The **immune system** in **Parkinson's disease** (PD) is modulated by comorbidities and **medication**.

Metabolic disease medication usage correlates with **higher proportions** of specific **innate and adaptive** immune cells in both Healthy and PD, albeit to a **lower magnitude** in the **PD cohort**.

Access GitHub repo for project information, full reference list & poster pdf

Exploring Medication-Induced Immunomodulation in Early-Stage Parkinson's Disease

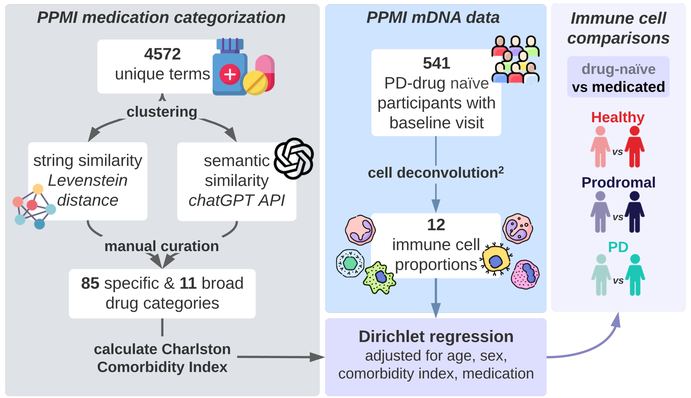
Petra Bachanová[1], Steven C. Pike[1,2,3], Lucas A. Salas[1,3]

[1]Dartmouth College, Integrative Neuroscience
[2]Dartmouth Health, Department of Neurology
[3]Geisel School of Medicine at Dartmouth, Department of Epidemiology

Introduction

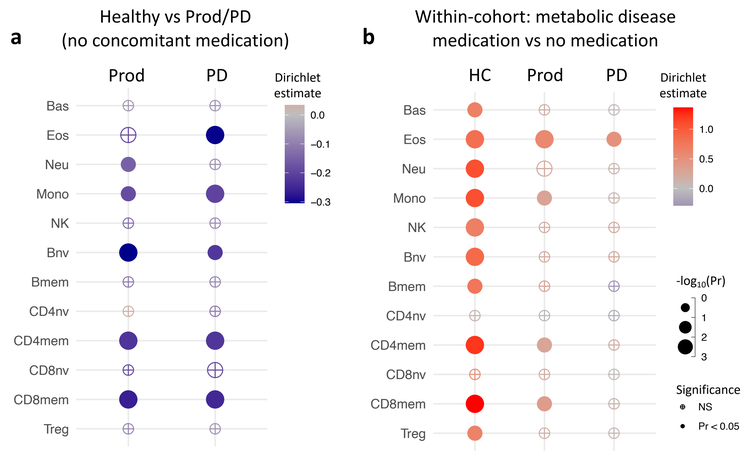
- **Parkinson's disease (PD)** is characterized by motor deficits, cognitive impairments, and **dysregulated immune responses**.
- PD **onset** and **progression** are strongly associated with an increased immune **inflammatory phenotype**[1].
- Factors such as the environment, lifestyle and medications influence the immune system.
- We aim to close a research gap regarding the **effects of concurrent medications on inflammation** in early & prodromal PD patient cohort. These results will aid in patient stratification to foster targeted therapies and biomarker discovery.

Methodology



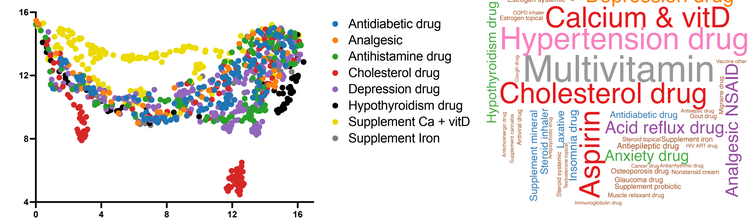
Results

- **Medication-naïve Prod** (n=23) and **PD** (n=32) patients have **lower abundances** of **memory T, naïve B cells** and **monocytes** compared to medication-naïve Healthy controls (n=6).
- The **increase in specific innate & adaptive immune cells** in Healthy controls correlates with **metabolic disease medication** (n=6). Similar trend, albeit lower in magnitude, is seen in Prod (n=17) and PD (n=12).

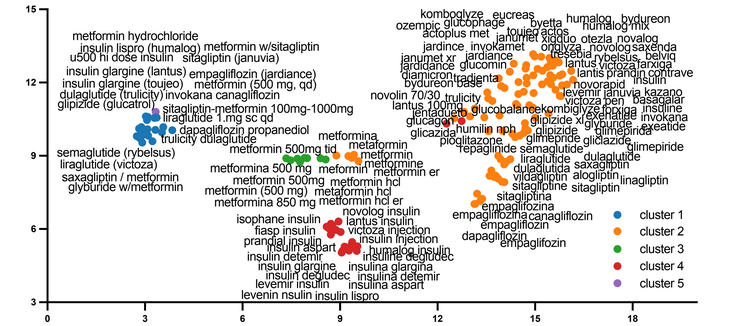


Supplementary data

Levenstein distance (LD) clusters similar terms. UMAP of LD matrix of 879 unique terms from 8 drug categories.



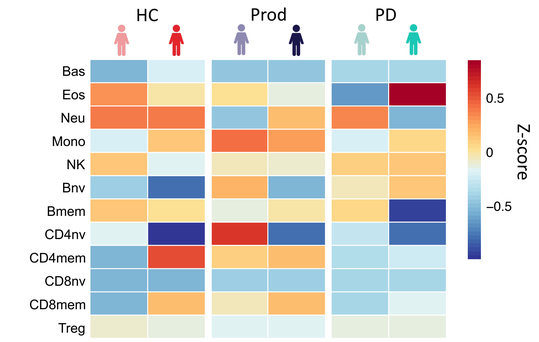
Semantic re-clustering is a necessary curation step.
UMAP of LD matrix of 136 unique terms within the antidiabetic drug group. Clusters defined by k-means clustering of LD matrix shown in color.



Demographics of study population

	Healthy Control (N=83)	Prodromal (N=175)	Parkinson's Disease (N=283)
Age at baseline			
Median [Min, Max]	61.9 [31.8, 81.8]	63.2 [46.7, 81.6]	63.2 [33.5, 84.5]
Reported gender			
Female	28 (34 %)	84 (48 %)	108 (38 %)
Number of drugs used at baseline			
Median [Min, Max]	3 [0, 7]	3 [0, 9]	3 [0, 10]
Age-adjusted Charlston Comorbidity Index (CCI)			
Low risk (CCI < 1)	10 (12 %)	1 (1 %)	33 (12 %)
Mild risk (CCI 1-2)	56 (67 %)	122 (70 %)	182 (64 %)
Moderate risk (CCI 3-4)	17 (20 %)	48 (27 %)	64 (23 %)
Severe risk (CCI > 5)	0 (0 %)	4 (2 %)	4 (1 %)
Medication at baseline			
No concomitant medication	6 (7 %)	23 (13%)	32 (11%)
CVD medication	57 (69 %)	98 (56 %)	167 (59 %)
GI tract medication	15 (18 %)	44 (25 %)	82 (29 %)
Hormonal medication	15 (18 %)	57 (33 %)	77 (27 %)
Immunomodulatory medication	1 (1 %)	6 (3 %)	3 (1 %)
Infection medication	9 (11 %)	16 (9 %)	26 (9 %)
Metabolic disease medication	6 (7 %)	17 (10 %)	12 (4 %)
Neurological/psychiatric medication	25 (30 %)	72 (41 %)	109 (39 %)
Other antidegenerative medication	5 (6 %)	22 (13 %)	40 (14 %)
Pain & Rheumatology medication	25 (30 %)	40 (23 %)	81 (29 %)
Respiratory medication	16 (19 %)	42 (24 %)	43 (15 %)
Supplement & vitamin	46 (55 %)	85 (49 %)	171 (60 %)

Z-scored immune cell proportions in medication-naïve and metabolic disease medication participants.



1. Pike, S.C. *et al.* Immunological shifts during early-stage Parkinson's disease identified with DNA methylation data on longitudinally collected blood samples. *npj Parkinsons Dis.* 10, 21 (2024).
2. Salas, L.A *et al.* Enhanced cell deconvolution of peripheral blood using DNA methylation for high-resolution immune profiling. *Nat Commun* 13, 761 (2022).