

NEUROSCIENCE

Switch the pain for an itch

Itchiness is a common side effect of morphine use. Zhou-Feng Chen at Washington University in St. Louis, Missouri, and his colleagues demonstrate that itchiness is caused by a different morphine receptor from that involved in pain relief.

The drug binds to a receptor called MOR, which has various subtypes, including MOR1 and MOR1D. Silencing MOR1 lessened the pain-killing effect of morphine in mice, whereas knocking down MOR1D dampened scratching behaviour, but had no effect on pain relief. Furthermore, only MOR1D interacts with another receptor called GRPR, which is involved in mediating itch.

Inhibiting proteins that are downstream of GRPR in the same pathway blocked the itchiness but not the analgesic effects of morphine.

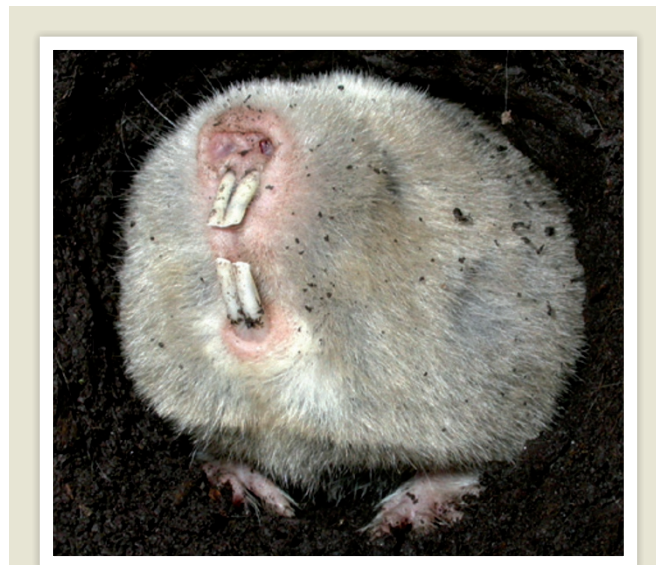
Cell 147, 447–458 (2011)

REPRODUCTION

Molecular clues to infertility

Abnormal regulation of an enzyme in the inner wall of the uterus may be one root of infertility and miscarriage.

The enzyme, SGK1, regulates sodium transport and its levels are known to be altered in infertile women. Jan Brosens at Warwick Medical School in Coventry, UK, and his colleagues injected female mice post-coitus with an active version of the gene. Embryos failed to implant and the animals showed either reduced or no expression of key implantation genes. Deleting the *Sgk1* gene in females resulted in implantation but later led to a reduction in



EVOLUTION

Mole-rat's toothy tale

The burrowing silvery mole-rat is one of only a handful of mammalian species that can continuously replace its teeth, an adaptation to a high dental wear-and-tear lifestyle.

Most mammals develop only two generations of vertically growing teeth. But in a few species, teeth are continuously replaced, moving horizontally towards the front of the jaw in a treadmill-like way. Helder Rodrigues and Laurent Viriot at the University of Lyons in France and their colleagues report that the silvery mole-rat (*Heliophobius argenteocinereus*; pictured) combines features of both dental systems: replacement teeth move towards the front of the jaw as they grow in vertically one after the other in a mechanism reminiscent of an escalator.

The authors say that the animal could be a good model for studying tooth evolution in mammals.

Proc. Natl Acad. Sci. USA <http://dx.doi.org/10.1073/pnas.1109615108> (2011)

litter size and signs of uterine bleeding. Silencing the gene in a class of human uterine cells disrupted the activation of molecules that mop up damaging free radicals.

The study reveals two distinct fertility-promoting roles for SGK1 in the uterus: it must be downregulated to enhance embryo implantation but is needed during pregnancy to help support the embryo. *Nature Med.* <http://dx.doi.org/10.1038/nm.2498> (2011)

IMMUNOLOGY

Vitamin D to fight tuberculosis

Vitamin D has several health benefits, including enhancing the immune response to tuberculosis infection. Robert Modlin at the University of California, Los Angeles, and his colleagues show how the immune system depends on vitamin D to mount a response against the causative

bacterium, *Mycobacterium tuberculosis*.

The team found that cultured human T cells that produce an immune-signalling protein called IFN- γ activate another class of immune cells, the macrophages, to produce antimicrobial peptides. The production of these peptides requires vitamin D.

Macrophages cultured with serum from the blood of vitamin D-deficient people did not produce antimicrobial peptides, whereas those from individuals with normal vitamin D levels did. The authors say that recommended vitamin D intake in nutritional guidelines should take into account benefits beyond bone health.

Sci. Transl. Med. 3, 104ra102 (2011)

CANCER BIOLOGY

Two-faced cancer gene

Certain cancer drugs inhibit the powerful gene regulator NF- κ B, overactivity of which drives some cancers. However, two groups now show that NF- κ B also stimulates some tumour cells to senesce, or stop dividing, during chemotherapy. This suggests that, in some patients, NF- κ B inhibitors could stimulate rather than inhibit cancer.

Scott Lowe of the Memorial Sloan-Kettering Cancer Center in New York and his colleagues found that NF- κ B activates many senescence-associated genes. In a mouse model of lymphoma, inhibiting NF- κ B boosted drug resistance and early relapse, and reduced survival.

Clemens Schmitt at the Charité University Hospital in Berlin and his colleagues found that maintaining a senescent cell state using