Welcome to the Experimental Pediatrics Lab

Elena Di Martino, PhD

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Who am I ?

2006-2009 Bachelor Degree in Biology

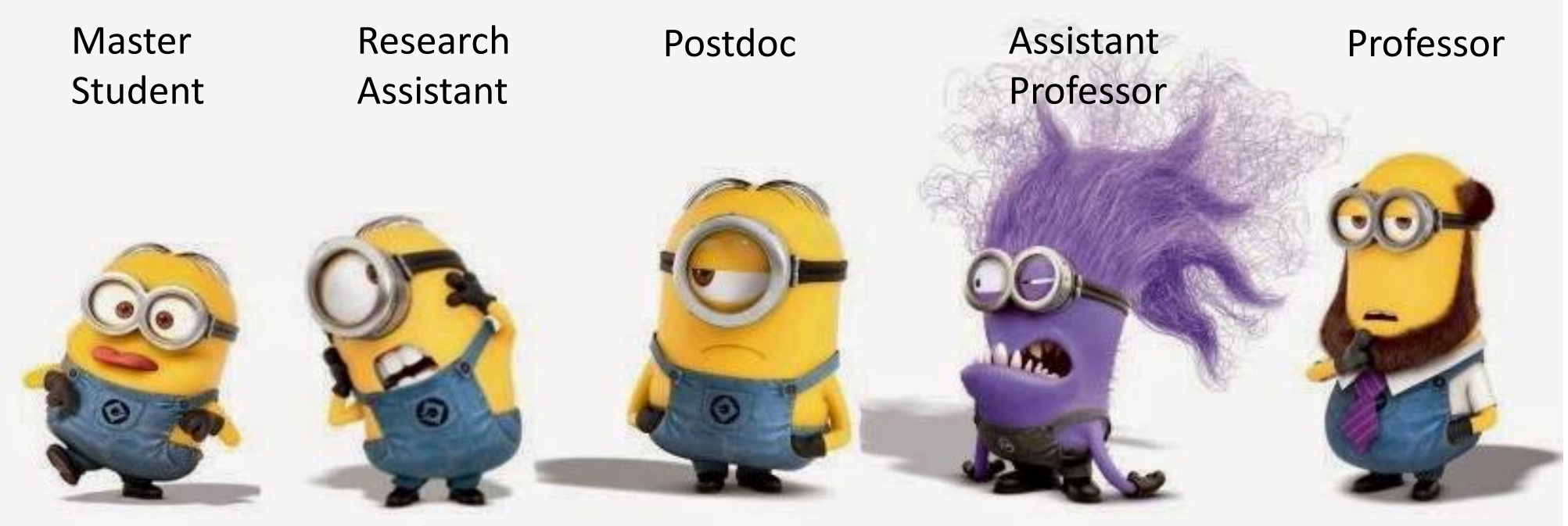
2010-2013 Int. Master Degree in Neuroscience

2014-2020 PhD in Neuroscience

2021-2023 Postdoc in Neuroscience

2024-2028 Assistant Professor in Experimental paediatrics (Ulrika Ådén's group)

Pediatric Neuroscience - preclinical research group







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Research Focus: neonatal hypoxia-ischemia (HI)

- major cause of perinatal brain injury
- 1-2/1000 live birth in high-income countries
- 10-20 time more frequent in low-income settings

Source: howtoreliefc.com

- lack of oxygenated blood
- due to intrapartum complications, perinatal/intra-uterine infections
- long term neurologic sequelae (cerebral palsy, developmental delay, cognitive/motor impairment)
- only available treatment is Hypothermia → limited applicability

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Volpe J, Neurology of the Newborn 2008 – Nair et al, 2018

Animal model of injury

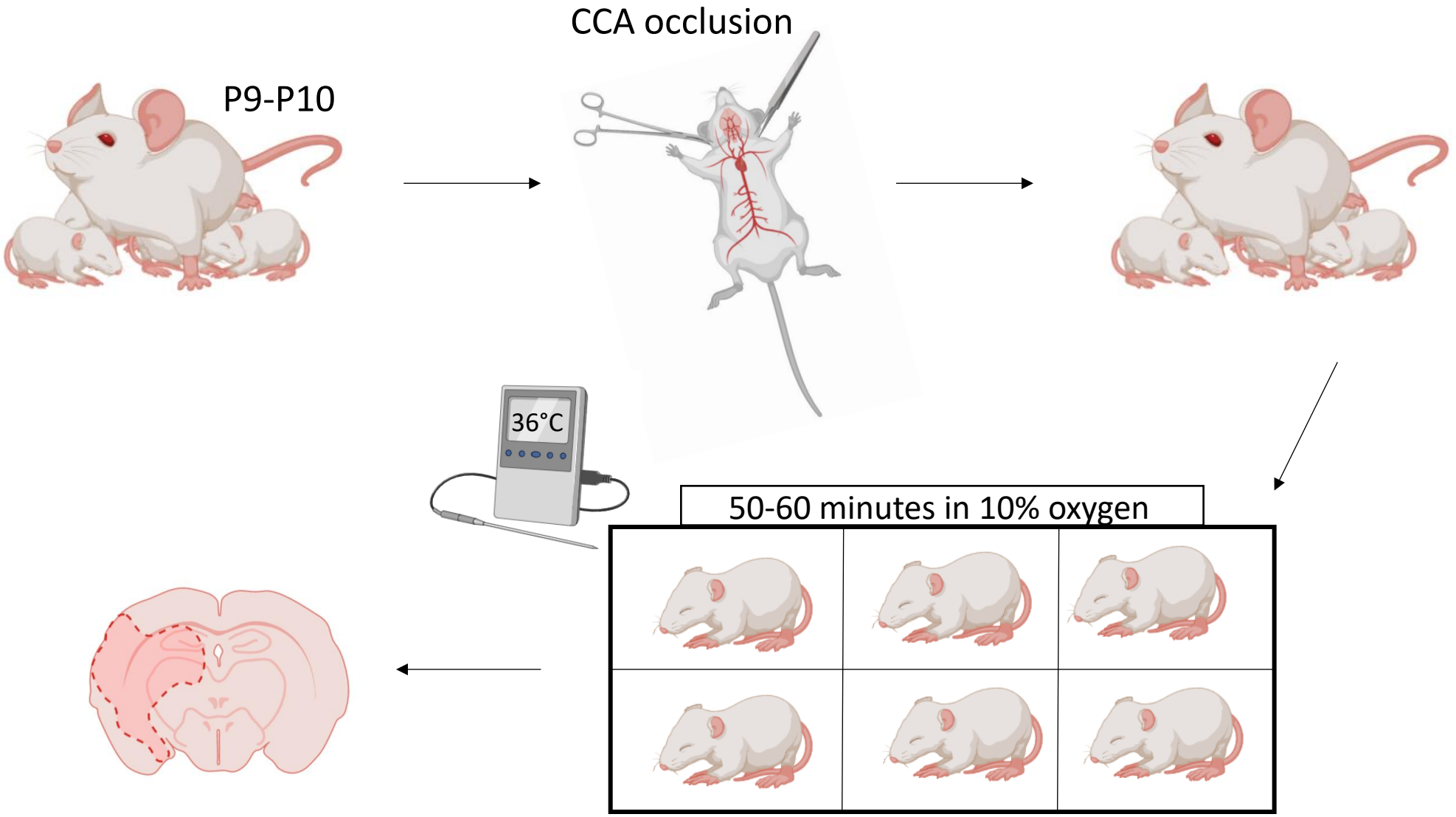

Image created with BioRender

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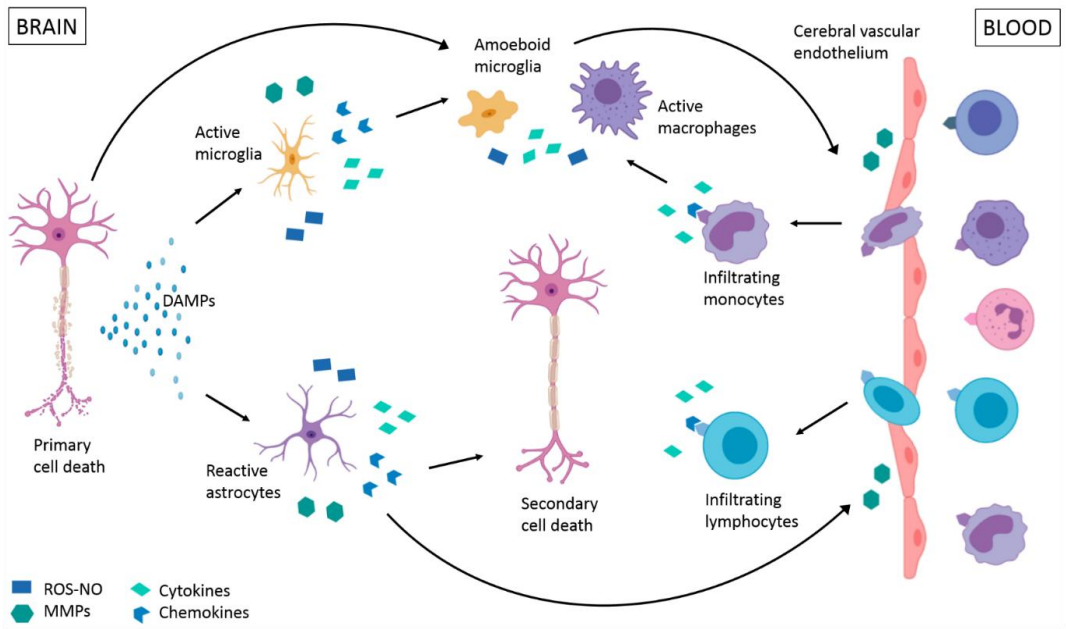
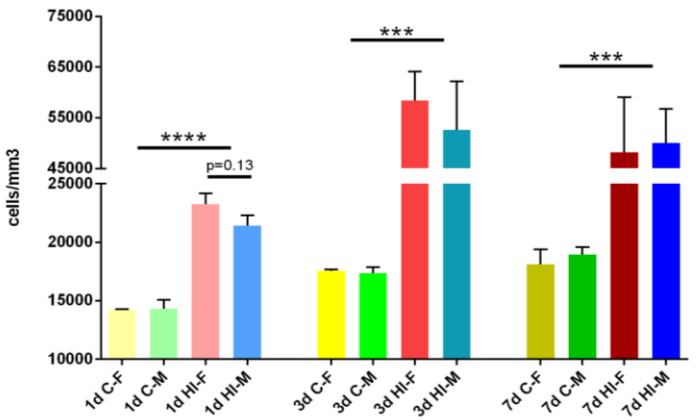
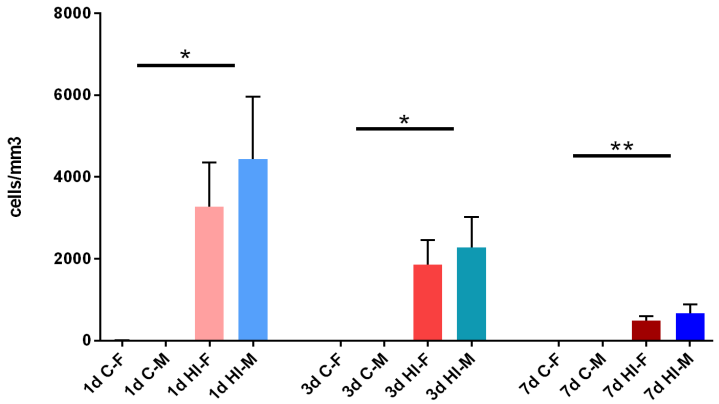
Injury and Inflammation after HI injury



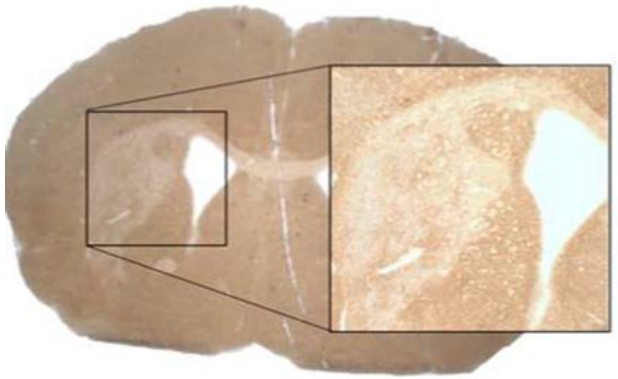
Microglia



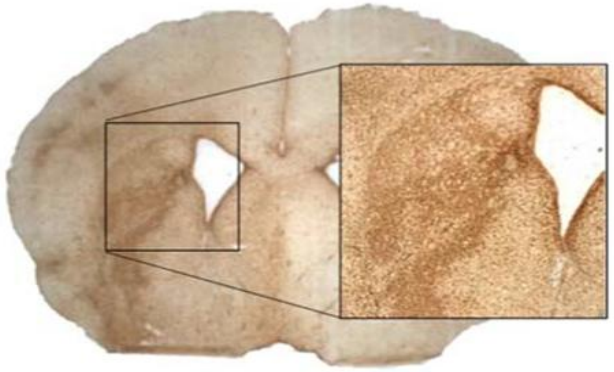
Peripheral macrophages



Injury



Scar



Di Martino et al, Mol. Neurobiol. 2020 – Di Martino et al. iScience 2024

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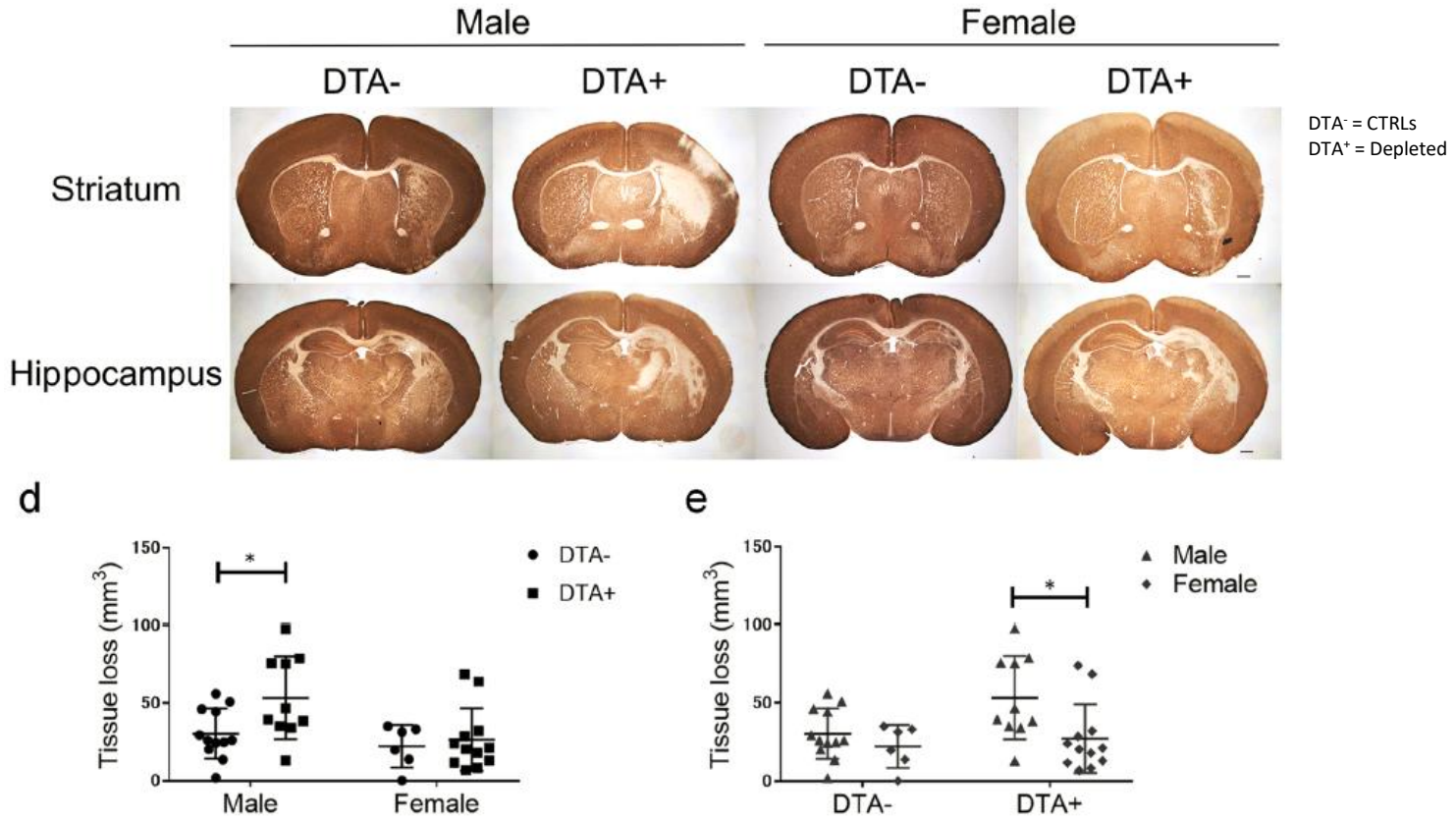
Roles of inflammatory cells – microglia

- Upon injury, activated microglia have been traditionally considered toxic by releasing inflammatory mediators and ROS

..however..

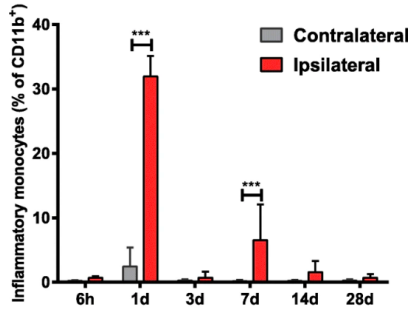


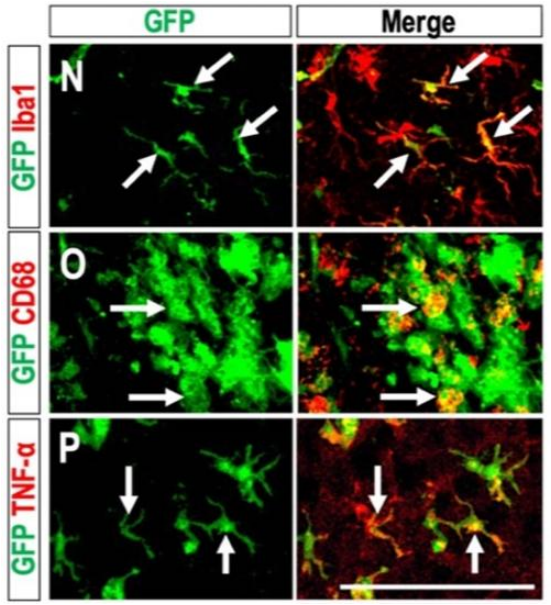
DTA^- = CTRLs
DTA^+ = Depleted

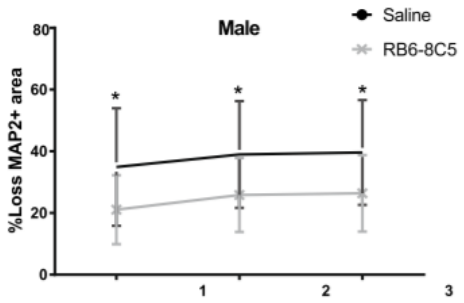
Kettenmann H, 2011 – Tsuji, Di Martino et al, 2020

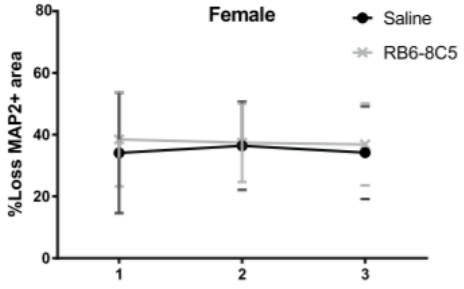
Roles of inflammatory cells – macrophages

- Peripheral macrophages instead..
  - were shown to reach the injury site biphasically via a disrupted BBB, contribute to brain damage
  - become pathological microglia-like cells by maintaining a long-term inflammatory phenotype
  - If depleted, a smaller lesion in observed in male mice after HI









Smith et al, 2018 - Chen HR et al, 2022

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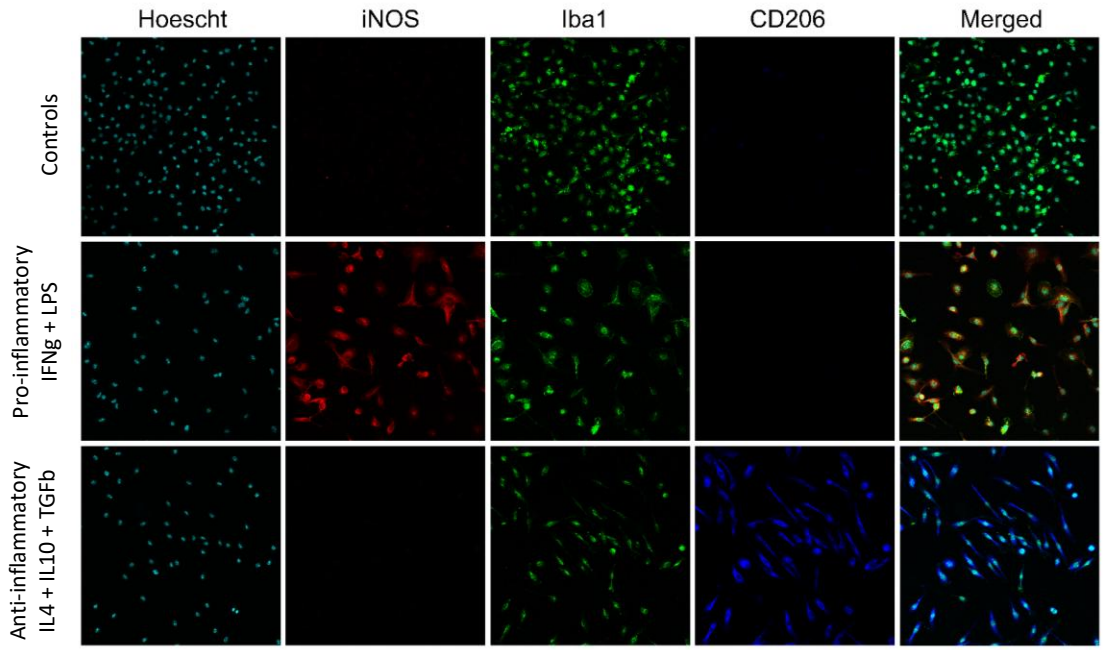
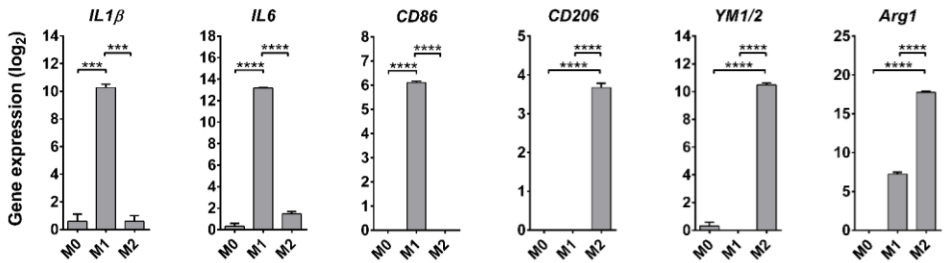
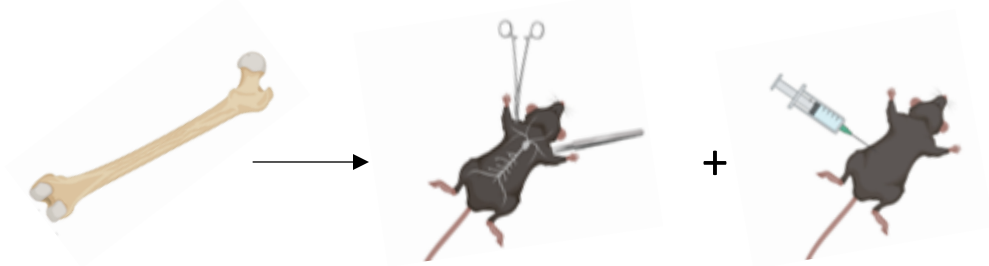
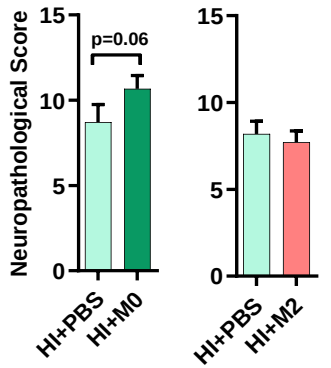
Cell treatment – macrophages



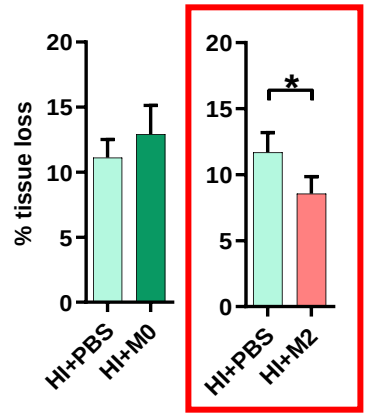




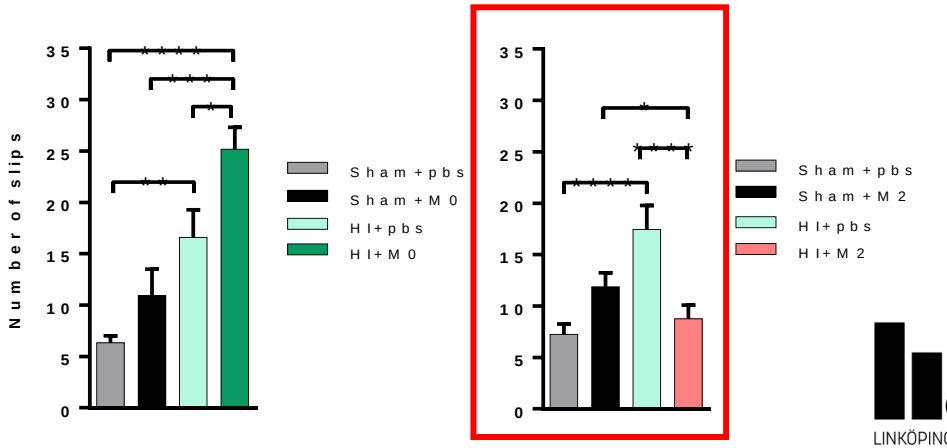
Global injury



Atrophy



Beam Walking Test



Di Martino et al, submitted

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What's next

Project 1:
Gene silencing technology as novel treatment for neonatal HI.

Project 2:
Multiomics analysis to investigate role of peripheral vs resident inflammatory cells in HI brains

Project 3:
3D brain imaging to evaluate the role of different inflammatory cells after HI injury

Main techniques

In vitro:
- Primary microglia
- Bone marrow-derived macrophages
- Organotypic hippocampal slices

In vivo:
- Neonatal HI
- Pharmacological and cellular treatment
- Behavioral tests

Other:
- PCR, RT-PCR
- IF, IHC, ICC, microscopy
- ELISA, WB
- FACS, ImageStream
- 3D imaging

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THANK YOU