

## IN BRIEF

**NEURAL CIRCUITS****Hanging in the balance**

Oxytocinergic (OXT) neurons in the paraventricular nucleus (PVN) project to tonically active dopaminergic (DA) neurons in the ventral tegmental area (VTA) and reticular area of the substantia nigra (SN), both of which regulate reward-based behaviour via projections to the ventral striatum (vStr). Optogenetic stimulation of OXT PVN neurons increased the firing rate of VTA DA neurons directly, but indirectly decreased the firing rate of SN DA neurons via activation of GABAergic neurons in the lateral SN. This suggests that OXT projections regulate the overall balance of DA tone in the vStr.

**ORIGINAL ARTICLE** Xiao, L. *et al.* Biased oxytocinergic modulation of midbrain dopamine systems. *Neuron* <http://dx.doi.org/10.1016/j.neuron.2017.06.003> (2017)

**LEARNING AND MEMORY****Catching fear memories**

Memory traces of long-term auditory fear memories are stored in the auditory cortex. Perineuronal nets (PNNs) are stable components of the extracellular matrix that could potentially provide a scaffold for long-term synaptic plasticity. In a model of auditory fear conditioning, mRNAs encoding three lecticans — key components of PNNs — were increased in the auditory cortex. By contrast, enzymatic degradation of PNNs impaired fear learning, which recovered on regrowth of PNNs, suggesting that PNNs in auditory cortex are necessary for the consolidation of fear memories.

**ORIGINAL ARTICLE** Banerjee, S. B. *et al.* Perineuronal nets in the adult sensory cortex are necessary for fear learning. *Neuron* **95**, 169–179 (2017)

**NEURAL DEVELOPMENT****Regional influence**

In mice, the ventricular–subventricular zone (V–SVZ) continuously produces neural stem cells (NSCs). Proopiomelanocortin-expressing (POMC<sup>+</sup>) neurons of the hypothalamus were found to project selectively to anterior ventral (AV) regions of the V–SVZ. Ablation of these neurons decreased NSC proliferation selectively in the AV V–SVZ, and chemogenetic activation of these cells increased NSC proliferation. In the fasted state, both hypothalamic POMC<sup>+</sup> neuronal activity and proliferation of NKX2.1<sup>+</sup> NSCs were reduced to around half of that in controls. Thus, POMC<sup>+</sup> neurons regulate NSC proliferation in a region-specific manner that changes depending on feeding status.

**ORIGINAL ARTICLE** Paul A., Chaker Z. & Doetsch E. Hypothalamic regulation of regionally distinct adult neural stem cells and neurogenesis. *Science* **356**, 1383–1386 (2017)

**NEURODEGENERATIVE DISORDERS****Amyloid clearance**

Microglia play a part in protein clearance and synaptic pruning. This latter process is re-activated in Alzheimer disease (AD) and promoted by amyloid- $\beta$  (A $\beta$ ). A screen of 18 AD-associated genes revealed that loss of the DNA–RNA binding protein TDP43 led to a considerable increase in phagocytic clearance of A $\beta$  by microglia. Selective knockout of TDP43 from microglia in a mouse model of AD resulted in increased A $\beta$  clearance but, unexpectedly, increased synapse loss. Consistent with this, people with TDP43 pathology had lower A $\beta$  load and a lower risk of AD but showed a small cognitive deficit. Therefore, microglial dysfunction could contribute to AD pathology.

**ORIGINAL ARTICLE** Paolicelli, R. C. *et al.* TDP-43 depletion in microglia promotes amyloid clearance but also induces synapse loss. *Neuron* <http://dx.doi.org/10.1016/j.neuron.2017.05.037> (2017)