

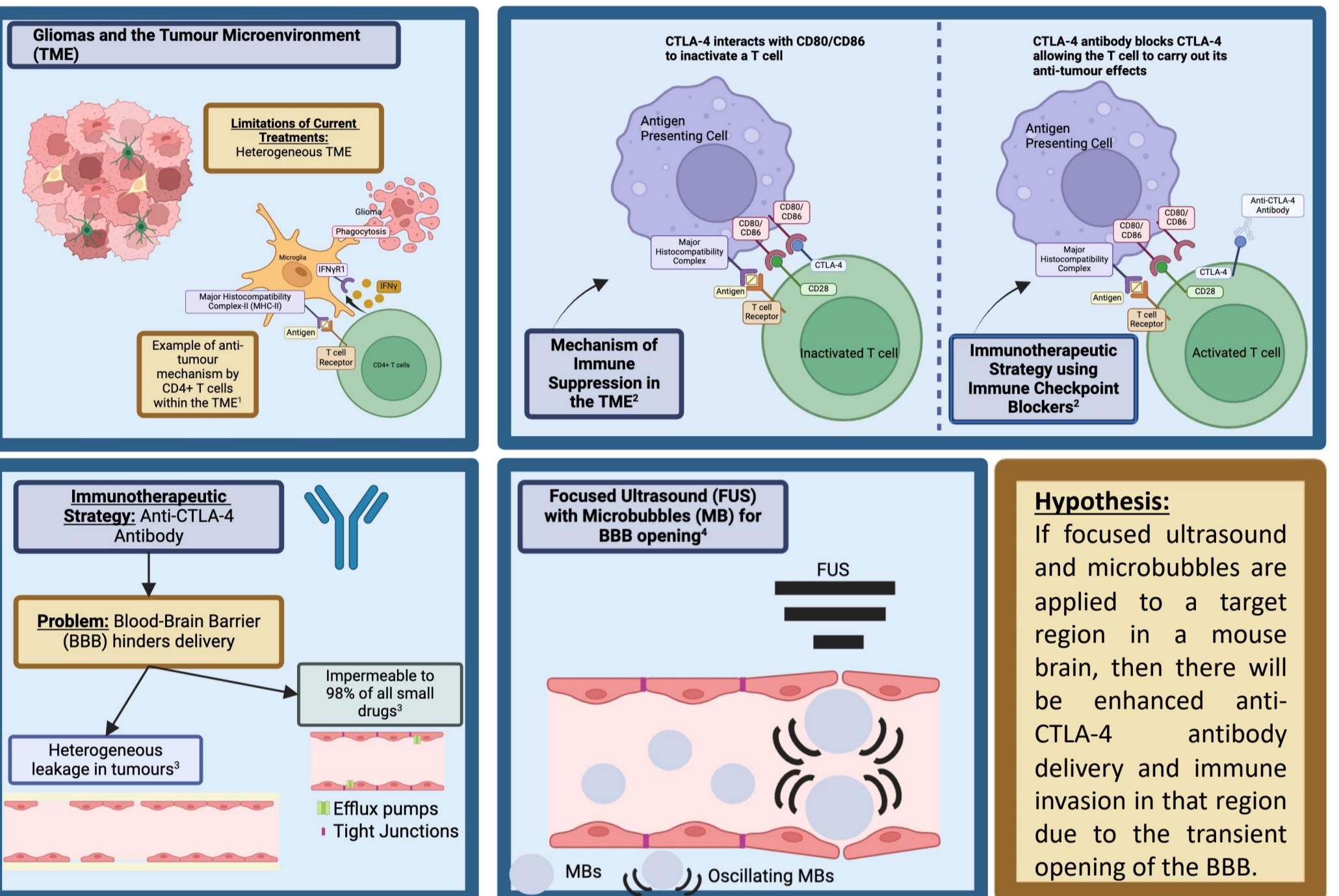


# Focused Ultrasound with Microbubbles as a Glioma Therapeutic Strategy to Improve the Delivery of Immune Checkpoint Blockers to the Brain

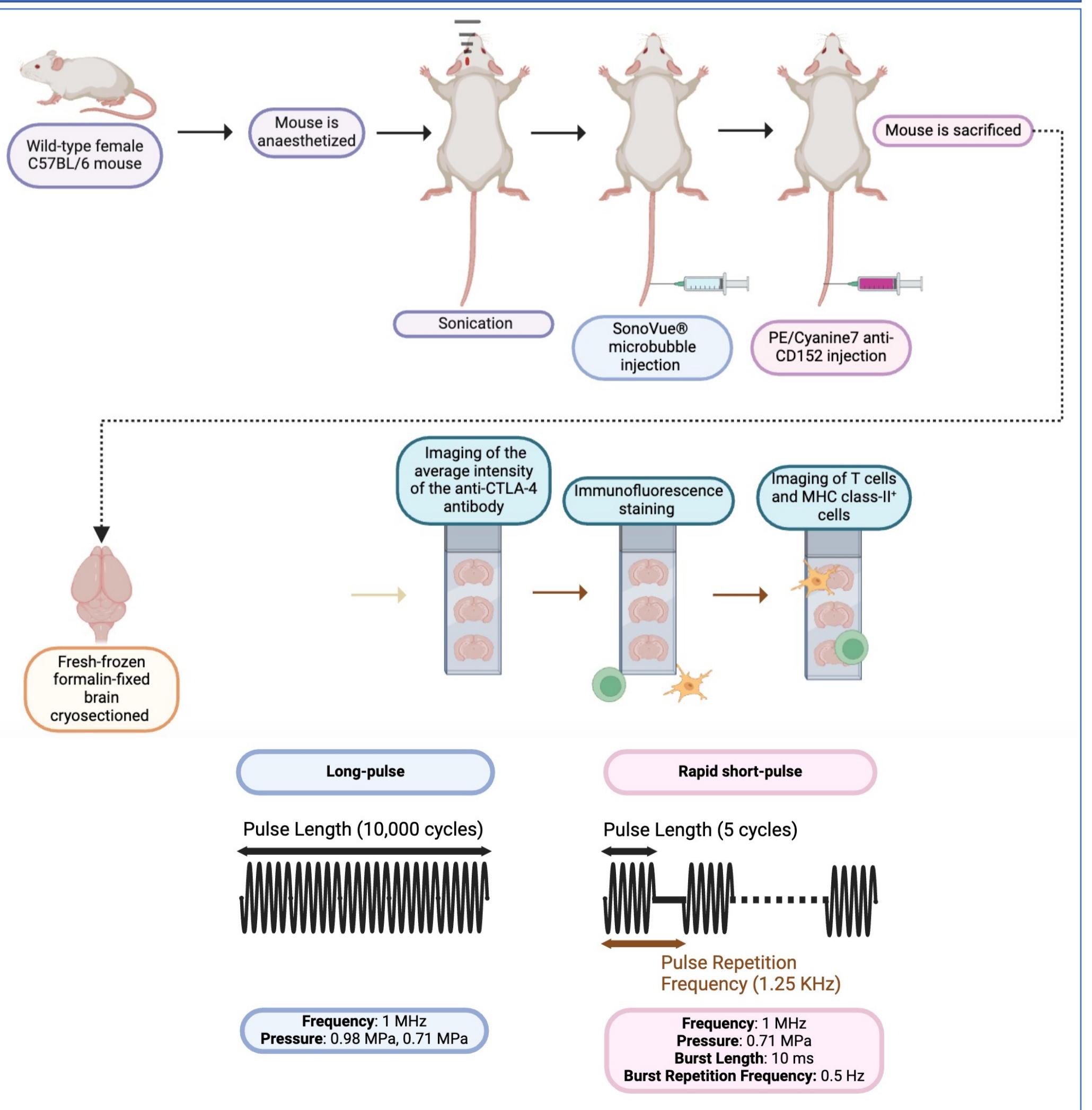
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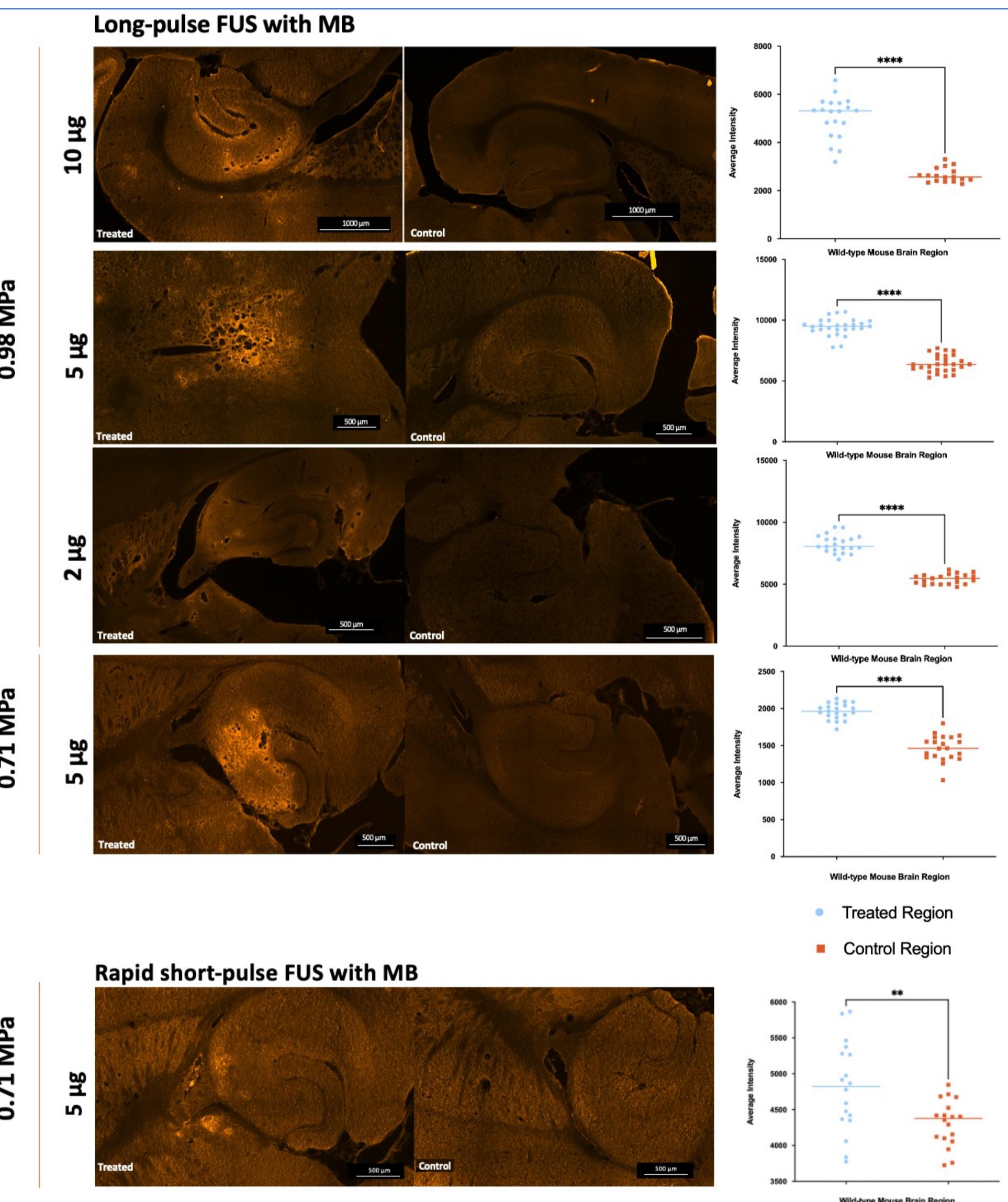
## Background



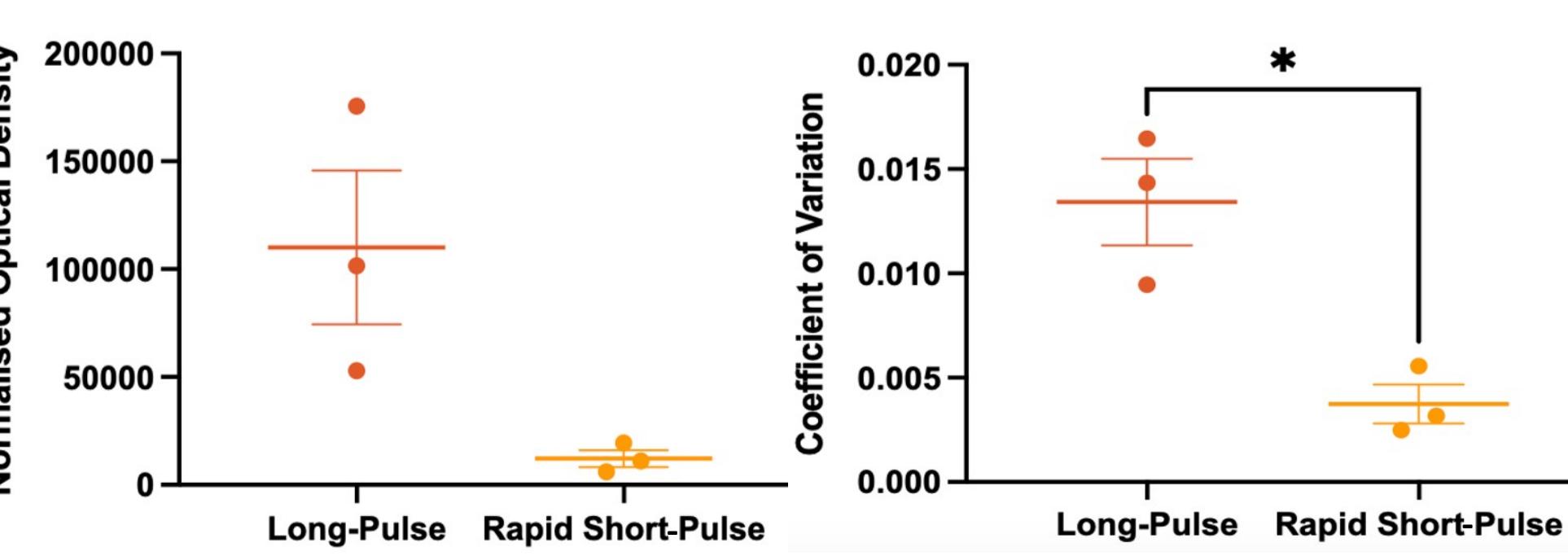
## Methods



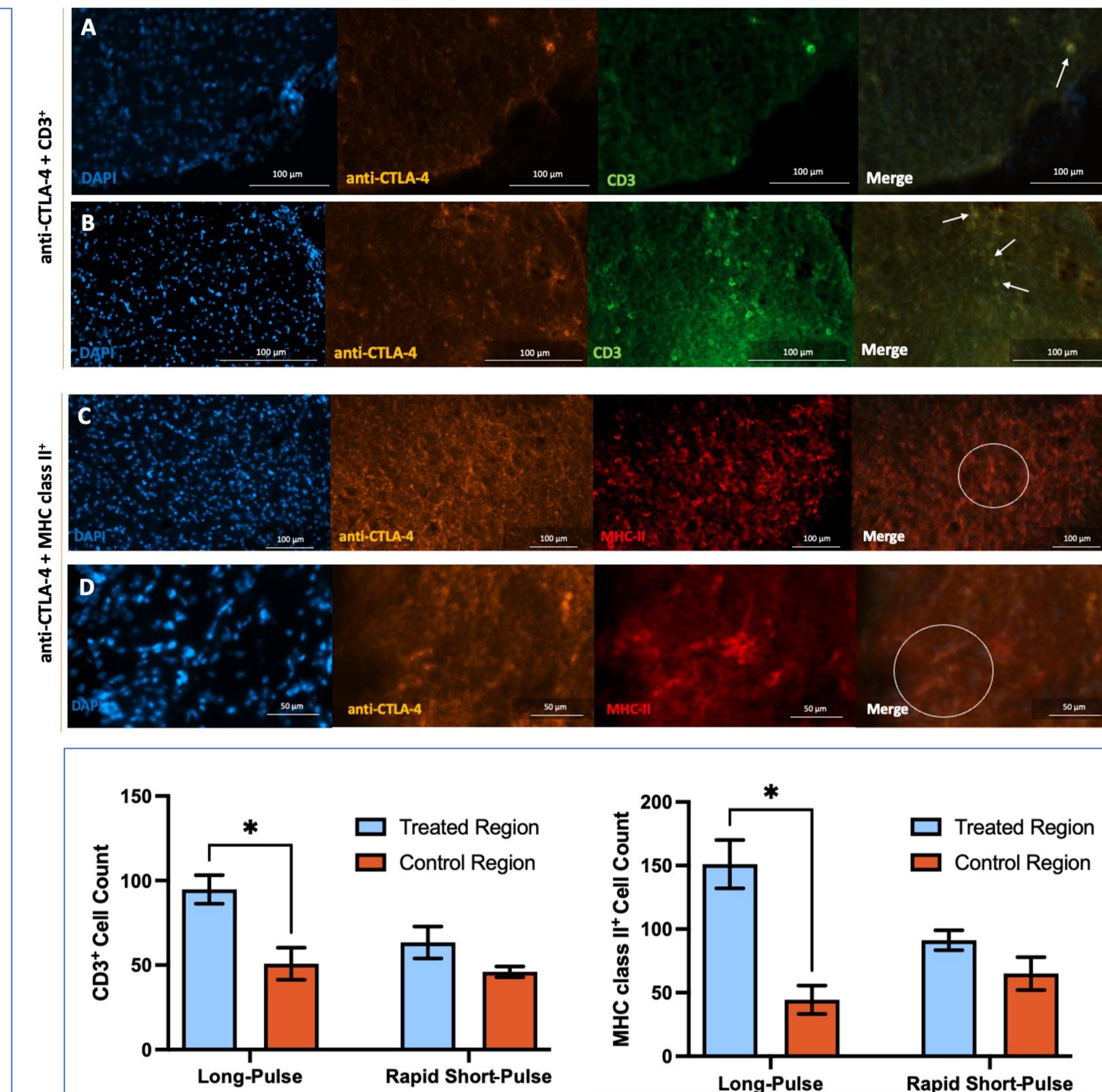
## Focused ultrasound with microbubbles improves anti-CTLA-4 antibody delivery to the brain



### Long-pulse vs Rapid short-pulse delivery



## Focused ultrasound with microbubbles modulates the immune microenvironment



## Conclusions and Future Work

- Focused ultrasound with microbubbles significantly increased the delivery of anti-CTLA-4 antibody across the blood-brain barrier.
- Rapid short-pulse focused ultrasound promoted a uniform immune checkpoint delivery but only long-pulse focused ultrasound enhanced immune invasion.
- **Future work:** Treat an LPS-induced neuroinflammatory mouse model with the same parameters of focused ultrasound to test if there is still improved delivery and immune invasion in an inflamed environment.

## References

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- Chen S, Nazeri A, Baek H, Ye D, Yang Y, Yuan J, et al. A review of bioeffects induced by focused ultrasound combined with microbubbles on the neurovascular unit. *Journal of Cerebral Blood Flow & Metabolism*. 2022;42(1): 3-26.