# Memory is influenced by perineuronal nets

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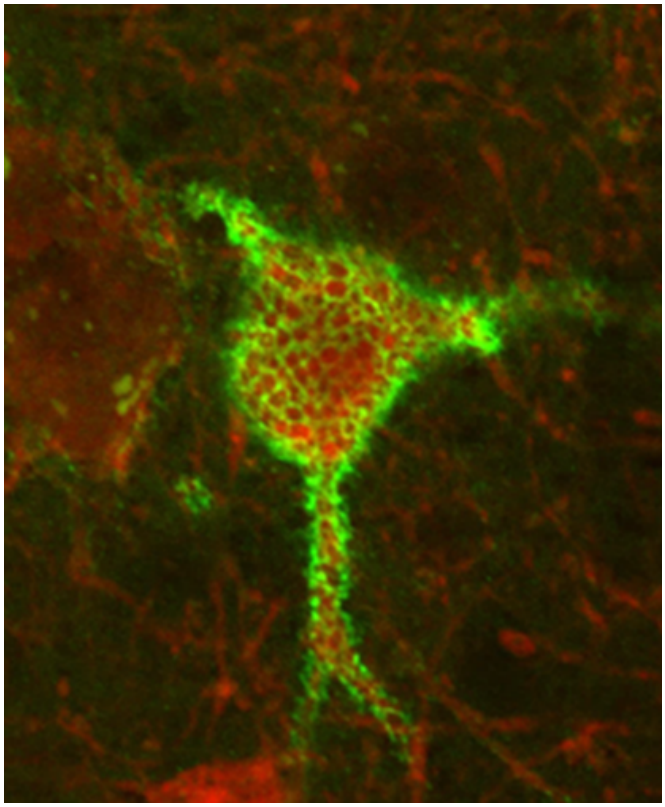

A neuron surounded by PNN (green). Credit: University of Oslo

Kristian Lensjø has taken a PhD at the University of Oslo investigating the mechanisms of learning and memory. His work has contributed to the understanding of perineuronal nets.

The brain must balance between the ability to learn new skills and form new memories (plasticity), and at the same time preserve learned skills and memories of experiences (stability). Kristian Kinden Lensjø's doctoral thesis describes a new mechanism for this regulation and how it affects learning and storage of memories over time.

The balance between plasticity and stability is regulated by several molecules inside the neurons and their connections. Recent findings also indicate that molecules outside the neurons, in particular a dense network of sugar-coated proteins termed perineuronal nets (PNNs), are important. The PNNs wrap tightly around the connections of a specific type of neuron toward the end of childhood like a stocking, at the same time as plasticity decreases and the stability increases.

Lensjø has investigated how removal of PNNs affects the neurons' function and how this affects learning and recall of memories. The work in the thesis shows that removal of PNNs alters the ability to remember; recall of remote memories is impaired. This likely happens because the PNNs stabilize the activity and connections of a specific type of neuron that regulates all other cells in the same brain area. Hence, the whole network of neurons is affected. Removing the nets changes the state of the neurons to an immature state similar to the juvenile brain.

In addition, the thesis shows that aggrecan, the biggest molecule of the nets, is an essential part of the structure. Removal of aggrecan alone prevents formation of the PNNs and causes a state of persistent plasticity and low stability.

Together, the results show that the PNN acts as a master regulator of brain plasticity and has an important role in memory processing.

**More information:** Kristian Kinden Lensjø et al. Removal of Perineuronal Nets Unlocks Juvenile Plasticity Through Network Mechanisms of Decreased Inhibition and Increased Gamma Activity, *The Journal of Neuroscience* (2016). DOI: 10.1523/JNEUROSCI.2504-16.2016

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