

ADDICTION

Brain's balancing act with cocaine

Cocaine's rewarding effects are controlled by the opposing actions of the two main cell types in the brain's reward centre, the nucleus accumbens.

The cells differ, in part, in which receptor they express for the neurotransmitter dopamine — D1 or D2. Eric Nestler at the Mount Sinai School of Medicine in New York and his co-workers used engineered mice in which they could activate each of these cell types in the nucleus accumbens using blue light. Mice with enhanced D1 activity showed a preference for cocaine in a behavioural test, whereas those with activated D2 cells had suppressed interest in the drug.

The authors say that the effect involves signalling through a pathway for the protein BDNF. They suggest that an imbalance of D1 and D2 cell activity contributes to cocaine addiction.

Science 330, 385–390 (2010)

METABOLISM

Night light, weight gain

Exposing mice to light at night disrupts their meal times, causing them to put on weight.

Laura Fonken at Ohio State University in Columbus and her colleagues report that mice exposed to 24 hours of continuous light, or 8 hours of low light overnight, gained significantly more weight and were less tolerant to glucose than mice receiving the standard 8 hours of night-time darkness. All mice had the same levels of caloric intake and daily activity.

Mice are nocturnal creatures that typically eat more at night. But those kept under dim light at night ate more than half of their food during daylight hours, compared with little more than one-third for mice under standard conditions. The authors suggest that the

weight gain of mice exposed to night-time light occurred because their food intake became desynchronized from their metabolic cycles.

Proc. Natl Acad. Sci. USA
doi:10.1073/pnas.1008734107 (2010)

BIOSYNTHESIS

Yeast yields plastic ingredient

Widely used oil-based plastics could be replaced with bioplastics made from renewable resources. But one potential type of building block for such materials, omega-hydroxy fatty acids, is difficult and expensive to synthesize using traditional methods. Richard Gross and his team at the Polytechnic Institute of New York University in Brooklyn show that an engineered yeast can pump out the compounds at high yields.

In the yeast *Candida tropicalis*, the team eliminated 16 genes coding for enzymes that would normally oxidize the key alcohol groups in omega-hydroxy fatty acids. Furthermore, strains expressing other selected enzymes could convert other fatty acids with varying chain lengths and other properties into the desired molecules.

J. Am. Chem. Soc. doi:10.1021/ja107707v (2010)

NEUROSCIENCE

The motor skills of musical minds

Movements are encoded in the brain by modular building blocks that can adapt to specialized skills such as playing a musical instrument.

Joseph Classen at the University of Leipzig in Germany and his colleagues used a sensor glove to measure joint movements in the left hands of 15 skilled musicians while they played the piano or violin (pictured). The researchers then evoked random finger movements in musicians and non-musicians at rest using transcranial

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GEOSCIENCE

Volcanoes respond to earthquakes

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An analysis of satellite data has revealed 37 instances of volcanic responses to regional earthquakes between 2000 and 2006.

Dario Delle Donne at the University of Florence in Italy and his colleagues used data from two NASA satellites to scan for increases in volcanic heat, a measure of volcanic activity, around the world. They compared these results to data from more than 40,000 earthquakes with a magnitude greater than 4.5. For example, they found that the magnitude-9.3 earthquake that hit Sumatra in 2004 led to a worldwide increase in volcanic heat of 300%.

Only about one-third of volcanoes with increased activity were reacting to specific earthquakes, suggesting that volcanic responses to earthquakes depend on many factors, including magnitude, distance from the epicentre and fault orientation.

Geology 38, 771–774 (2010)

magnetic stimulation to excite neurons in the motor cortex. They broke these movements down into basic units and used these to reconstruct voluntary instrument-playing postures.



The authors' statistical analysis revealed that reconstructions of random movements made by musicians more closely matched the instrument-playing movements than did the reconstructions of non-musician controls.

Curr. Biol. doi:10.1016/j.cub.2010.09.045 (2010)

MICROBIOLOGY

Salmonella gets help from host

The bacterium often responsible for food poisoning, *Salmonella enterica* Typhimurium, exploits an enzyme produced by the host's intestinal cells to help it to invade them.

Beth McCormick at the University of Massachusetts Medical School in Worcester and her colleagues show that a protein produced by the bacterium to aid infection, SipA, activates a host enzyme called caspase-3 within hours of infection. Caspase-3 then cleaves SipA at a specific location, which triggers SipA to induce changes in the cells lining the gut that allow *Salmonella* to enter.

These reactions seem to occur on the outer surface of the intestinal cells. Knocking out the caspase-3 gene in mice resulted in a less virulent *Salmonella* infection.

Science 330, 390–393 (2010)

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