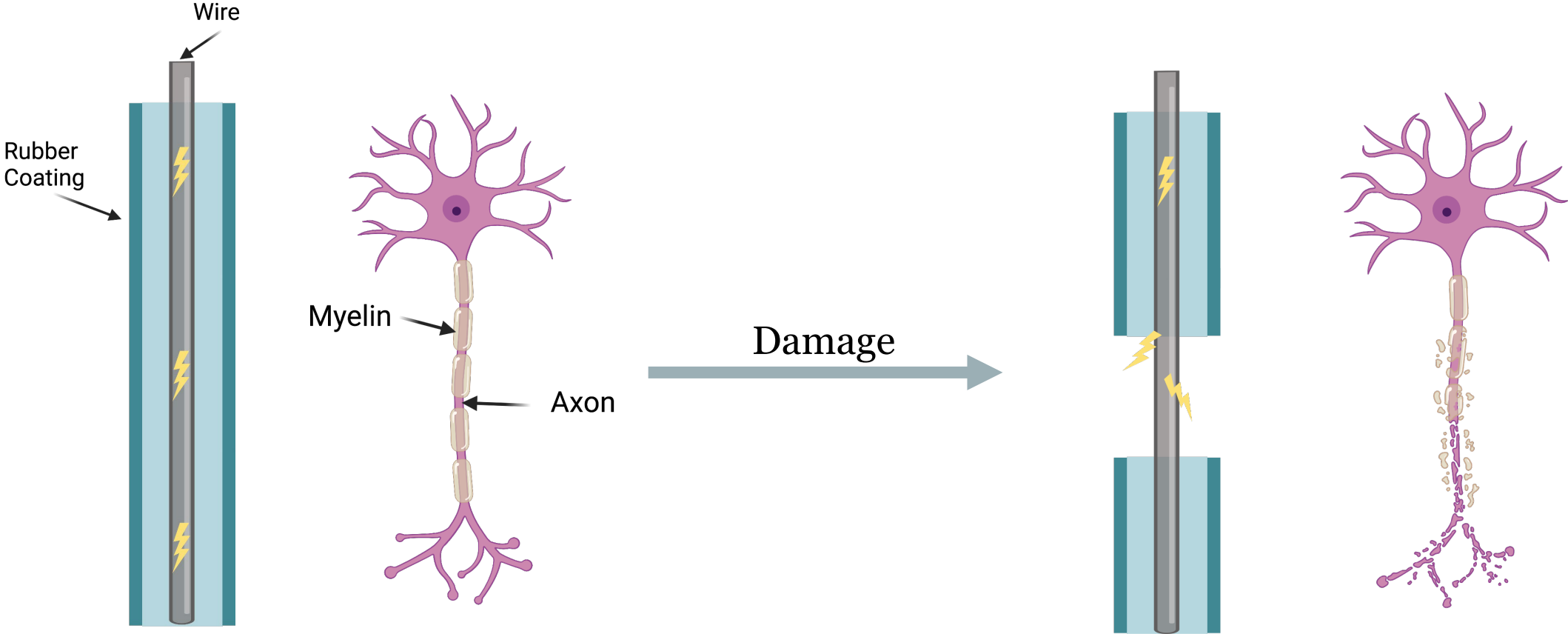


# Immature Neutrophils, A New Ally in MS?

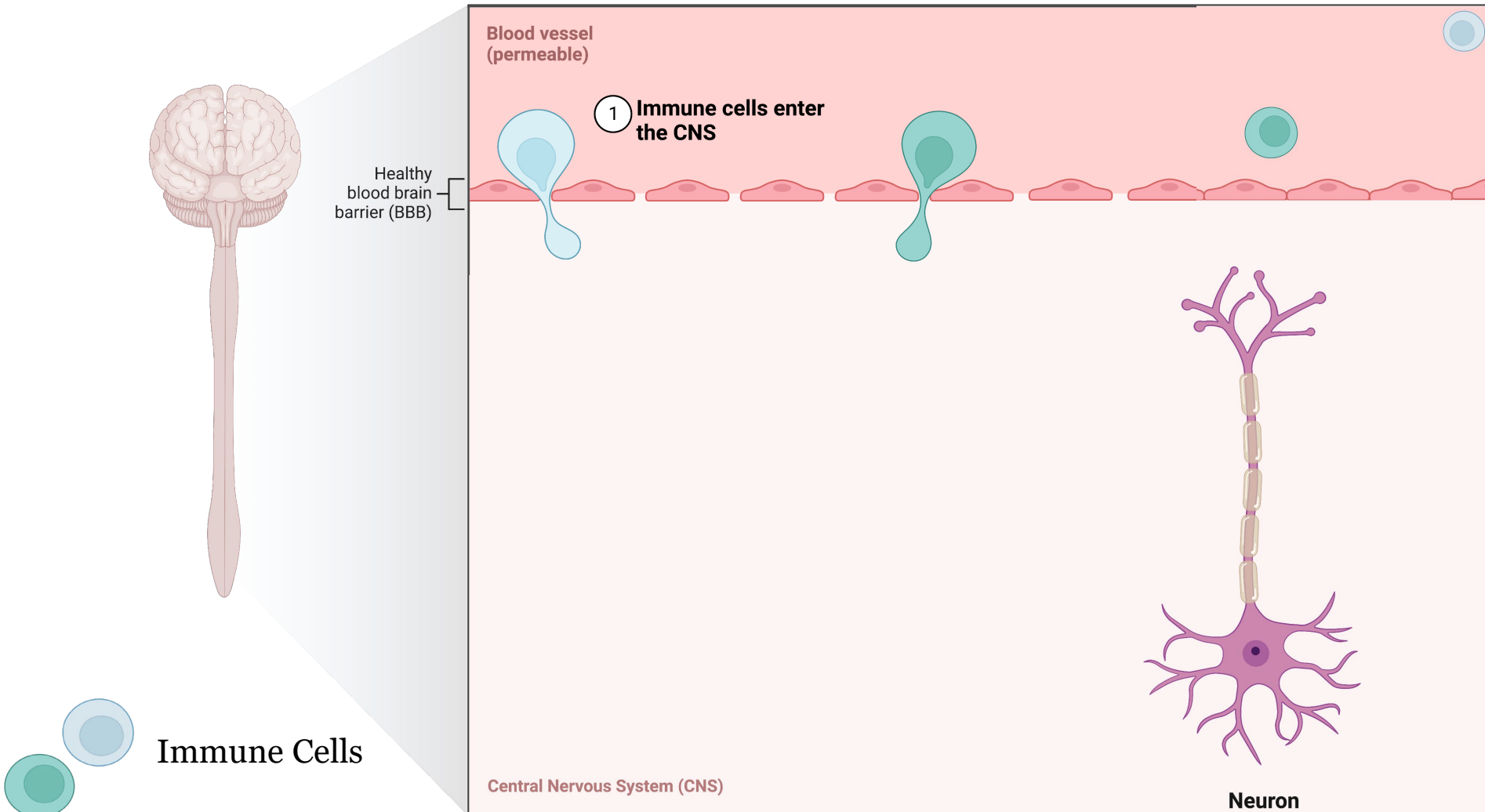
Calli Bellinger

September 21<sup>st</sup>, 2023

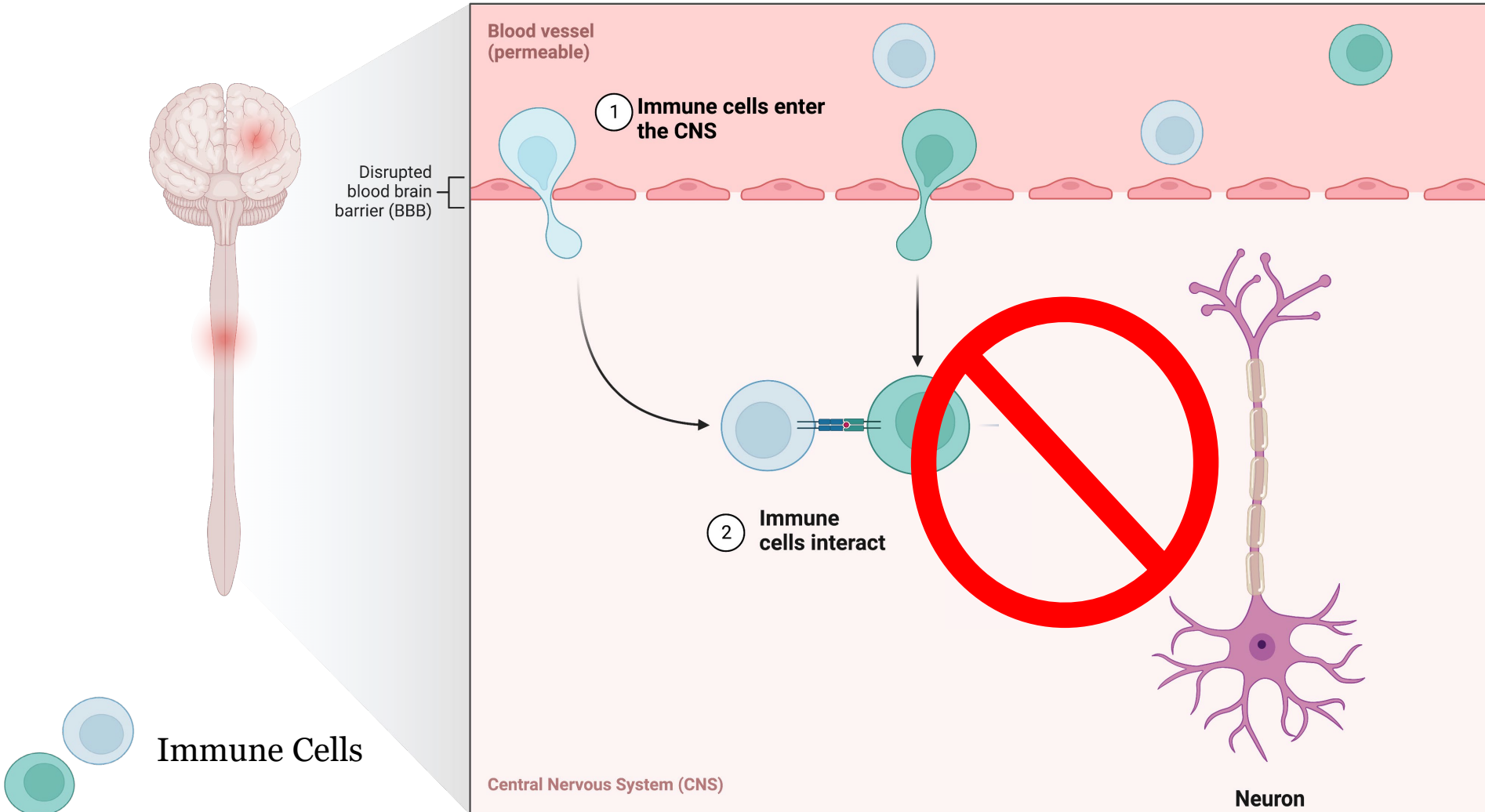
# Biological background on the brain



# Current focus of MS therapies is on prevention



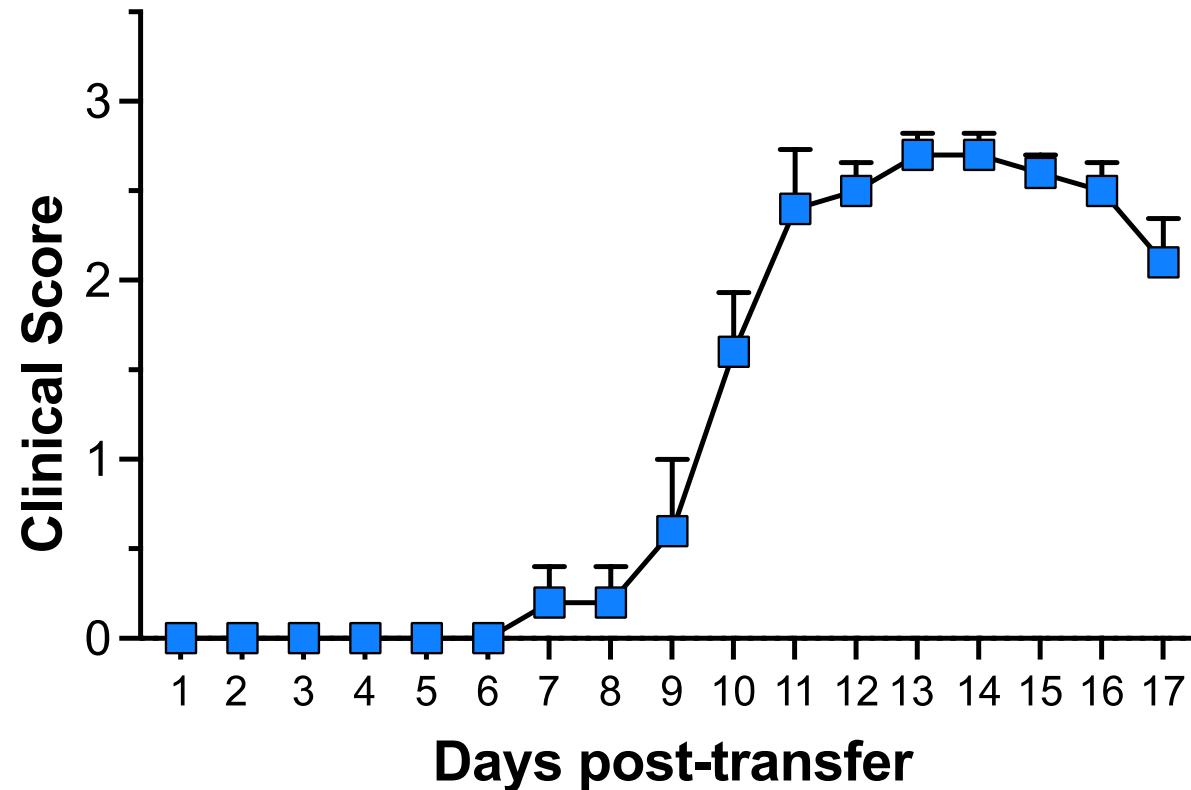
# Current focus of MS therapies is on prevention



# Mouse Model of MS: Experimental Autoimmune Encephalomyelitis (EAE)

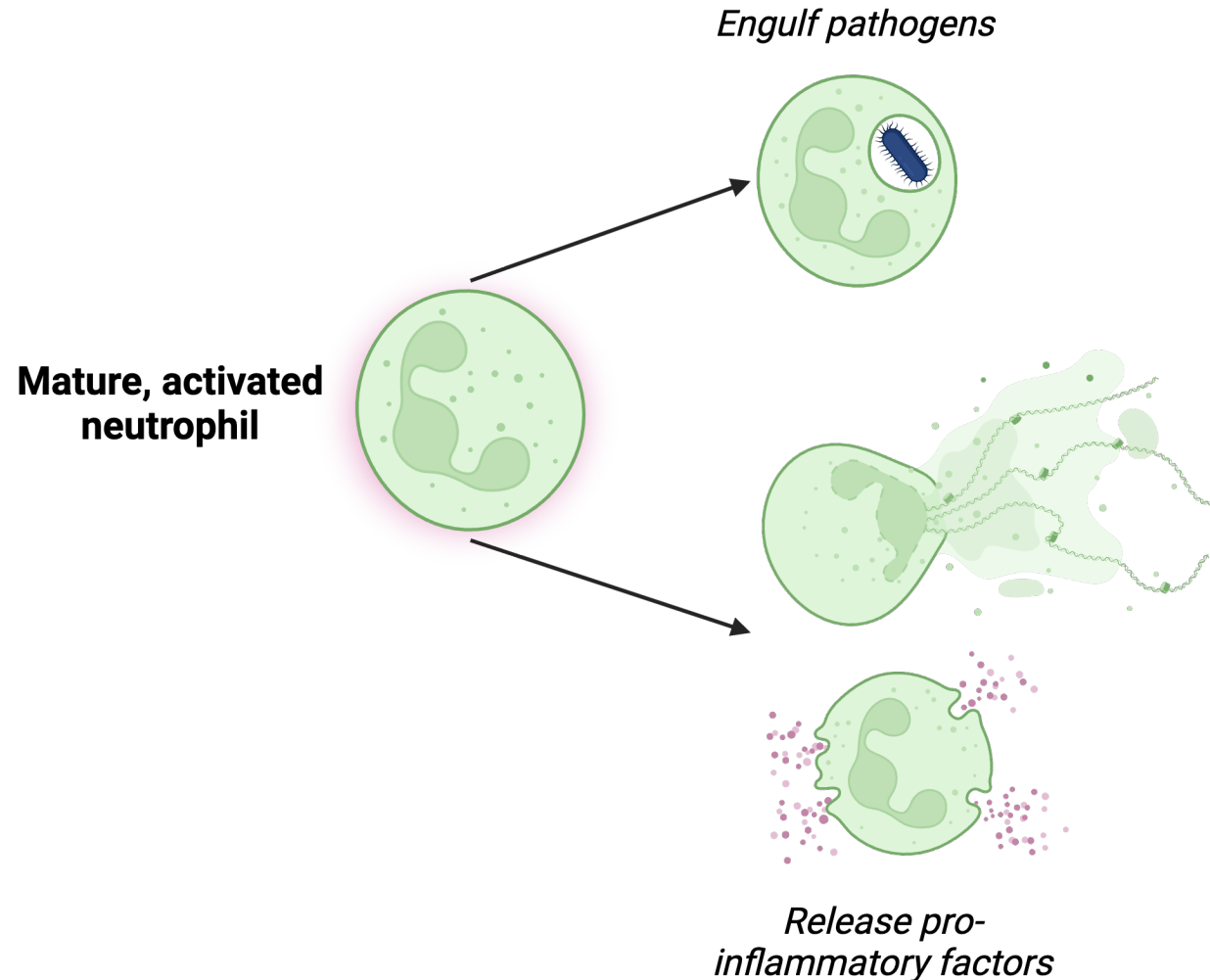
## Conventional Clinical Scores

- Inject white blood cells that specifically attack myelin in mice
- **Clinical disease course:**
  - 0 = no disease
  - 1 = limp tail
  - 2 = difficulty righting
  - 3 = hindlimb weakness
  - 4 = hindlimb paralysis



# Introduction of the neutrophil

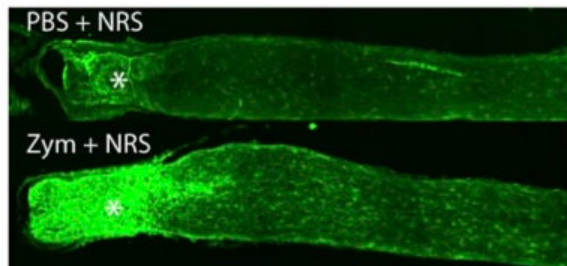
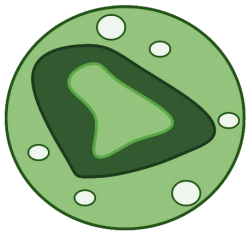
- One of the most abundant white blood cells in the human body
- Short lived
- First responders of the immune system



# Polarized, immature neutrophils alter EAE disease course

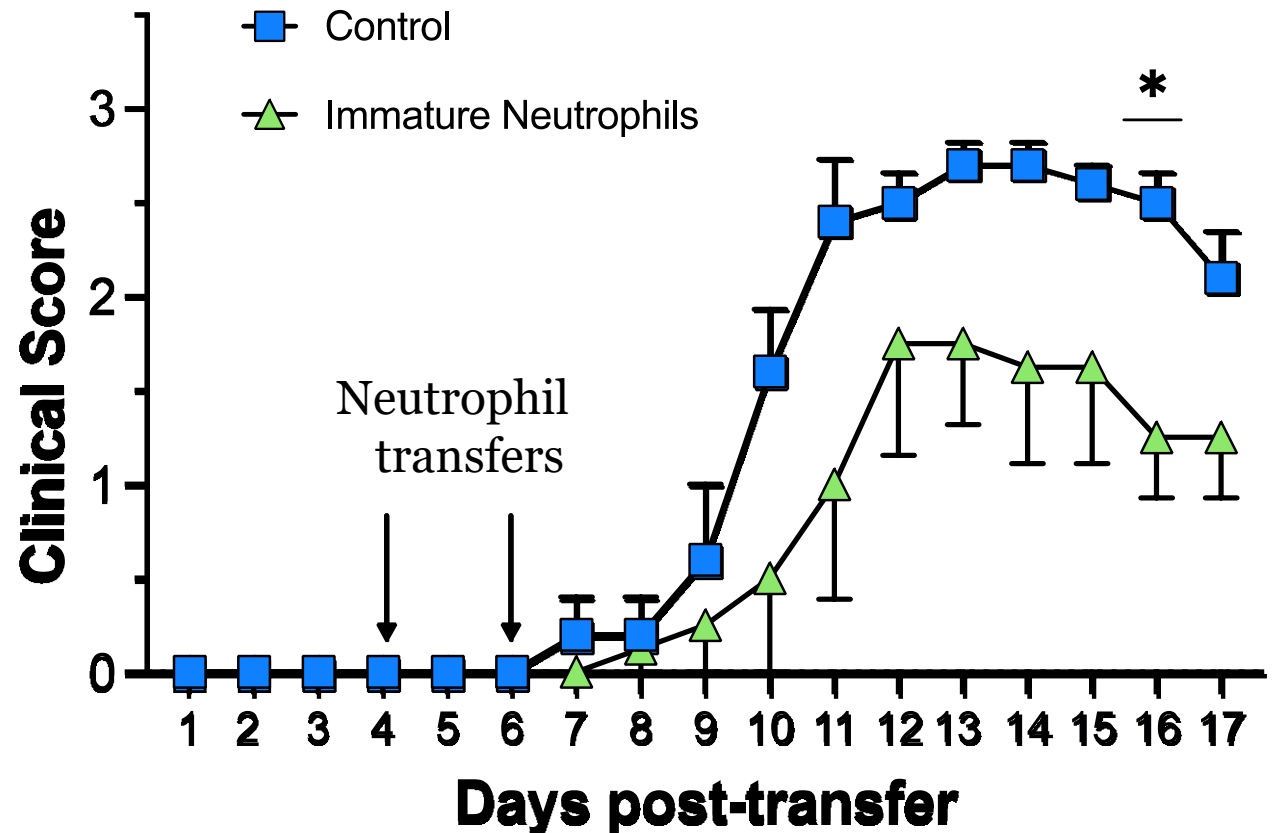
## ❖ Polarized immature neutrophils:

- *Neuroregenerative:*
  - Promote regenerative of damaged axons (Sas et al. 2020)

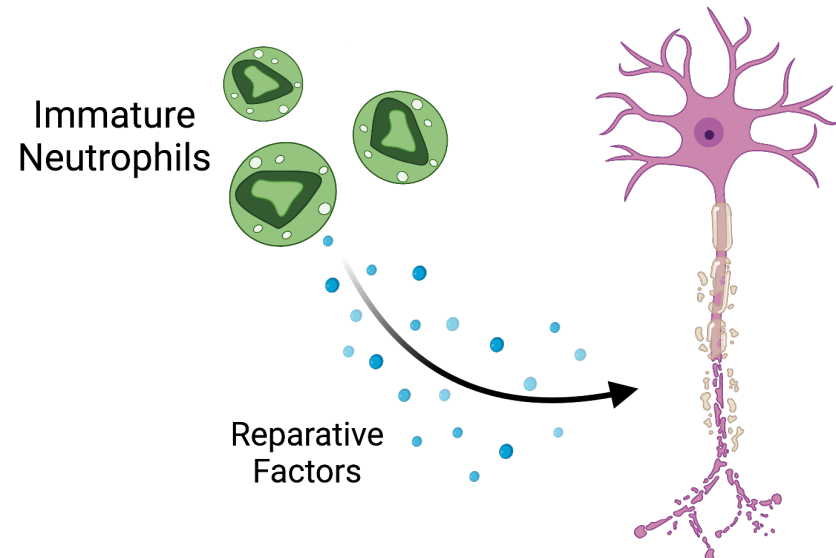


- *Neuroprotective:*
  - Prevents the damage of neurons
- *Immunosuppressive:*
  - Disrupts the activation of immune cells

## Conventional Clinical Scores

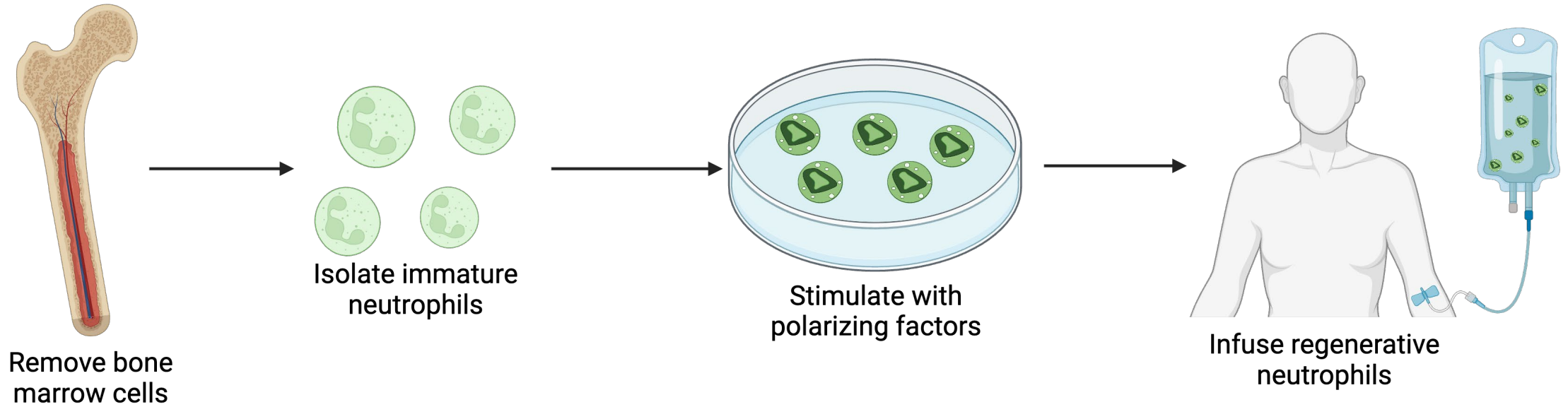


# Polarized immature neutrophils, summary





# Polarized immature neutrophils, a potential new ally



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- Cole Harrington, MD, PhD



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# REFERENCES

## (IN ORDER OF REFERENCE)

- McGinley MP, Goldschmidt CH, Rae-Grant AD. Diagnosis and Treatment of Multiple Sclerosis: A Review. *JAMA*. 2021;325(8):765–779. doi:10.1001/jama.2020.26858
- Rosales C. Neutrophil: A Cell with Many Roles in Inflammation or Several Cell Types? *Front Physiol*. 2018 Feb 20;9:113. doi: 10.3389/fphys.2018.00113. PMID: 29515456; PMCID: PMC5826082.
- Sas AR, Carbajal KS, Jerome AD, Menon R, Yoon C, Kalinski AL, Giger RJ, Segal BM. A new neutrophil subset promotes CNS neuron survival and axon regeneration. *Nat Immunol*. 2020 Dec;21(12):1496-1505. doi: 10.1038/s41590-020-00813-0. Epub 2020 Oct 26. PMID: 33106668; PMCID: PMC7677206.
- Shi, L., Chen, S., Yang, L. *et al*. The role of PD-1 and PD-L1 in T-cell immune suppression in patients with hematological malignancies. *J Hematol Oncol* **6**, 74 (2013). <https://doi.org/10.1186/1756-8722-6-74>