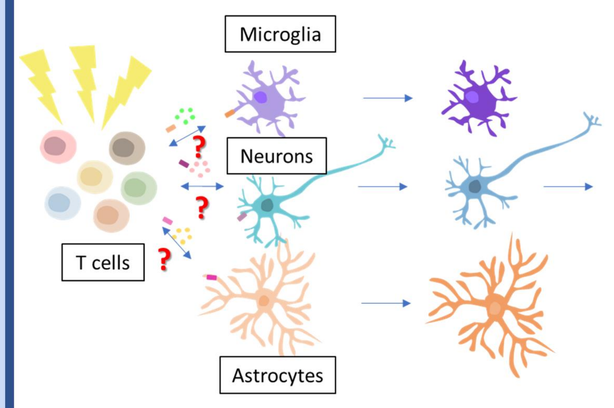
Neuroimmunology Lab

VIB-UANTWERP CENTER FOR MOLECULAR NEUROLOGY

Universiteit Antwerpen

The **NIM lab** studies the complex interactions between the immune and nervous systems. The role of the immune system in brain physiology and pathology is a rapidly evolving topic in science. T cells represent the central component of adaptive immune responses, serving as vital protectors against infections and contributors to immune tolerance. Although the significance of T cells in neuroinflammatory and neurodegenerative processes is gaining recognition, their presence and potential functions in a healthy brain are still not fully elucidated. Our dual objective is to explore the **contribution of T cells to mechanisms of brain plasticity and their impact on neurodegenerative and neurodevelopmental disorders**, with the mission of identifying new biomarkers and therapeutic targets/agents. Capitalizing on my multidisciplinary training we are forging a translational approach that integrates immunology, neuroscience, biochemistry, and behavioural neuroscience to study the involvement of T cells in brain physiology and pathology. Our ultimate aim is to gain mechanistic insights into how T cells influence brain plasticity and diseases and to pinpoint molecular targets for innovative therapeutics. We have devised a comprehensive research pipeline that commences with in-depth immunological profiling for the identification of novel immunological pathways. This is followed by rigorous functional validation to assess the role of the identified circuits. We will employ genetic models and AAV-based gene therapy to target specific pathways, administer biologics, or modulate the presence of beneficial immune infiltrates in the brain.

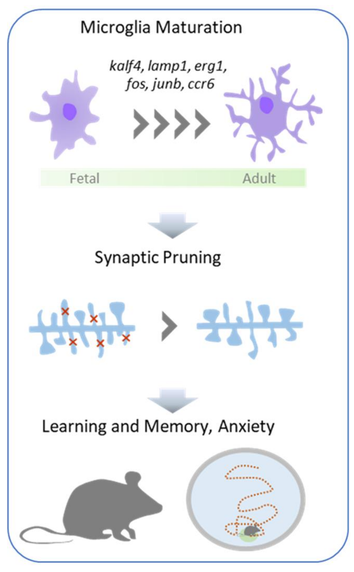


Function
Synaptic function, neurogenesis, behaviour

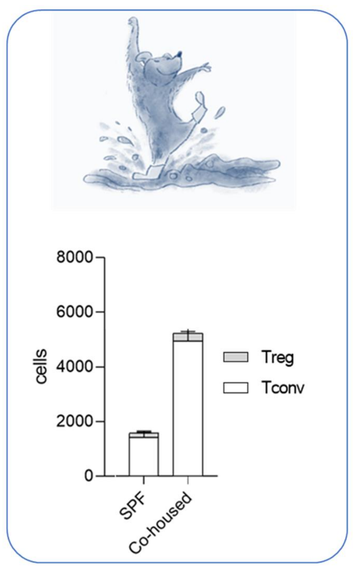
Dysfunction
Neurodevelopment
neurodegeneration

Why T cells?

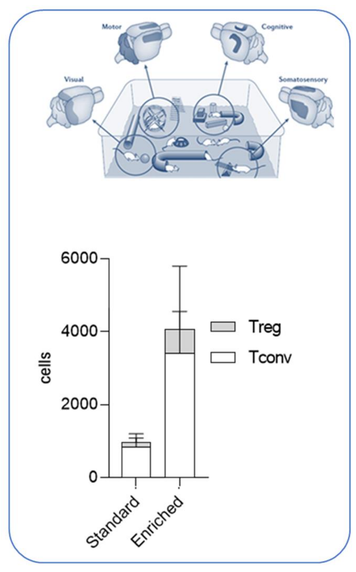
CD4 T cell KO



Enriched Gut microbiome

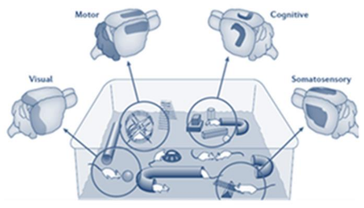


Enriched environment



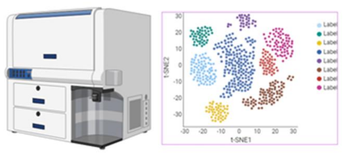
Project 1: Role of $CD4^+$-T cell in mechanisms of brain plasticity and neuroprotection

T cell modulation



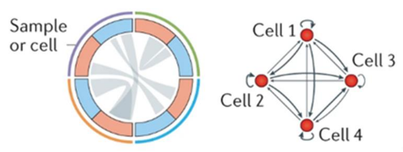
Enriched environment
T cells depletion

Immune phenotyping



scRNA seq
hpFlow
Citeseq

Computational analysis



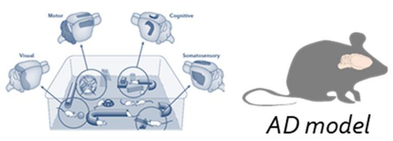
Pathways
Cell-Cell interaction

Gene Targeting

Synaptic structure
Neurogenesis
Behaviour

Project 2: T cells dependent enviromimetics to reduce inflammation and Neurodegeneration

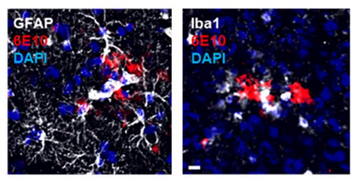
T cells modulation



AD model

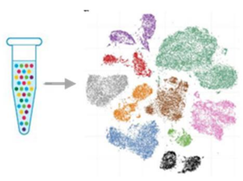
Enriched environment
T cells depletion_upregulation
T cells-microglia interaction

Pathology



Inflammation
Abeta pathology
Neurogenesis, Behaviour

Cell states & Interaction



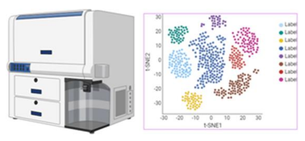
T cells
Microglia
Astrocytes

Gene therapy

Inflammation
Abeta pathology

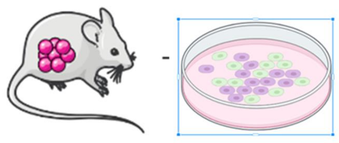
Project 3: Role of brain resident T cells in Autism Spectrum Disorder

Immune phenotyping



scRNA seq
hpFlow

Functional tests



Suppression assay
Adoptive transfer
Bone marrow chimera

Gene therapy

Synaptic structure
Synaptic transmission
Behaviour

Key Publications

1. Pasciuto, E., et al. Neuron, 2015.
2. Briz, V.*, Restivo, L.*, Pasciuto E.*., et al. Nature Communications, 2017.
3. Pasciuto, E., et al. Cell, 2020.
4. Yshii, L. *, Pasciuto, E. *, et al. Nat Immunol, 2022.

The NIM team

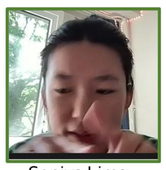
Identify novel mechanism of brain plasticity
Microglia - T cells interaction
Plasticity and neuroprotection

Role of T cells in neuropathology
Immunephenotyping in Autism model (ADNP)
Microglia-T cells interplay in AD
Gut-brain axis in Colitis

Available Technology:
Immunophenotyping platform: High parametric flow cytometry (Symphony), Spectral flow cytometry (Aurora), scRNA seq, Cite seq, Cytokine profiling
Therapeutic tools development: Gene therapy, enviromimetics, Targeting T cells dependent mechanisms
Inflammation/Disease models: Neurodegeneration (AD), Autism (FXS), Neuroinflammation (MS), Colitis

If you like our research and want to talk more about it and learn about neuroimmunology please ***contact: Emanuela.Pasciuto@uantwerpen.vib.be***
Website: *https://pasciutolab.sites.vib.be/en*


Arthi Shanmugavadivu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