.28
Disease duration (y)	5.6±1.5	6.0±1.4	0.84

# Intervention Group

---

- Given 16 g/day of free essential, water-soluble AAs for 6 months
- Received 2 bags of AAs 60 minutes after lunch and 60 minutes after dinner
  - 4 g AA/bag
  - Supplement consumed  $\geq 60$  minutes before subsequent L-dopa administration
  - Each supplement administration corresponds to 28 g protein
- Participants in control group received placebo according to the same regimen



# Results

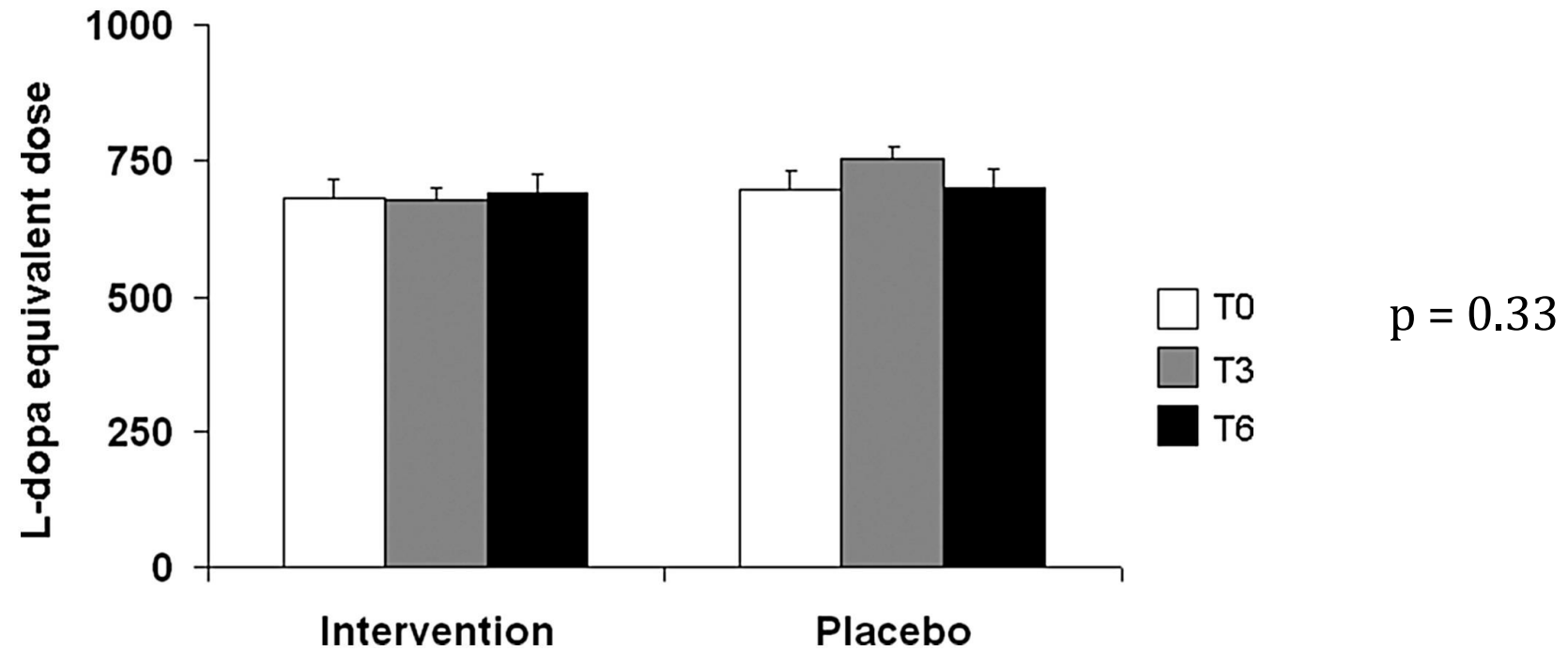
---

- Assessments taken at baseline, 3 months, and 6 months

	Treatment	T0	T3	T6	Time x Treatment Interaction
Average Daily "Off" Time	Intervention	1.6±0.4	1.7±0.6	2.4±0.7	0.65
	Placebo	1.5±0.2	1.6±0.3	1.6±0.3	
Insulin Sensitivity (QUICKI Index)	Intervention	0.372 ± 0.009	0.370 ± 0.005	0.360 ± 0.006	0.01
	Placebo	0.351 ± 0.014	0.343 ± 0.008	0.344 ± 0.006	

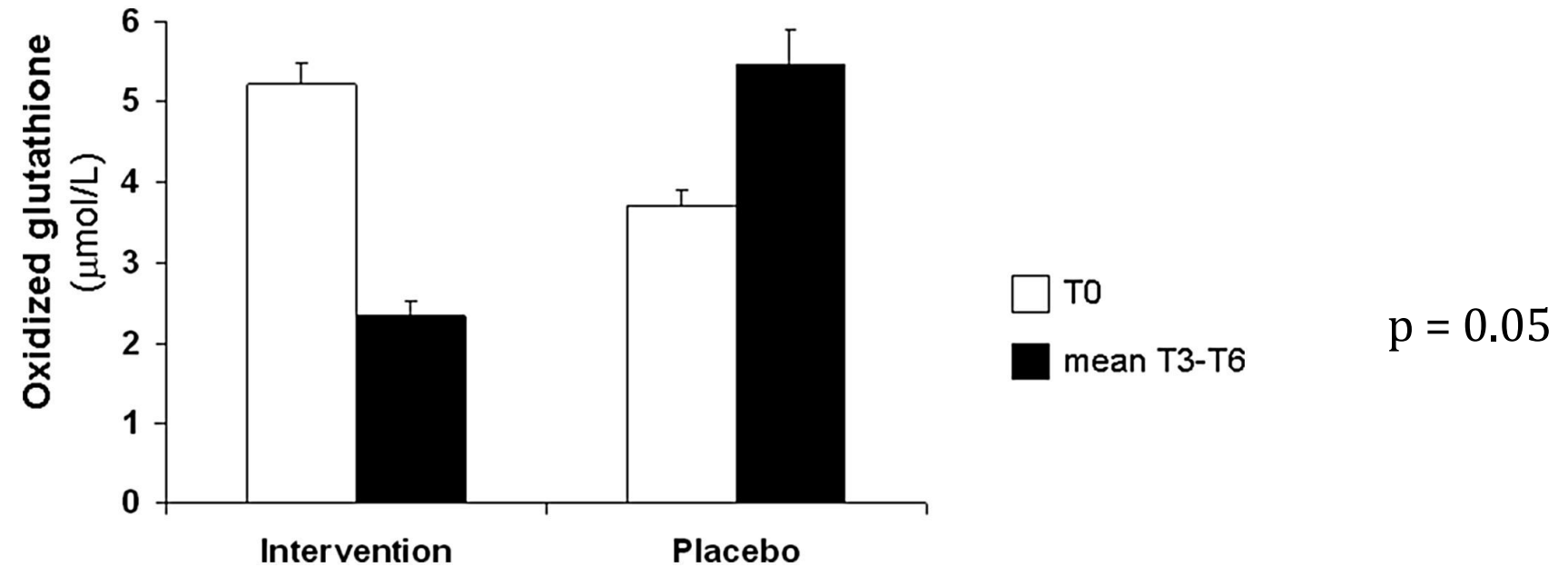
# Results: L-dopa Dosage

---



# Results: Oxidative Stress

---



# Conclusion

---

- AA supplementation was not found to have detrimental neurological or pharmacological effects in protein-restricted PD patients chronically treated with L-dopa
  - May reduce risk of malnutrition
  - No significant increase in “off” periods
  - L-dopa dosage did not change

# Analysis

---

## Strengths

- RCT study design
- Participants in intervention and control groups were very similar at baseline

## Limitations

- Small sample size and high attrition rate
- Short follow-up period (6 months)

EAL Rating: **Positive**

# Next Steps

---

## Practice Implications

- Parkinson's disease symptoms impact nutritional status
  - Difficulty eating
  - Higher calorie needs
  - Protein effect
- Work with entire team to determine appropriate diet

## Action

- Calorie and protein recommendations must be individualized
- Risk of malnutrition should be addressed and continually monitored
- Further research is needed regarding amino acid supplementation

# Works Cited

---

Barichella, M., Cereda, E., Cassani, E., Pinelli, G., Iorio, L., Ferri, V., ... Monajemi, F. (2017). Dietary habits and neurological features of Parkinson's disease patients: Implications for practice. *Clinical Nutrition*, 36(4), 1054–1061.

Cucca, A., Mazzucco, S., Bursomanno, A., Antonutti, L., Di Girolamo, F., Pizzolato, G., ... Biolo, G. (2015). Amino acid supplementation in L-dopa treated Parkinson's disease patients. *Clinical Nutrition*, 34(6), 1189–1194.

Diagnosing Parkinson's. (2019). Retrieved from American Parkinson Disease Association website: <https://www.apdaparkinson.org/what-is-parkinsons/diagnosing/>

Duffy, L. (2018, August 27). Parkinson's and protein — what's the connection? Retrieved from Medium website: <https://medium.com/parkinsons-uk/parkinsons-and-protein-what-s-the-connection-41e6c820e071>

Gilbert, R. (2019, May 21). Carbidopa/Levodopa: Answers to Frequently Asked Questions. Retrieved from American Parkinson Disease Association website: <https://www.apdaparkinson.org/article/common-questions-about-carbidopa-levodopa/>

Parkinson's Disease. (2018, June 20). Retrieved from Mayo Clinic website: <https://www.mayoclinic.org/diseases-conditions/parkinsons-disease/symptoms-causes/syc-20376055>

Symptoms of Parkinson's. (2019). Retrieved from American Parkinson Disease Association website: <https://www.apdaparkinson.org/what-is-parkinsons/symptoms/>

Virmani, T., Tazan, S., Mazzoni, P., Ford, B., & Greene, P. (2016). Motor fluctuations due to interaction between dietary protein and levodopa in Parkinson's disease. *Journal of Clinical Movement Disorders*, 3(8).



# Audience Questions

---

Katie Maccoux

[maccke25@uwgb.edu](mailto:maccke25@uwgb.edu)

Research Review Link:

<https://uwgbresearchreviews.weebly.com/fall-presentations-2019.html>