

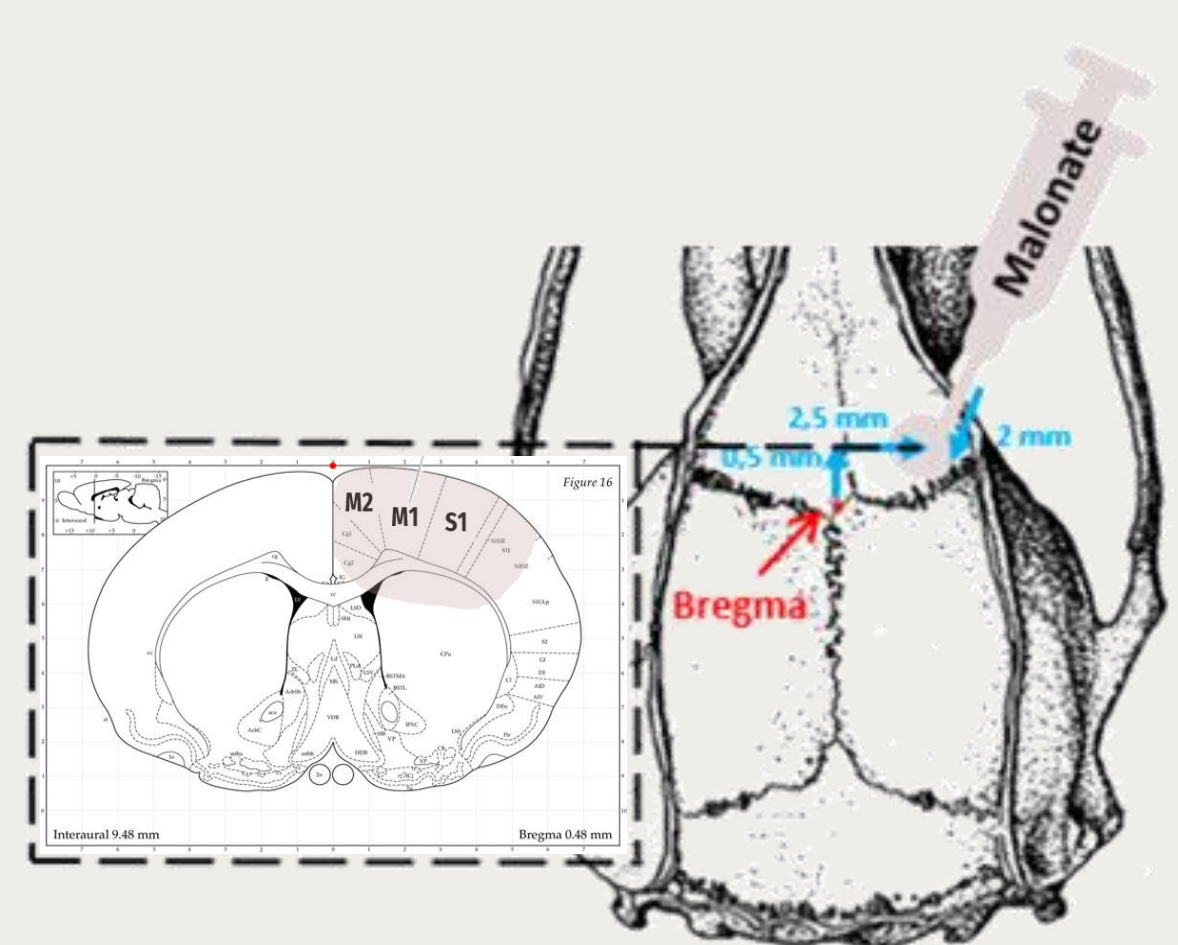
## Introduction

- **Stroke** and **severe head trauma** are two pathologies involving **acute brain damage**. In particular, lesions in the primary motor cortex are very **invalidating** for patients.
- Brain plasticity and neurogenesis can initiate self-repair of brain tissue and participate in patient recovery. Unfortunately, the probability of **cell survival** within this neotissue remains **very low**.
- **Therapeutic interest** in developing **scaffold mimicking the extracellular matrix** and allowing the growth of new cells is growing.

## Materials and Methods

Brain lesion : injection of **malonate** in the **motor cortex**

- Targeting of specific brain regions
- Extent of lesion proportional to volume injected
- Reproducibility of lesion size



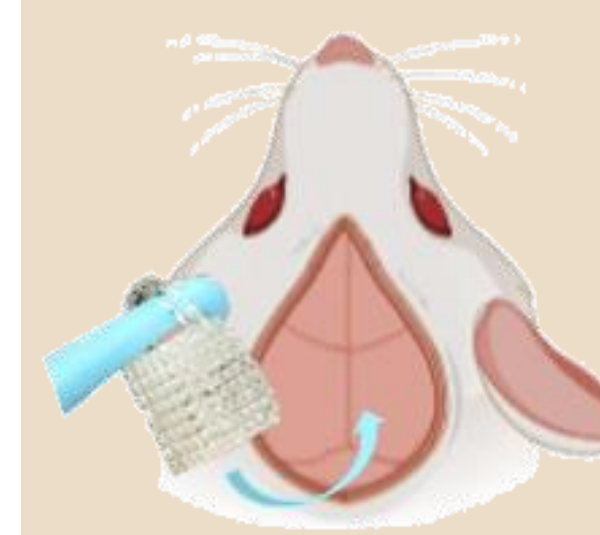
Training motor tests

Motor tests are used to monitor the **health** and **recovery** of rats throughout the study.

- Neurological Severity Score
- Open Field
- Grip strength test
- String Pulling



Injury surgery



- Implantation in the brain 8 days after injury
- Two biomaterials with specific characteristics :
  - No toxicity
  - Slow degradation
  - Biocompatibility
  - 3D bioprintable

MRI

**Three** T2-weighted TurboRare sequences / rat: post-lesion, post-implantation and pre-sacrifice (7 Tesla MRI)

Implant surgery

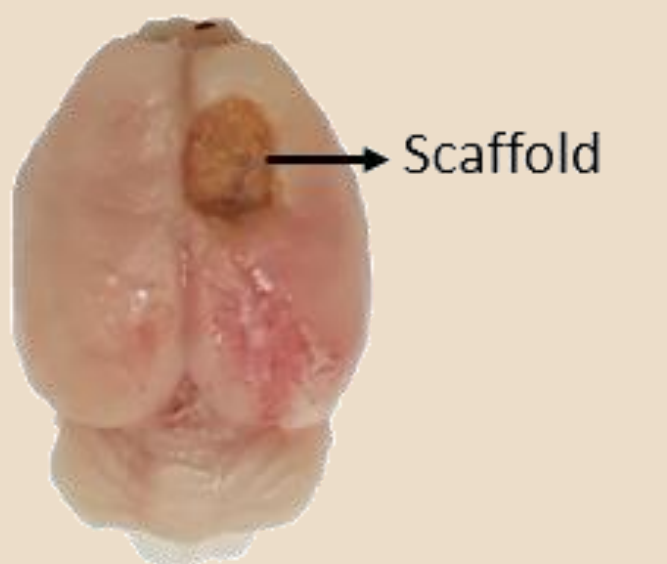
- Scaffold architecture :



- PEGDA-GelMA scaffold



- PCL scaffold



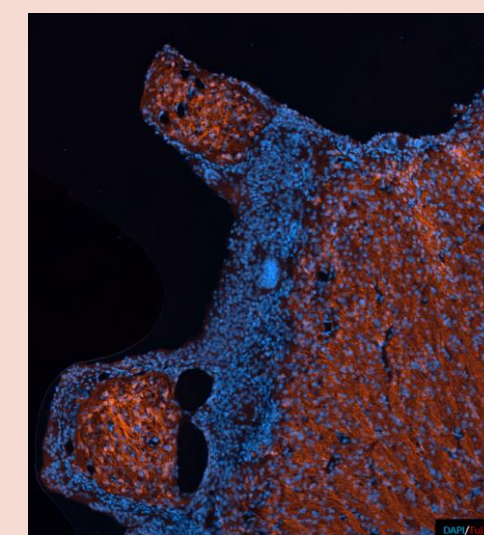
Histology

- Immunohistochemistry

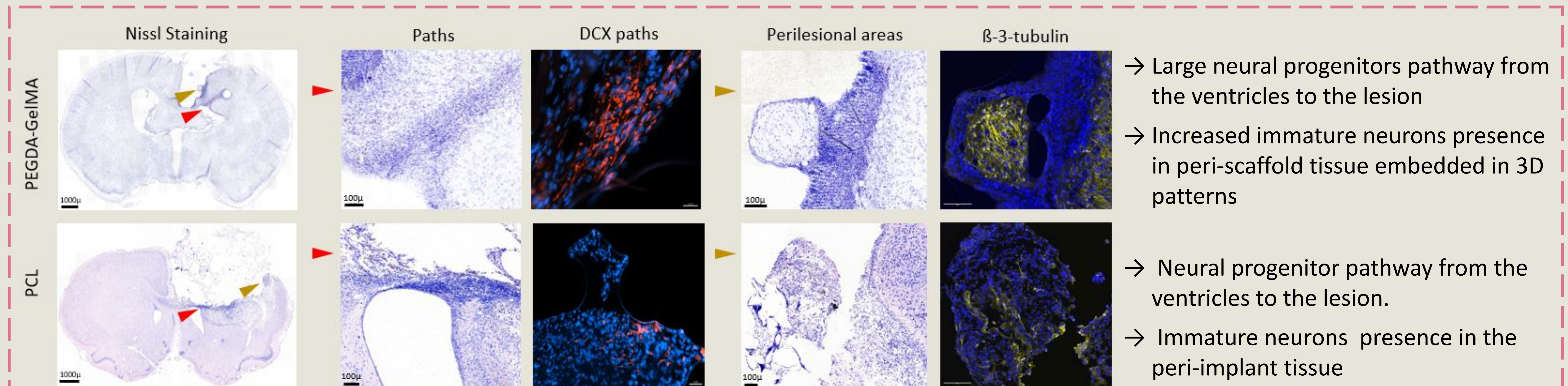
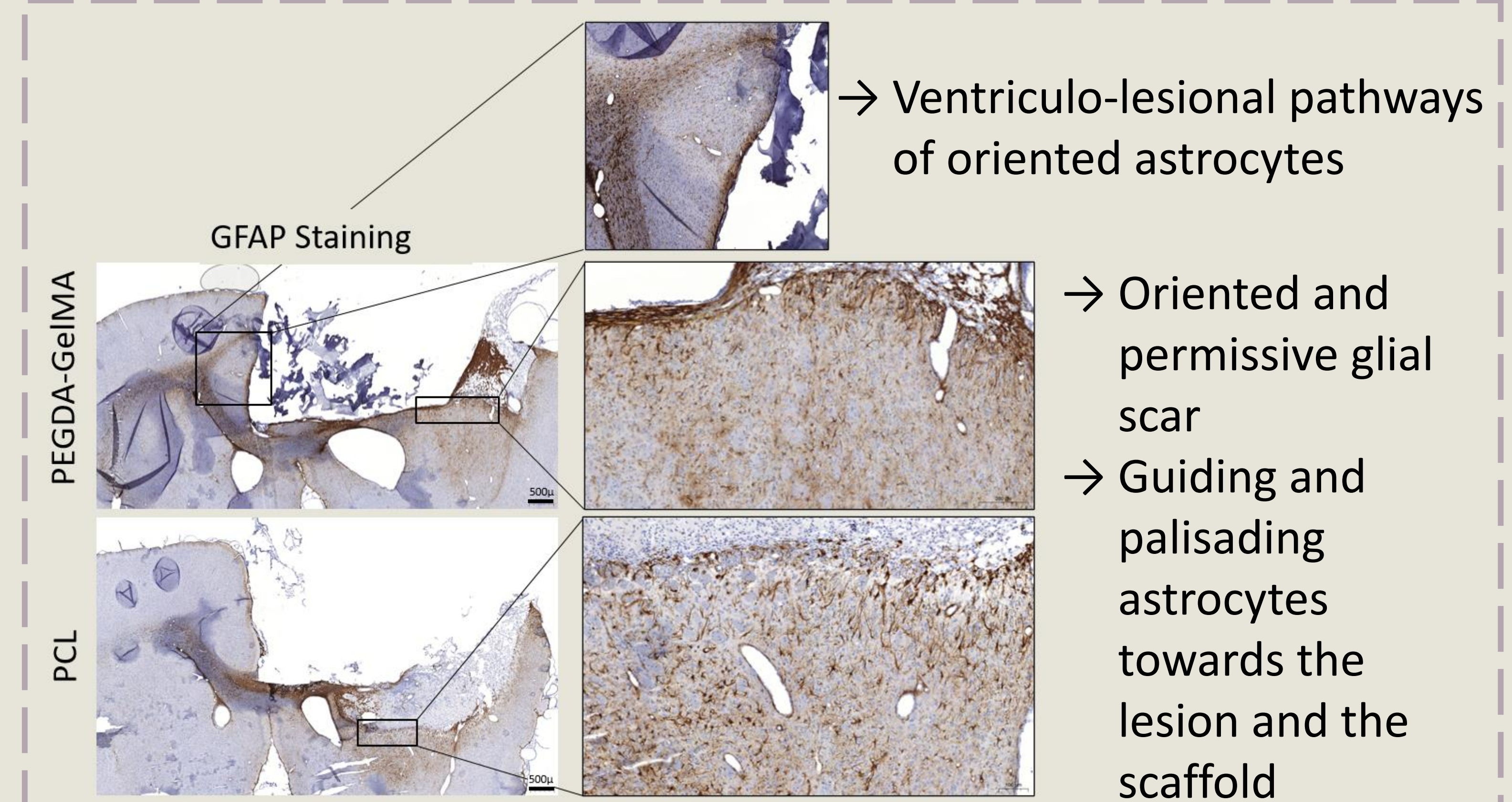
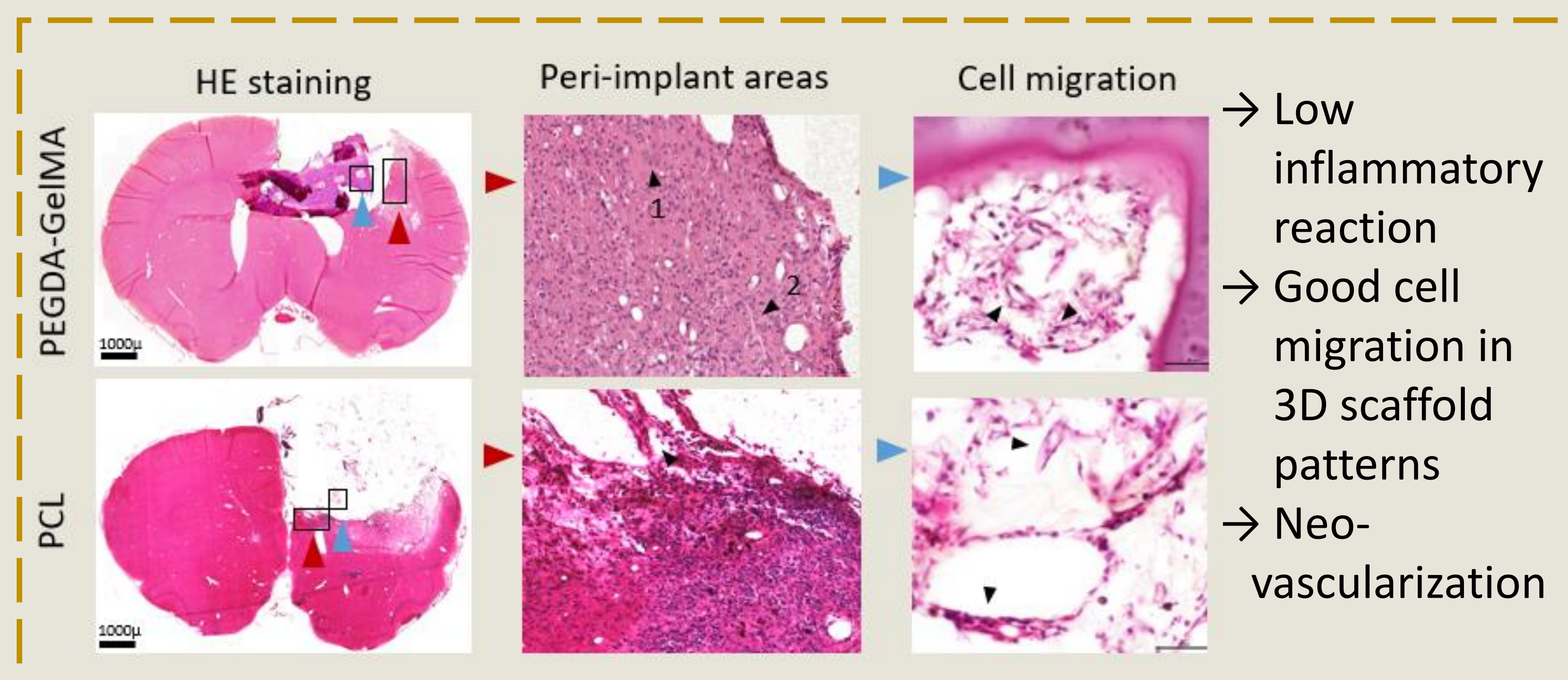
- Hemotoxyline-eosine staining/Nissl staining
- GFAP : astrocytes

- Immunofluorescence

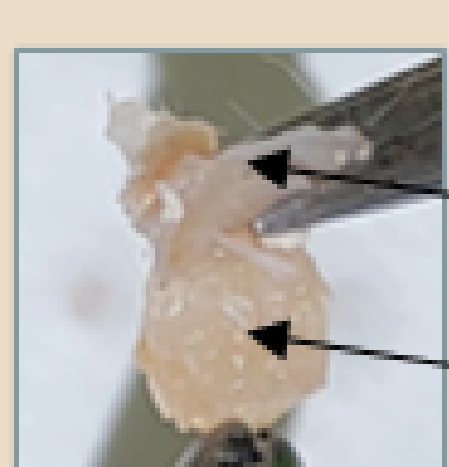
- DCX : neural progenitors
- $\beta$  3 tubulin : immature neurons



## Results



## Discussion



- PCL adheres more favorably to the bone
- PCL allows a less complex 3D architecture
- PCL generates a stronger fibrosis reaction than PEGDA-GelMA (*not shown here*)

## Conclusion

- PEGDA-GelMA appears to be a good biomaterial tolerated by the brain that initiates **low inflammatory** and **tissue reconstruction** with **cell migration in the 3D scaffold patterns** and presence of **various neural progenitor cells around the scaffold**.