

Do not implant!

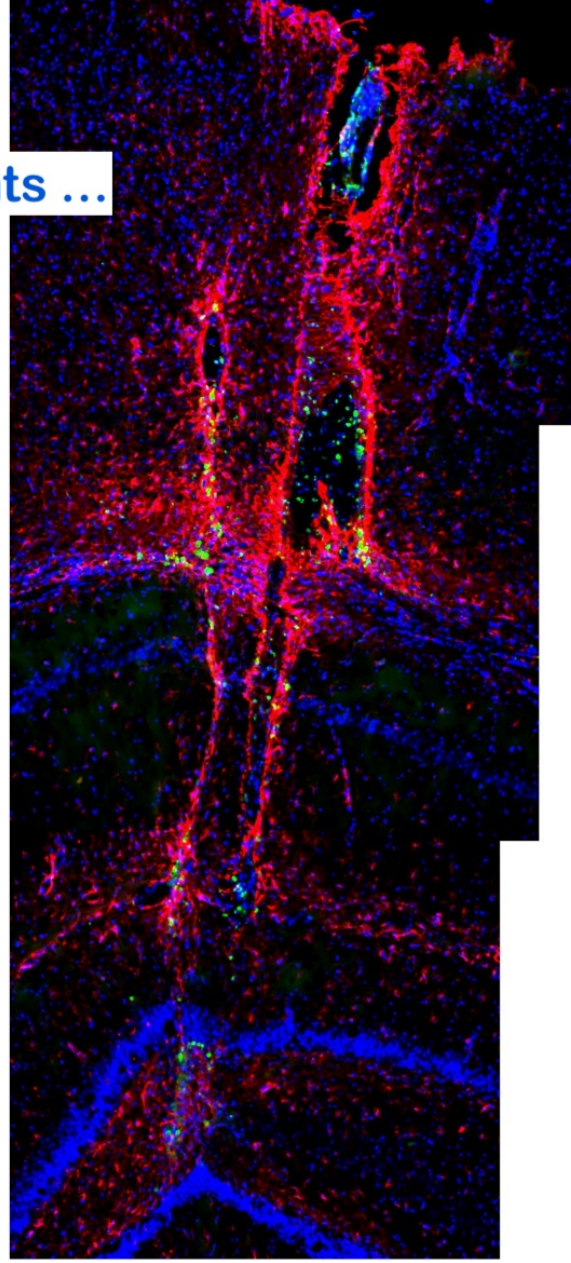
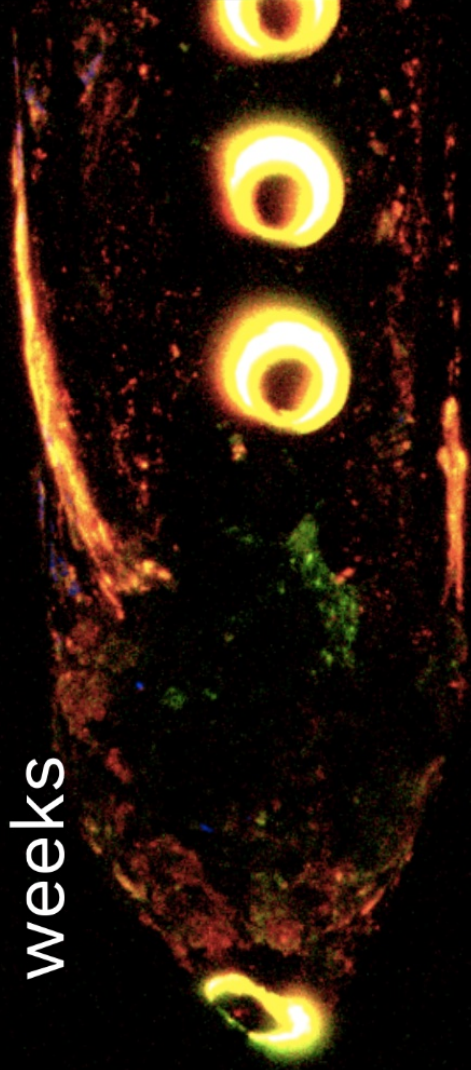


since we currently fall for
the „Drunkard’s Fallacy“

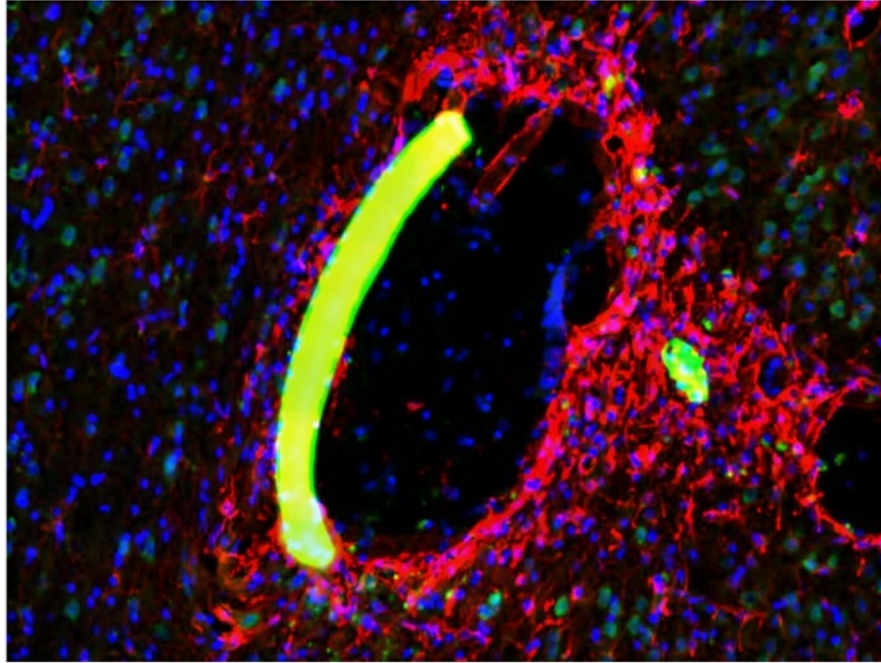
Gliosis is unavoidable

in rigid implants ...

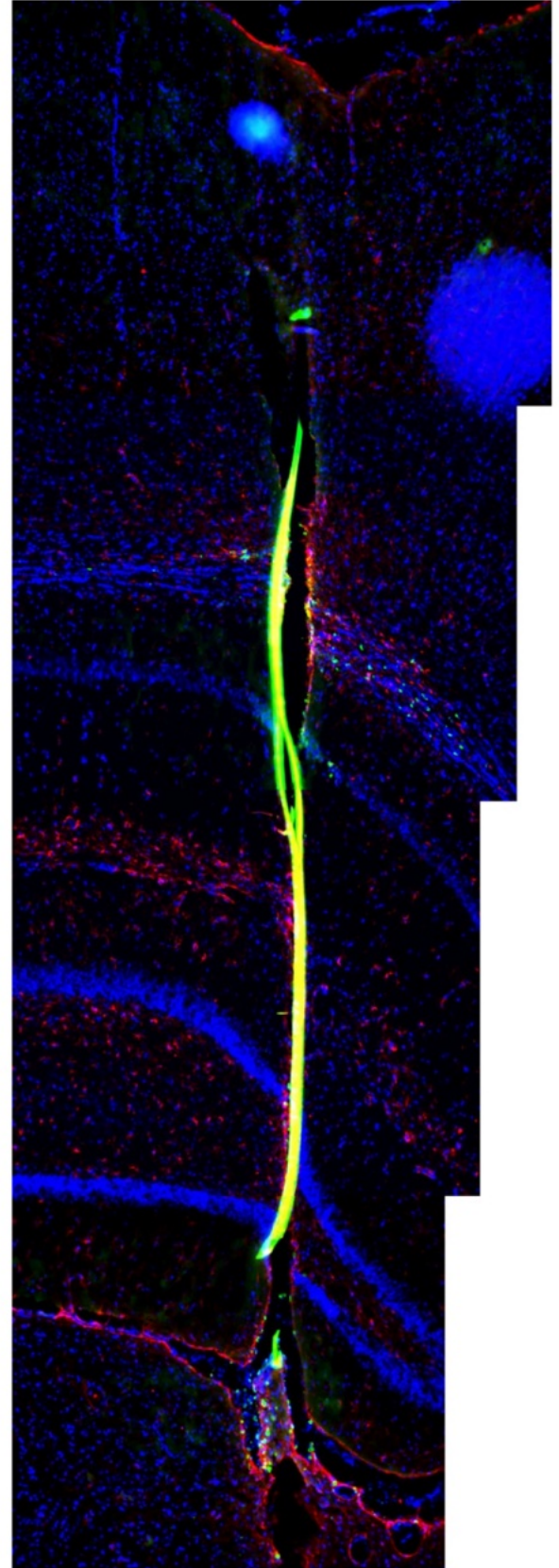
Metal multisite probe after 10
weeks



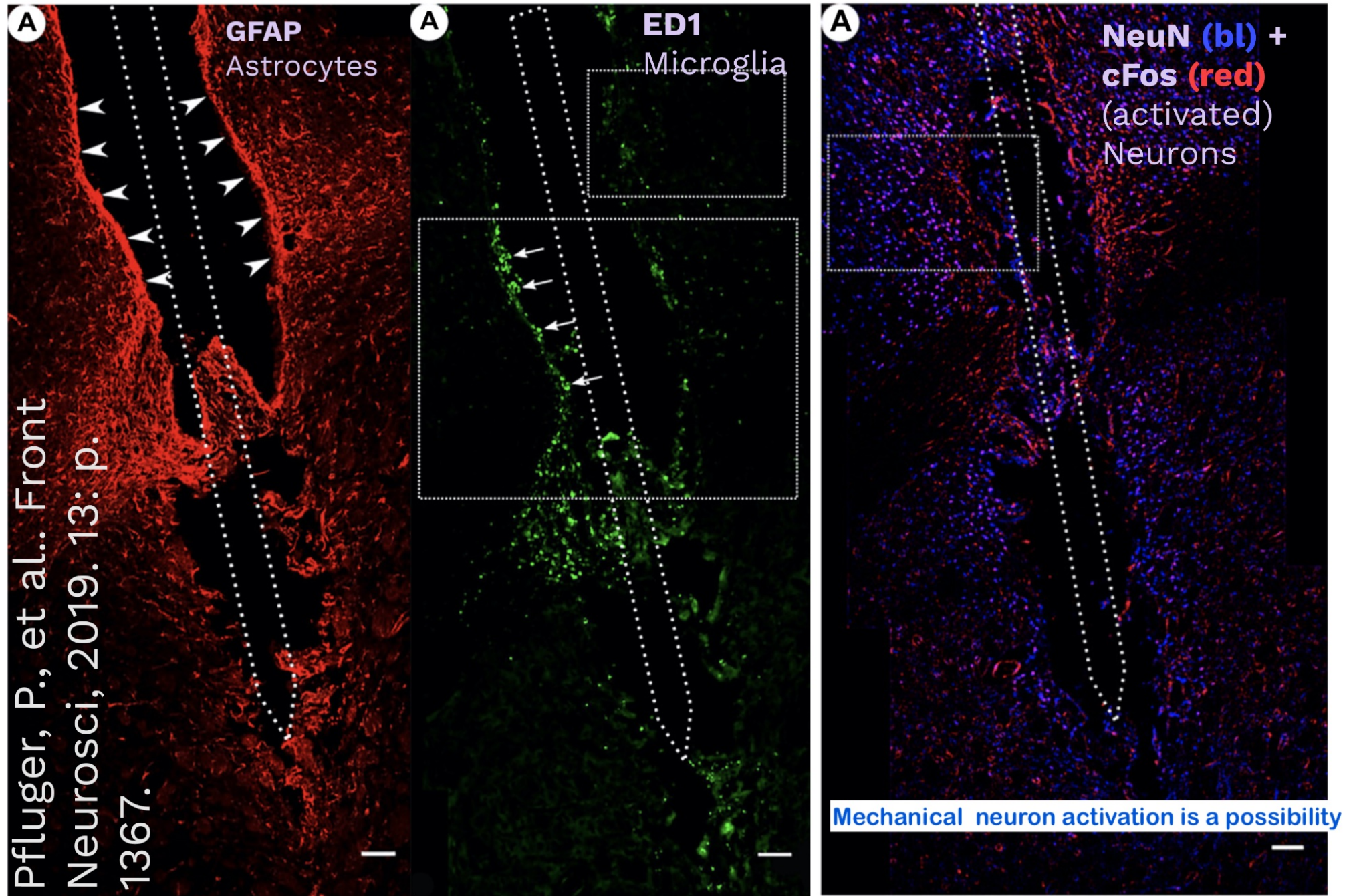
Pfluger, P., et al.. Front
Neurosci, 2019, 13: p.



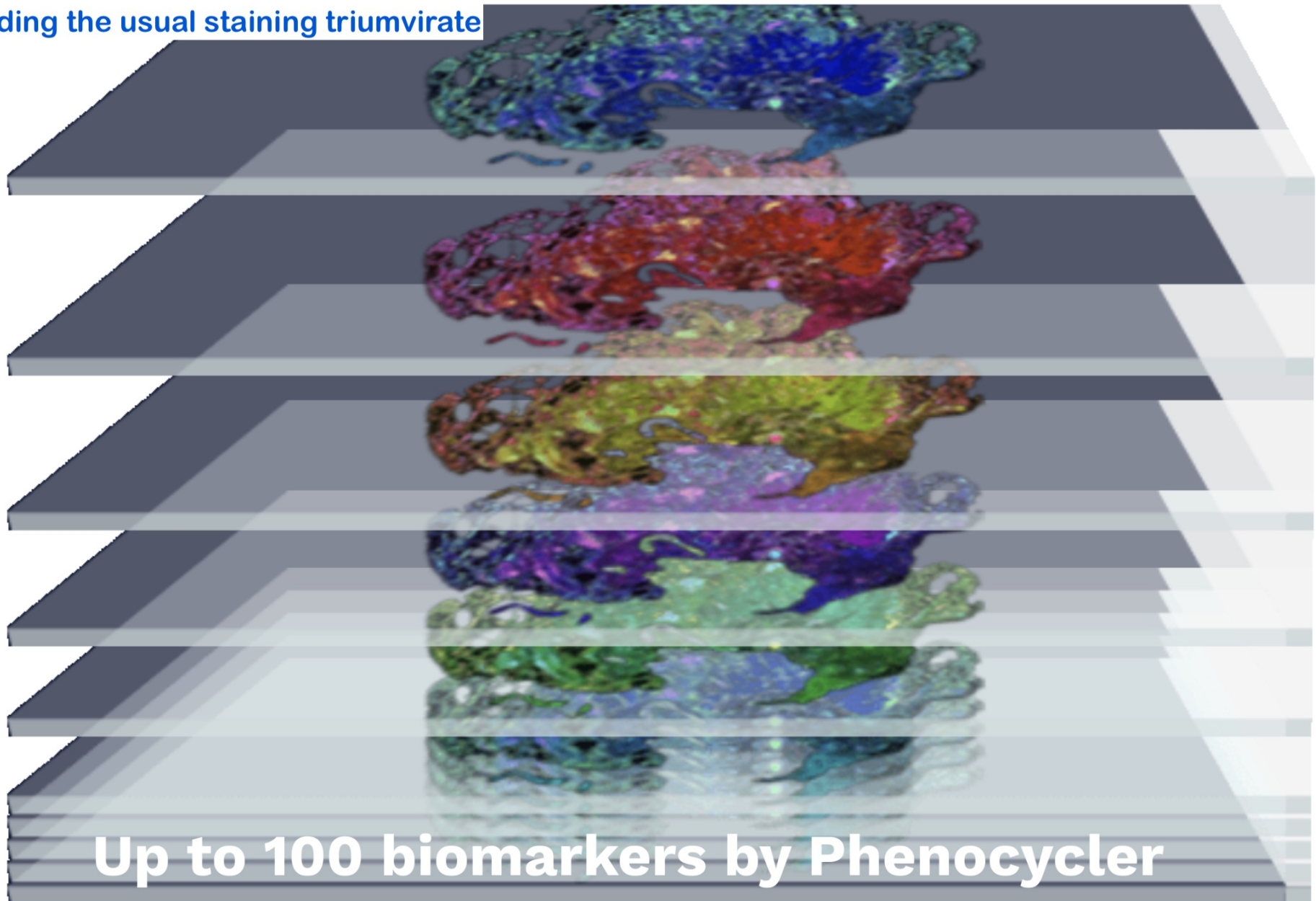
Not even flexible
micro-implants are
Gliosis-free



... as seen by the usual staining triumvirate



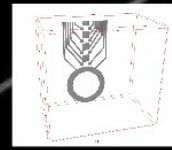
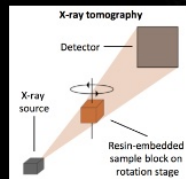
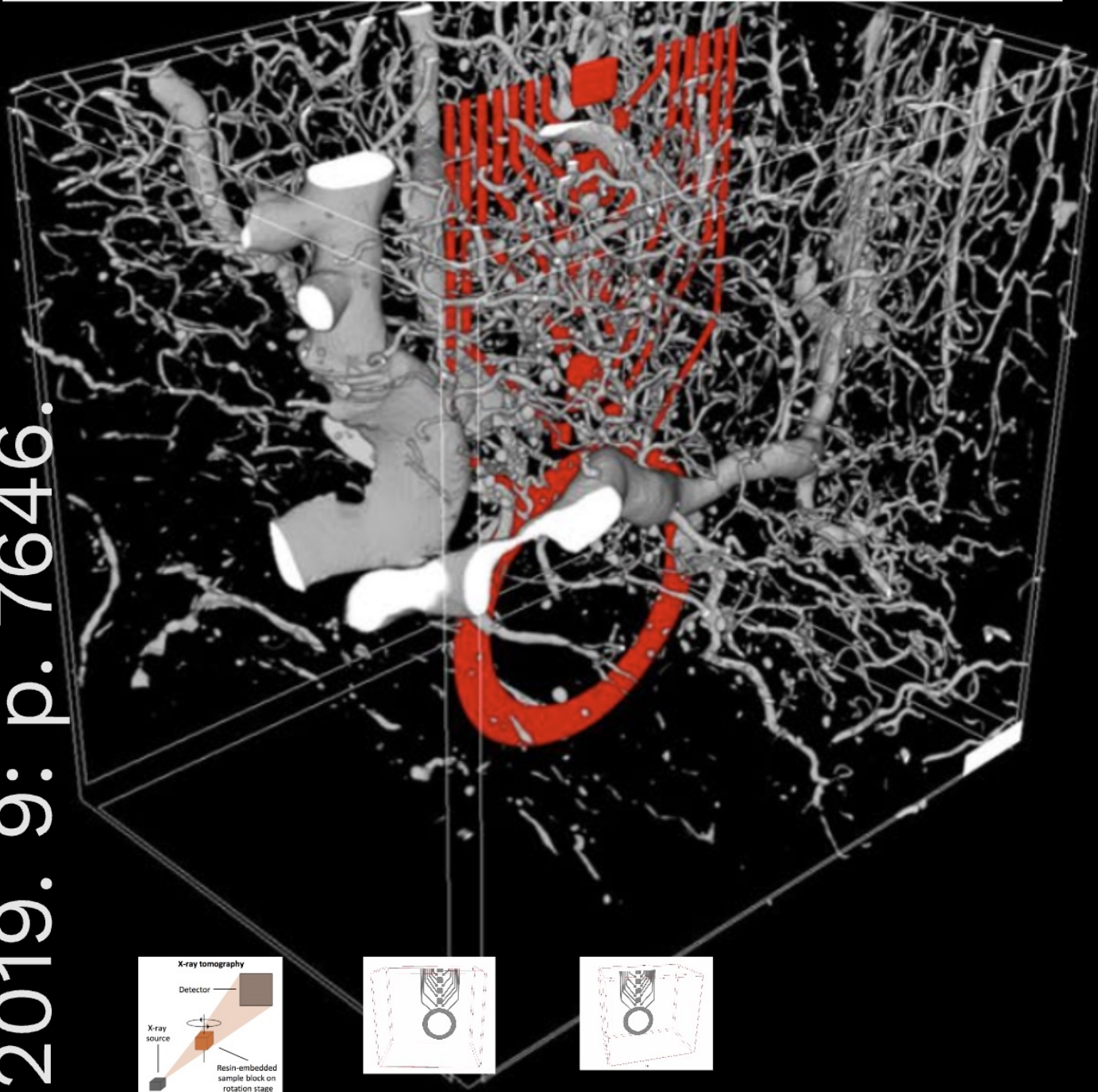
Extending the usual staining triumvirate



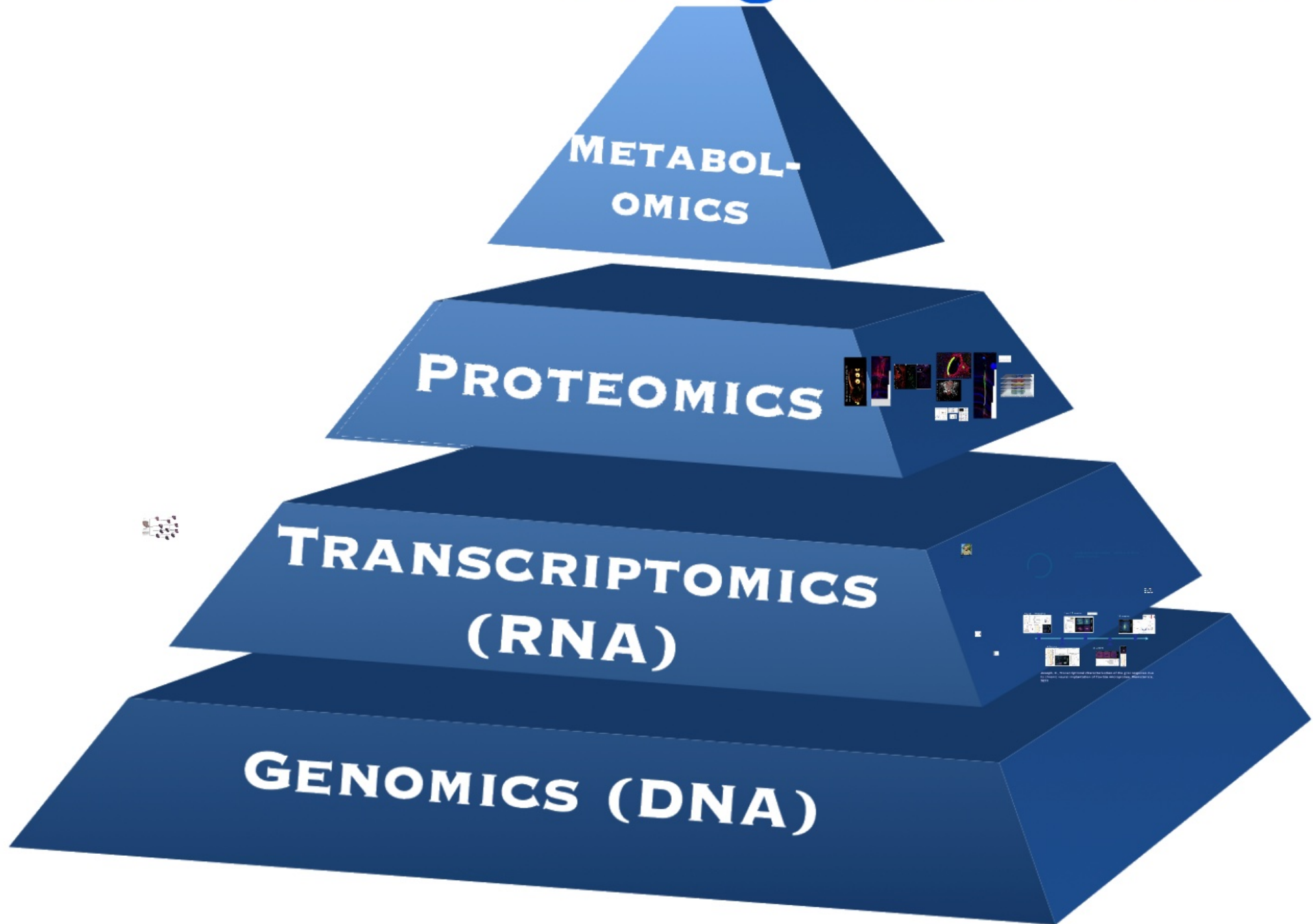
Up to 100 biomarkers by Phenocycler

Böhm, T., et al. Sci. Rep. **2019. 9:** p. 7646.

Some things are still outside
the usual „light cone“



Let's go multi-omics!





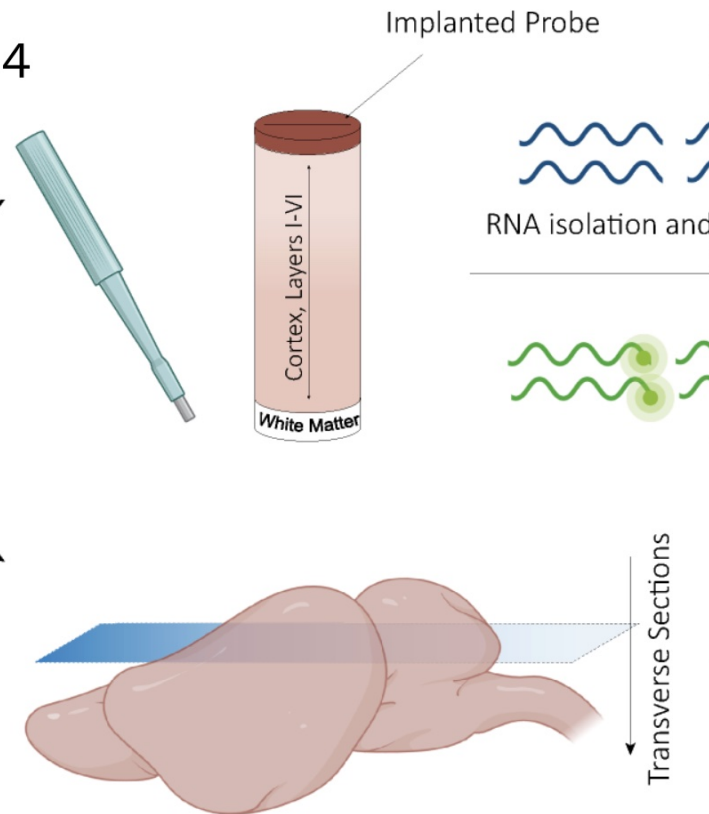
Kevin Joseph,

Sprague-Dawley, 300g, P54



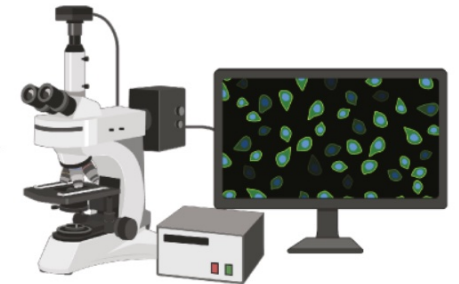
Acute,
1 week, 2 weeks,
4 weeks & 18 weeks

Transcriptomics Workflow



Antibody Based

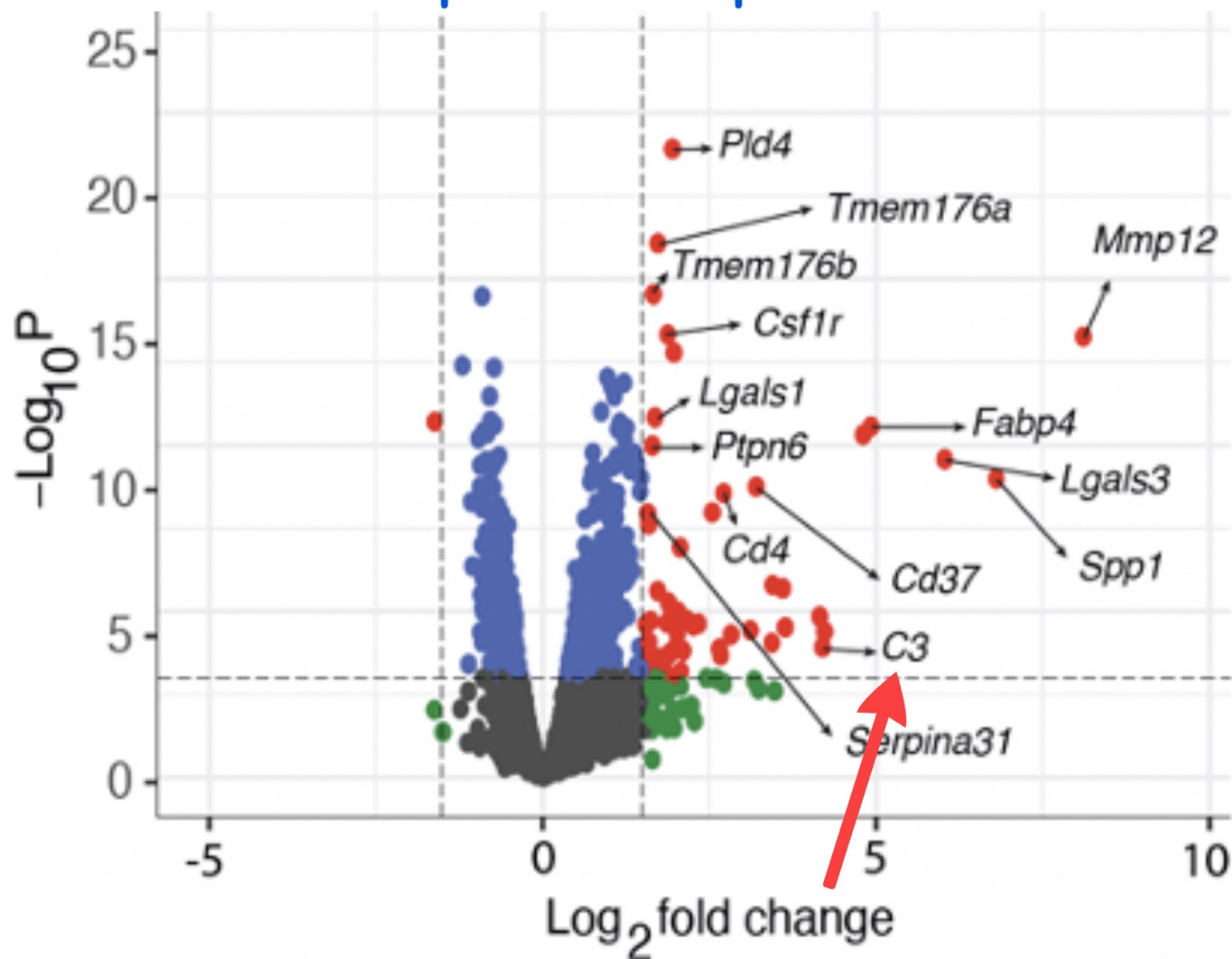
Immuno Staining



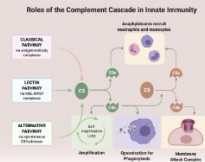
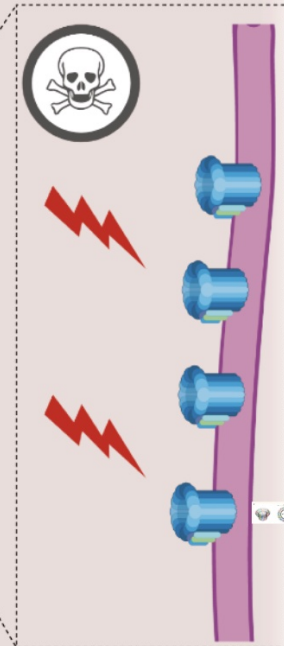
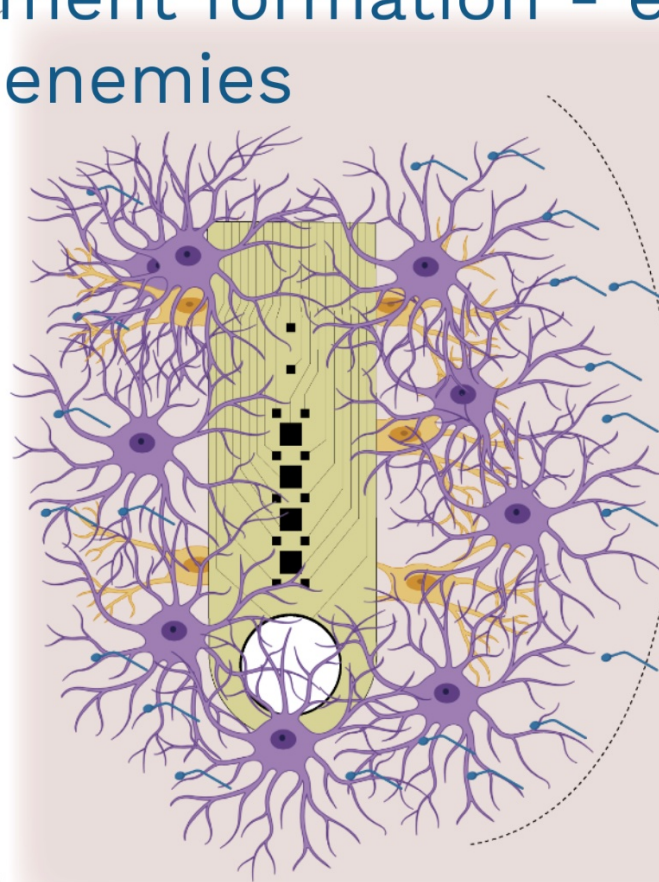
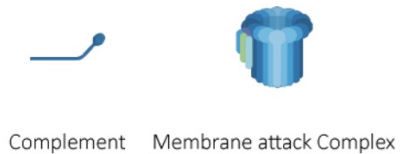
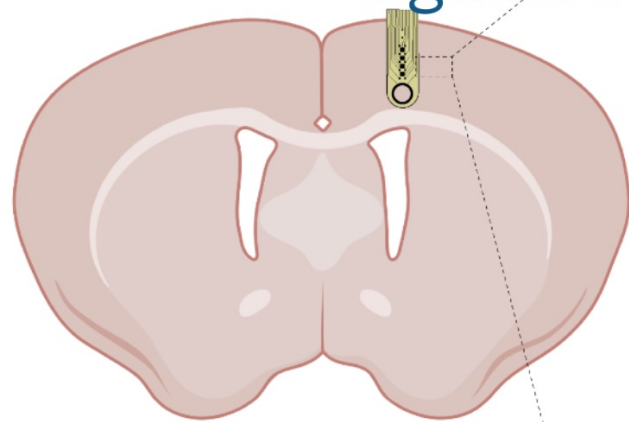
d

● NS ● Log_2FC ● p-value ● p-value & Log_2FC

Not a real surprise: Complement Activation

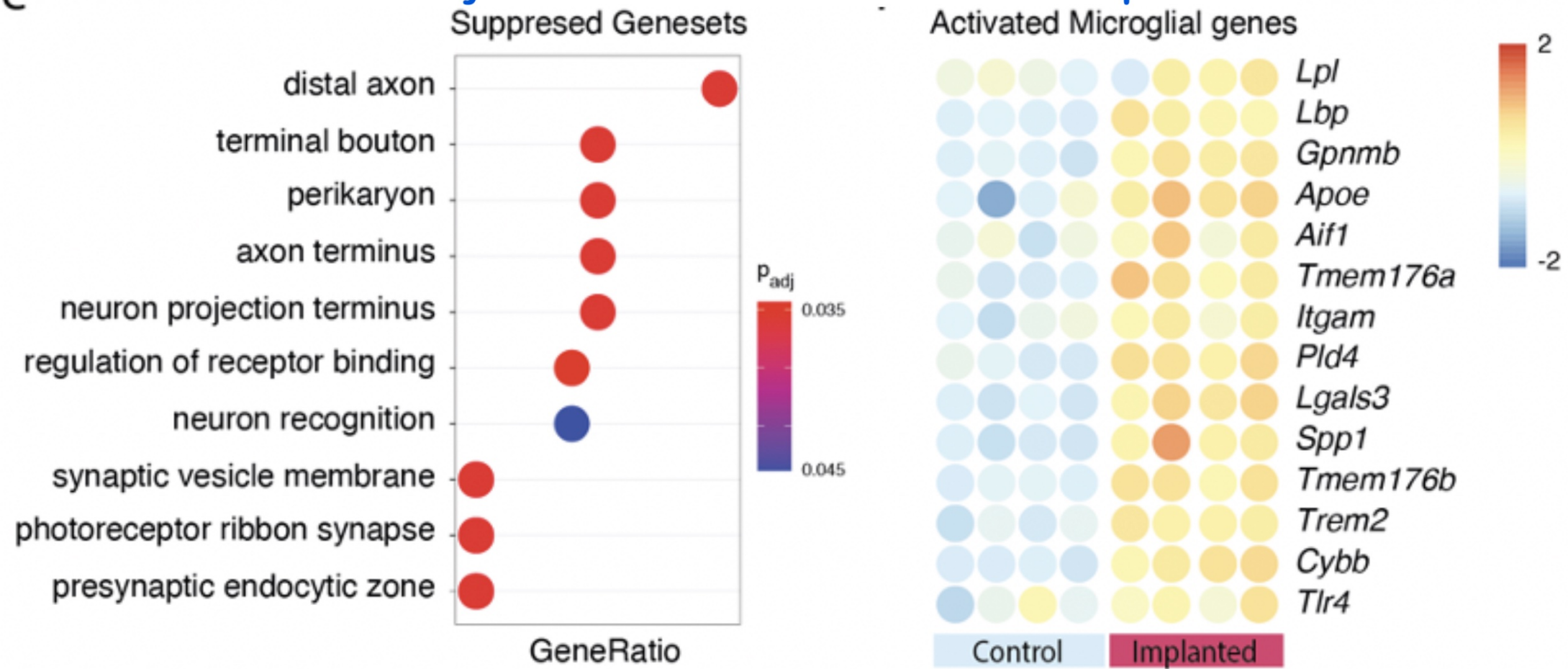


„C3“ Complement formation - earliest defense against enemies

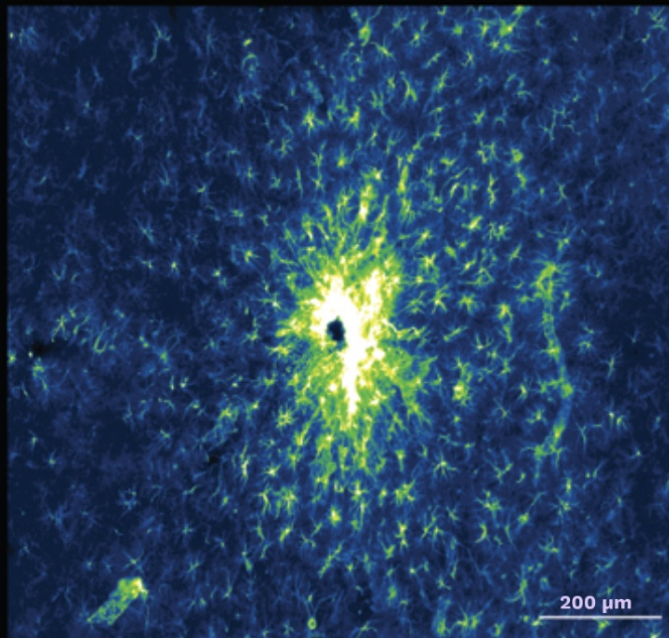


e

Pathway stories instead of mono-color pictures

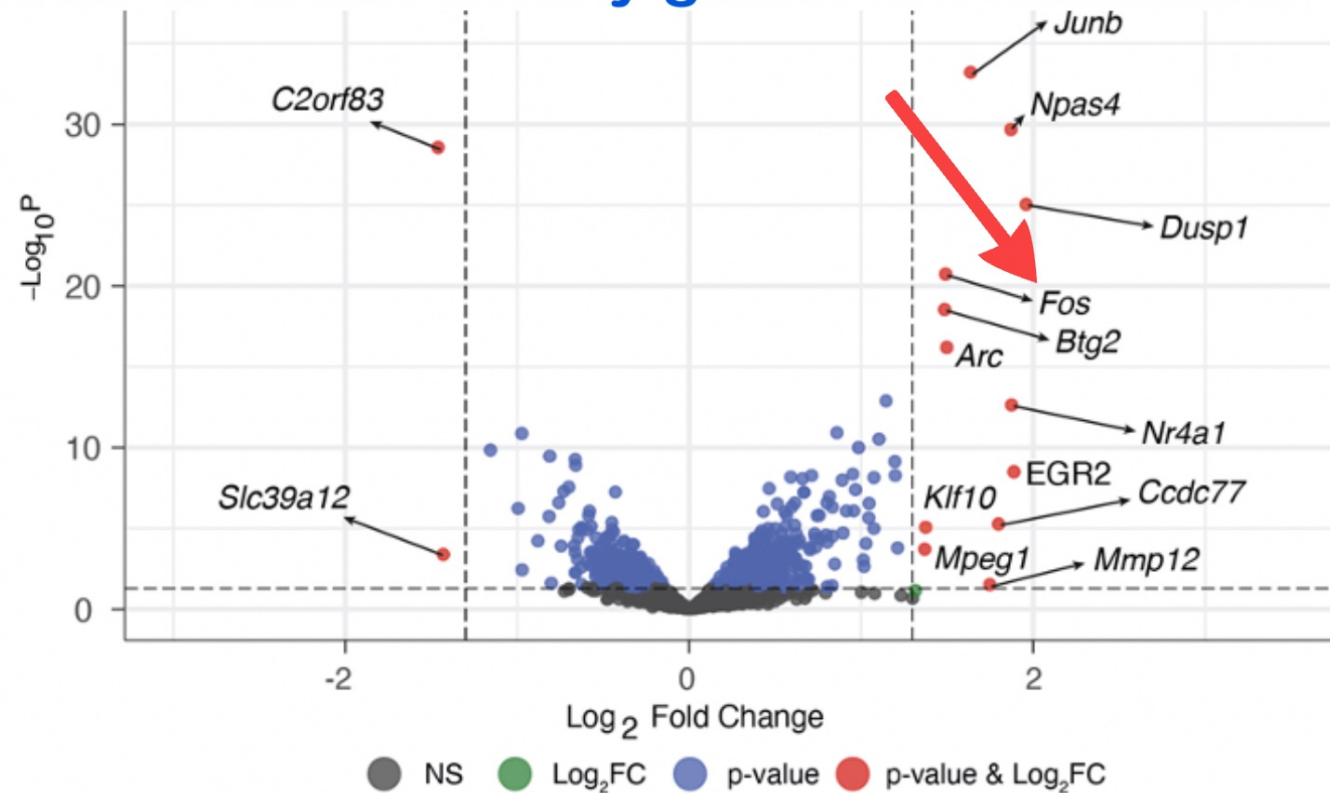


18 weeks post implant



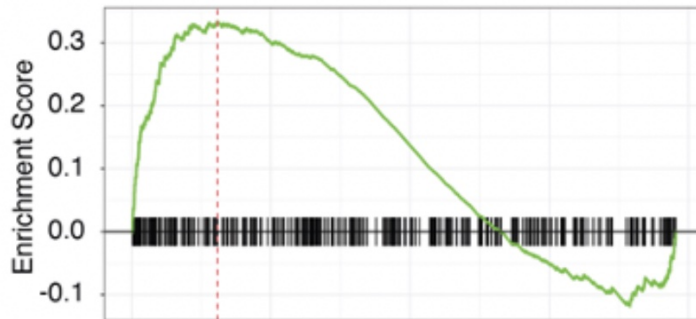
GFAP⁺ Astrocytes

Even after 18 weeks: Early genes are activated!

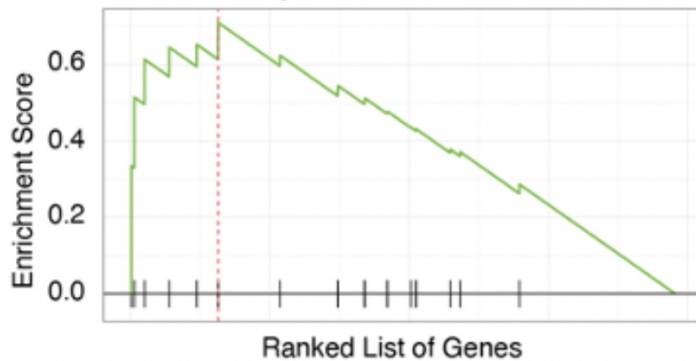


a

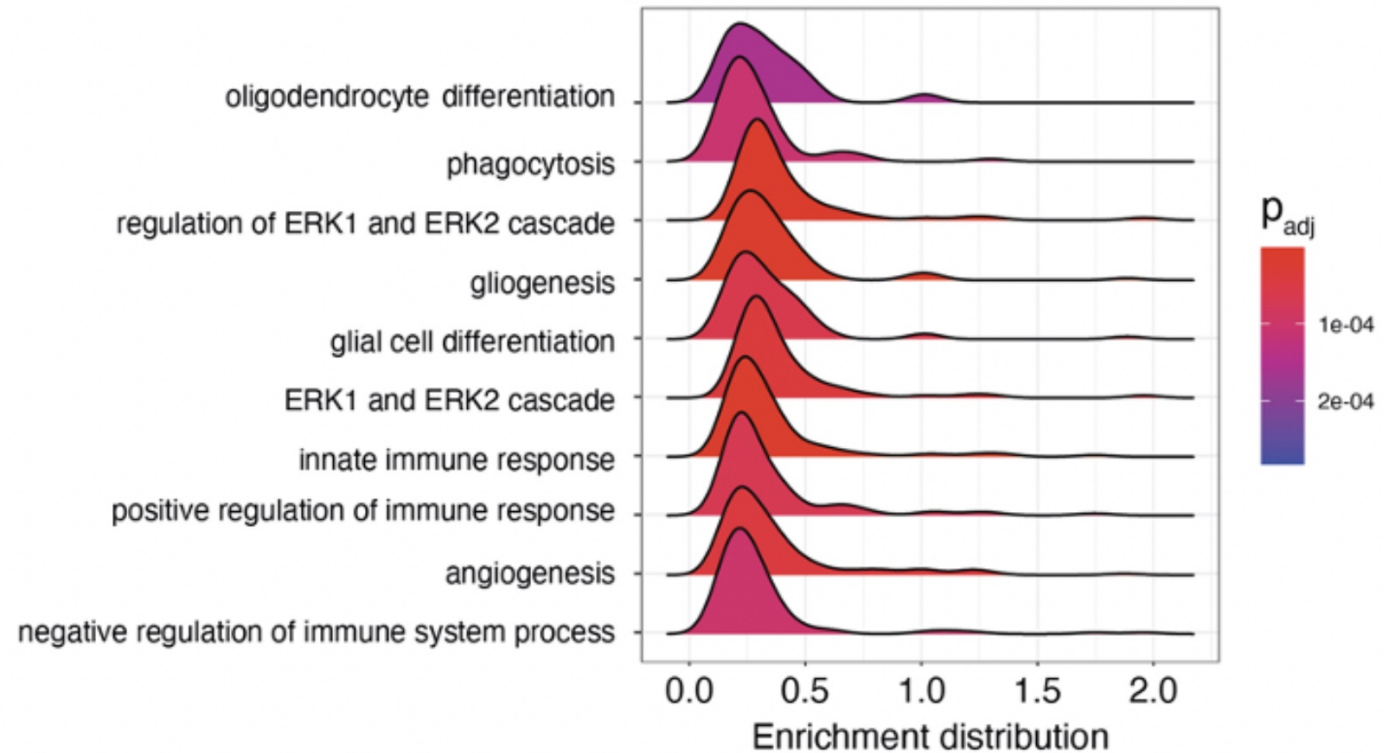
Wound Healing



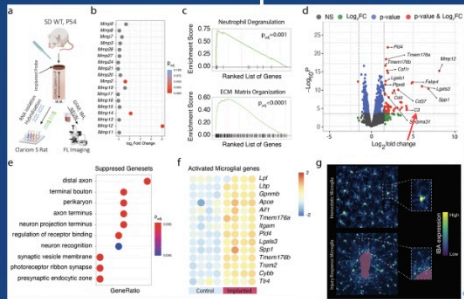
Complement Activation



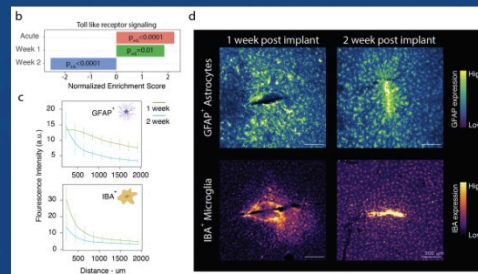
Even after 18 weeks: Repair continues!



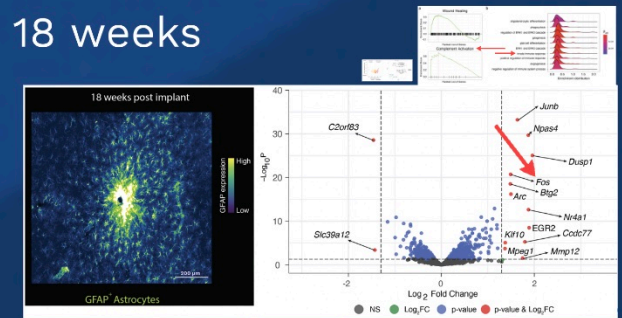
Acute Timepoint



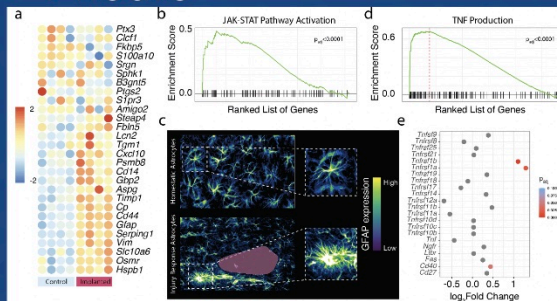
1 and 2 weeks



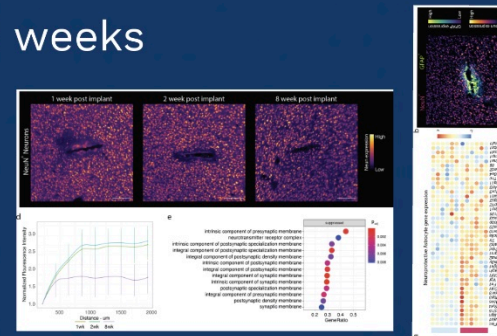
18 weeks



4 hours



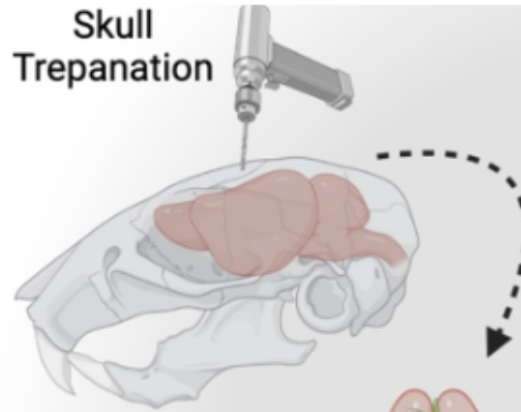
8 weeks



Joseph, K., Transcriptional characterization of the glial response due to chronic neural implantation of flexible microprobes. Biomaterials, 2021

Part of the problem: Insertion procedure

Skull
Trepanation

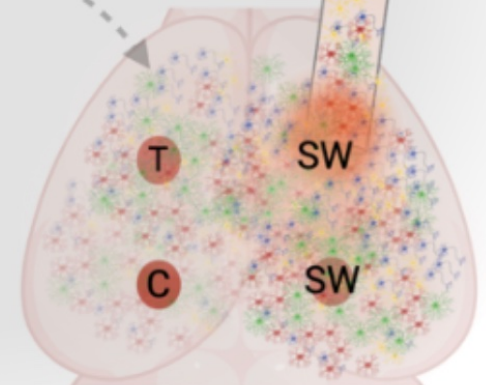


Trepanation (T)

Control (C)

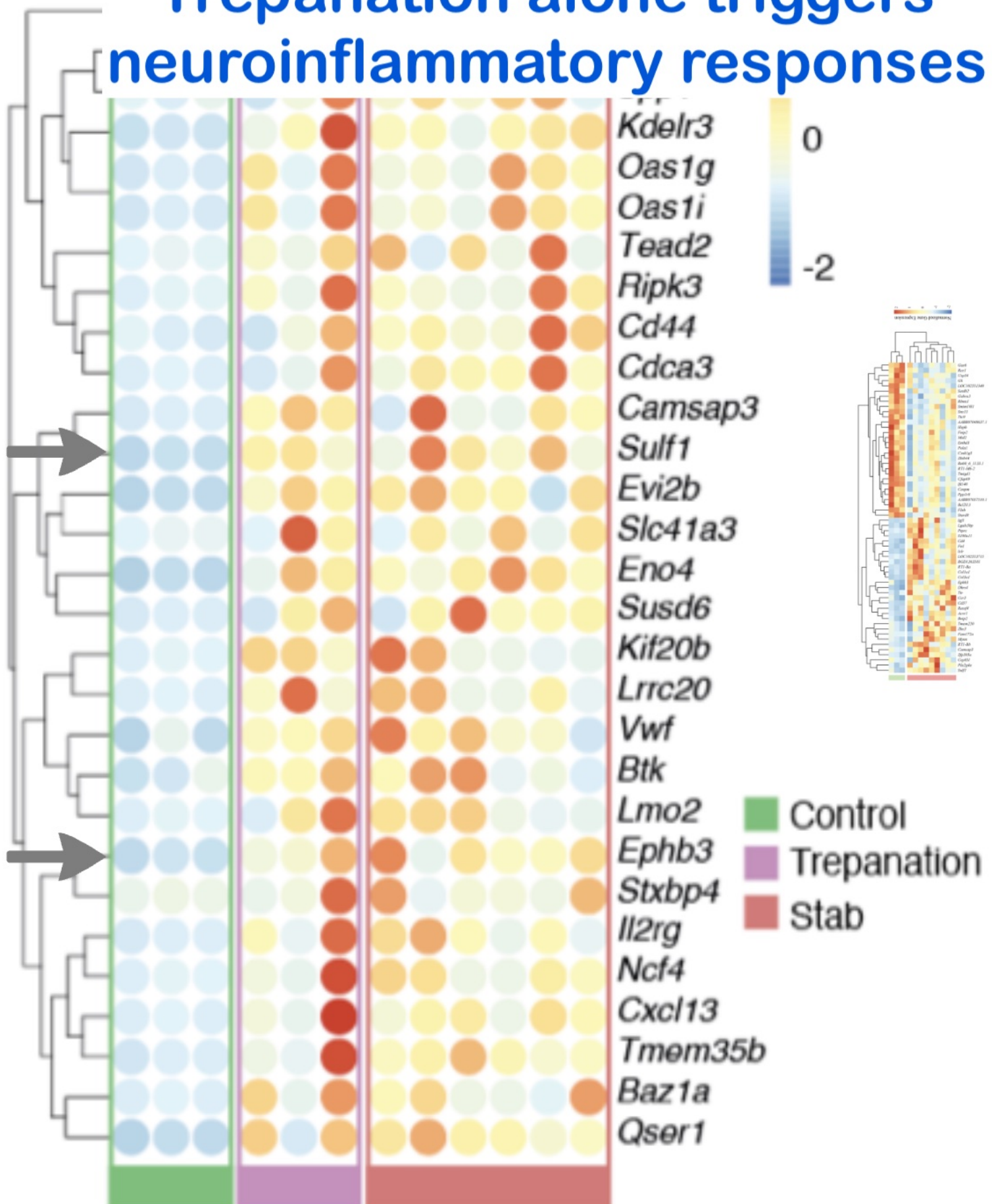


Stab wound
(SW)

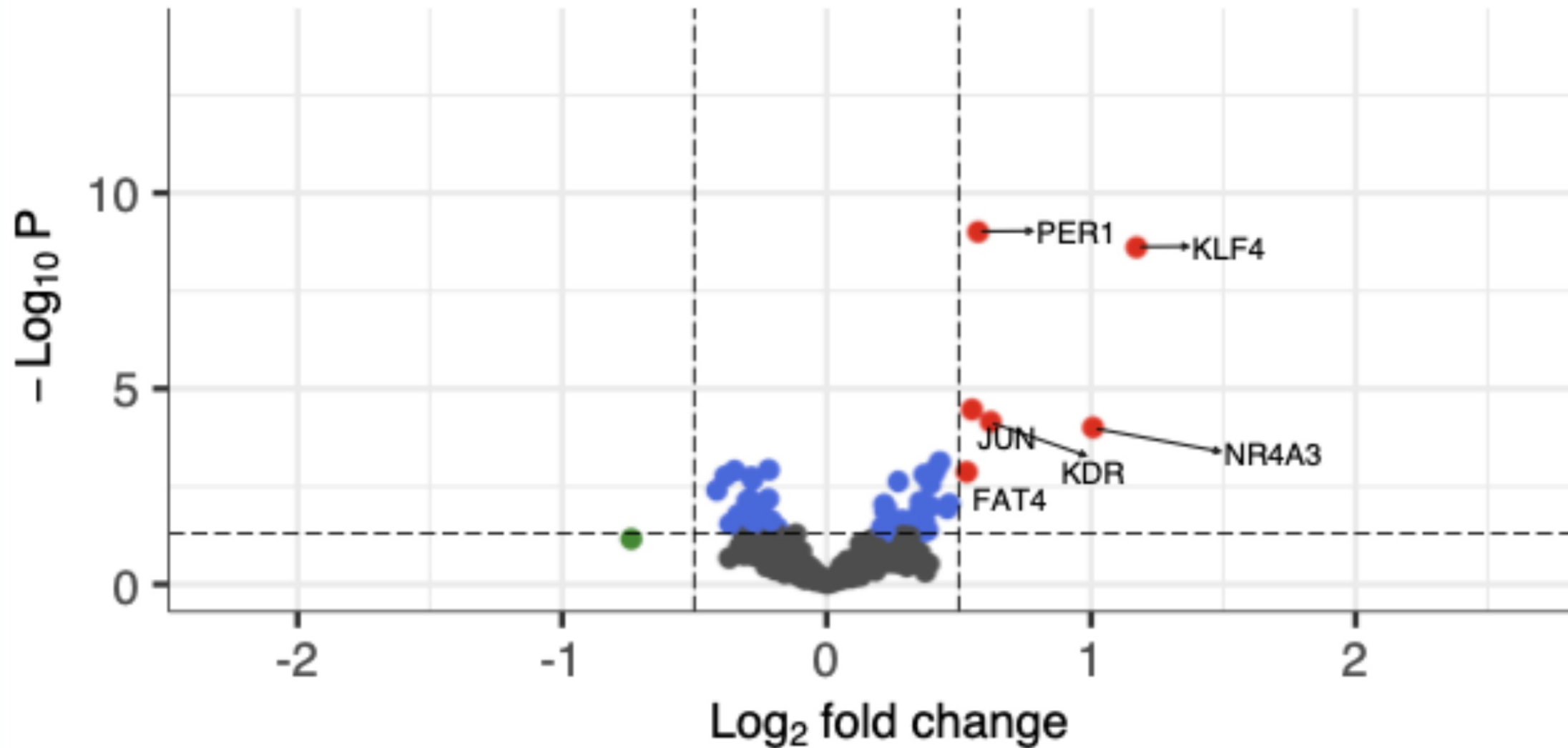


Tissue Sampling
at day 7

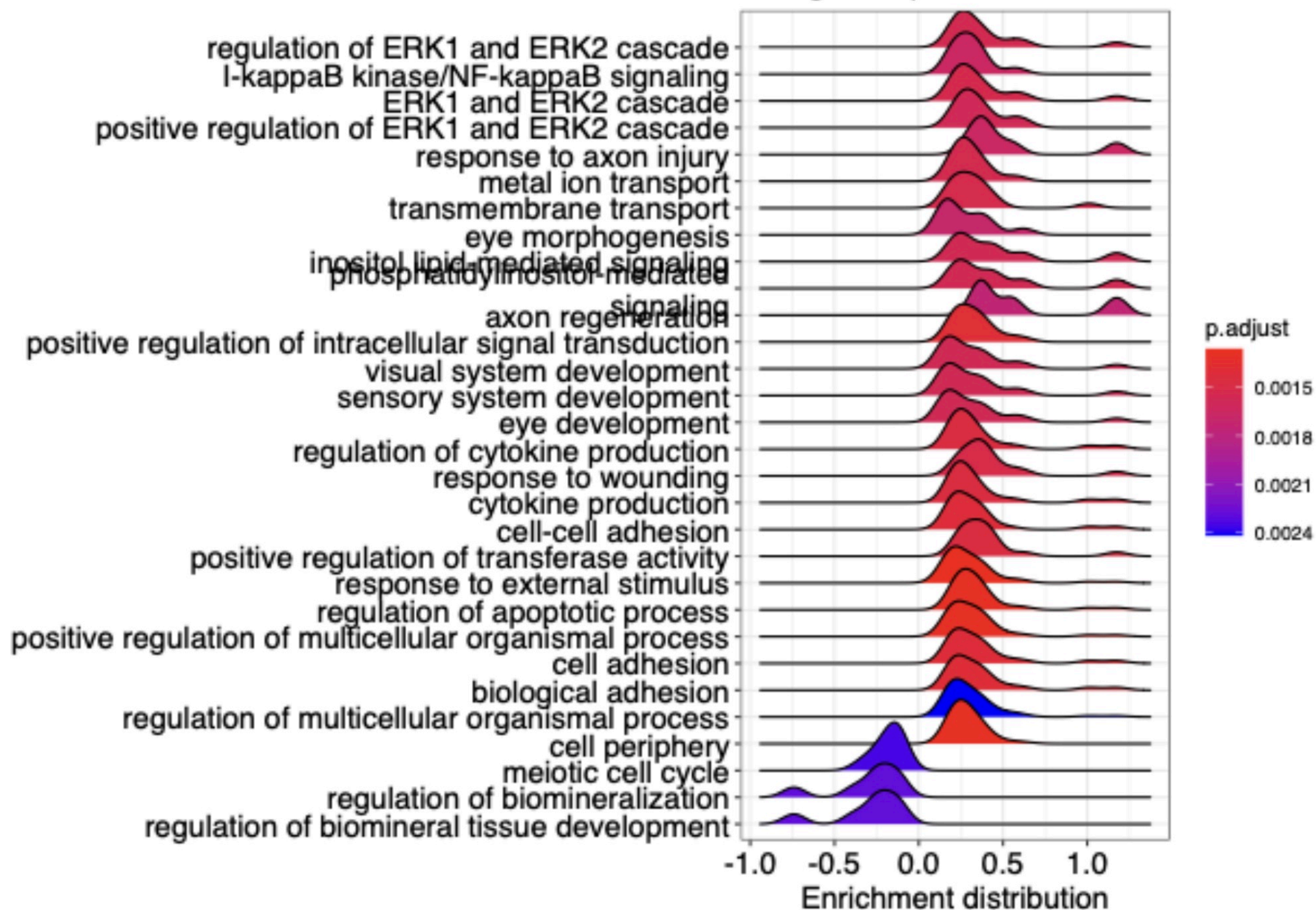
Trepanation alone triggers neuroinflammatory responses



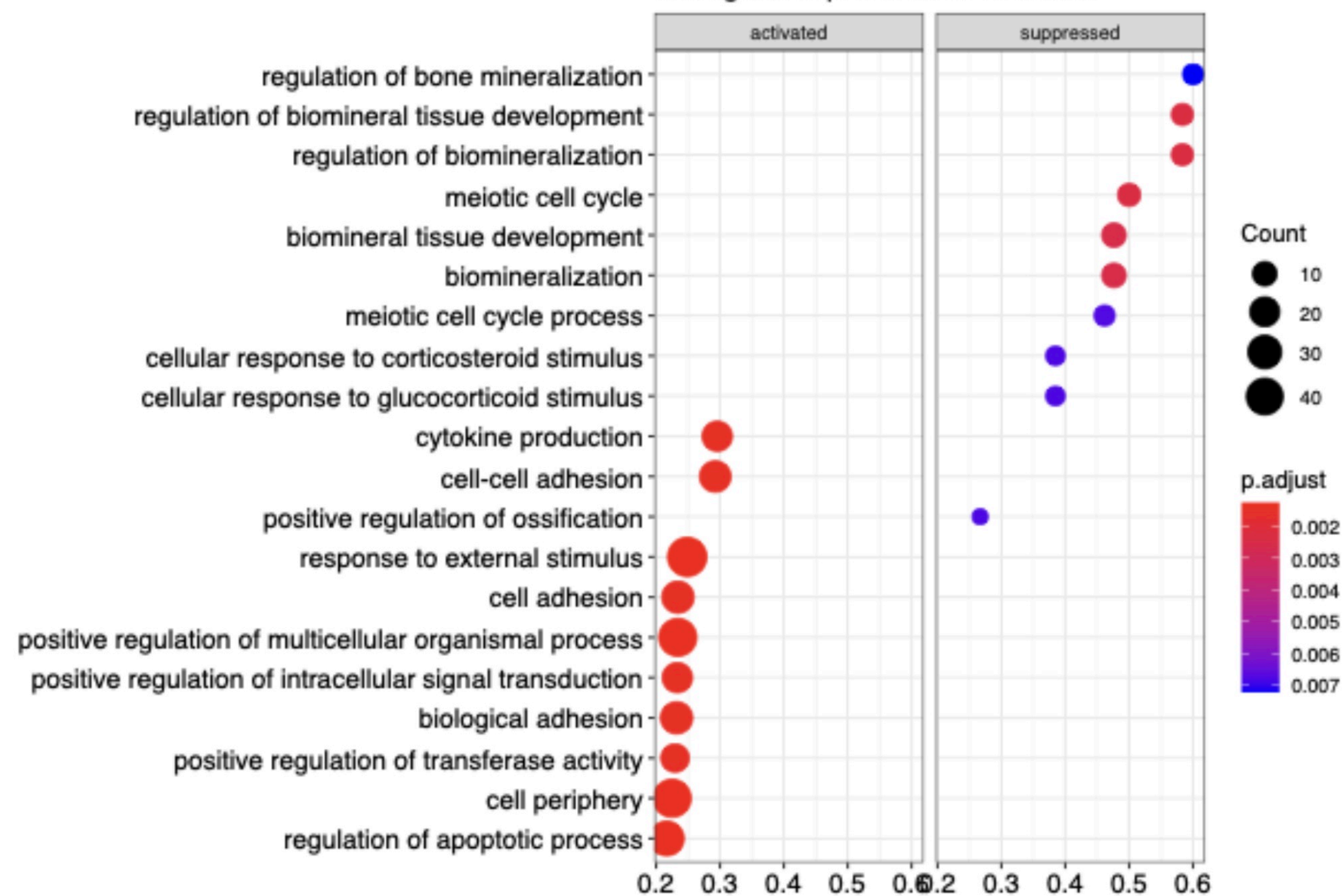
Neuroinflammatory responses may contain Pre-Oncogen Activation



Oncogene expression at 18 weeks



Oncogene expression at 18 weeks



Clinical Case Reports / Volume 10, Issue 6 / e05927

CASE REPORT |  Open Access |  

Glioblastoma 20 years after a nail gun trauma: A risk factor?

Megan M. Finneran , Michael Young, Larry Joyce, Emilio M. Nardone

First published: 02 June 2022

<https://doi.org/10.1002/ccr3.5927>

Original Investigation | Neurology



Traumatic Brain Injury and Risk of Malignant Brain Tumors in Civilian Populations

Sandro Marini, MD^{1,2}; Amr R. Alwakeal, MD³; Hunter Mills, MS⁴; [et al](#)

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Key Points

Question Is a history of traumatic brain injury (TBI) associated with increased risk of developing a malignant brain tumor among civilian populations?

Findings In this cohort study including 151 358 US adult civilians, the risk of developing a malignant brain tumor was significantly higher among adults with TBI compared with those without TBI.