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IN BRIEF

ADDICTION

Brain changes in siblings of addicted individuals

Drug addiction has been associated with structural brain changes, but do they precede addiction or are they the consequence of it? Here, the authors showed that compared with unrelated healthy controls, stimulant-dependent individuals and their biological siblings have impaired inhibitory control, reduced white matter integrity in the prefrontal lobe and altered grey matter volume. These findings suggest that structural brain abnormalities may predispose individuals to reduced self-control, which, in the absence of resilience factors, may lead to stimulant addiction.

ORIGINAL RESEARCH PAPER Ersche, K. D. *et al.* Abnormal brain structure implicated in stimulant drug addiction. *Science* **335**, 601–604 (2012)

NEUROIMMUNOLOGY

Neural activity regulates T cell entry

Peripheral $CD4^+$ T cells have a central role in multiple sclerosis, but how these cells cross the blood–brain barrier is not understood. Here, the authors examined this issue in a mouse model of the disease. In mice with experimental autoimmune encephalomyelitis, $CD4^+$ T cells accumulated in the lumbar spinal cord. The accumulation was due to the activation of sensory neurons by soleus muscle contractions, which changed blood flow speed in the lumbar region. This induced interleukin-6 amplifier activation in endothelial cells and, consequently, increased chemokine (C-C motif) ligand 20 (CCL20) expression, which was required for $CD4^+$ T cell accumulation. Thus, regional neural activity creates gateways in local blood vessels through which T cells enter the CNS.

ORIGINAL RESEARCH PAPER Arima, Y. *et al.* Regional neural activation defines a gateway for autoreactive T cells to cross the blood-brain barrier. *Cell* **148**, 447–457 (2012)

PROTEIN METABOLISM

No turnover for brain nuclear pore proteins

Although most proteins undergo turnover, a few extremely long-lived proteins (ELLPs) have been identified. To detect potential ELLPs in the rat brain, the authors fed rat pups a ^{15}N-enriched diet until they were 6 weeks of age and a ^{14}N-enriched diet thereafter. Twenty-five nuclear proteins, mainly histones and nuclear pore complex (NPC) proteins, from brains of rats sacrificed at 12 months had a high $^{15}N/^{14}N$ ratio, suggesting that they were ELLPs. The lack of protein turnover in brain NPCs may underlie the age-related decline in NPC function in rats.

ORIGINAL RESEARCH PAPER Savas, J. N. *et al.* Extremely long-lived nuclear pore proteins in the rat brain. *Science* 2 Feb 2012 (doi: 10.1126/science.1217421)

TECHNIQUES

Nanoscale imaging of dendritic spines

Stimulated emission depletion (STED) microscopy has an extremely high (nanoscale) resolution, but this technique has not been applied *in vivo* in rodents. Here, the authors used STED microscopy to study neuron dynamics *in vivo* in the somatosensory cortex of adult mice. The images showed structures as small as <70 nm. Moreover, serial imaging revealed morphological changes and movement in the head and neck regions of dendritic spines over minutes. STED and other forms of nanoscopy could be used to investigate spine dynamics in brain development and function as well as in disease processes.

ORIGINAL RESEARCH PAPER Berning, S. *et al.* Nanoscopy in a living mouse brain. *Science* **335**, 551 (2012)