To develop a more sustainable process, Sang Yup Lee and his colleagues at the Korea Advanced Institute of Science and Technology in Daejeon, Republic of Korea, boosted putrescine production in *Escherichia coli*. Their method involved inactivating the metabolic pathways that use and degrade putrescine, and amplifying the production of an enzyme that makes it from its precursor, ornithine. In high-cell-density cultures, the bacteria can produce up to 24.2 grams of putrescine per litre in about 32 hours.

CANCER BIOLOGY

Cilia's dual role

Nature Med. doi:10.1038/nm.2011; doi:10.1038/nm.2020 (2009)

Cilia, the thin filaments that protrude from many mammalian cells, can both inhibit and exacerbate tumour formation in mice.

Cilia are essential for proper functioning of the hedgehog signalling pathway, which has been found to go haywire in various cancers. Jeremy Reiter of the University of California, San Francisco, and his colleagues deleted genes for cilia formation in two mouse models of skin cancer, each carrying a mutation in the hedgehog pathway. Tumours did not grow in mice with one mutation, but were accelerated in mice carrying the other.

Arturo Alvarez-Buylla, also at the University of California, San Francisco, and his colleagues found similar results modelling brain cancer in mice. In addition, they showed that some types of human brain cancer have cilia, whereas others do not, suggesting that cilia could aid in diagnosing cancer type.

GENETICS

Y-rated

Curr. Biol. doi:10.1016/j.cub.2009.07.032 (2009)

DNA sequencing of the human Y chromosome suggests that humans carry 100–200 genetic mutations not seen in their parents. This direct measurement of the human mutation rate should help researchers to refine evolutionary dating and better understand the source of genetic disease.

Yali Xue and Chris Tyler-Smith of Wellcome Trust Sanger Institute in Hinxton, UK, and their colleagues sequenced the Y chromosome of two men in China separated by 13 generations. Four mutations had cropped up during that time. Extrapolating out to the 6-billion-odd base pairs of the complete human genome, that translates to roughly one mutation per 30 million base pairs per generation on average.

For a longer story on this research, see http://tinyurl.com/nv9u59

MICROBIOLOGY

Resistance is futile

Clin. Infect. Dis. **49,** 869–875 (2009)

Antibiotic resistance in pathogens can be reversed by rolling back the total amount of the drug consumed, but it increases as soon as consumption rises again.

During a seven-month period in 2001–02, the use of ciprofloxacin, a popular antibiotic, was restricted in Israel because supplies were being stockpiled in case of a bioterrorist attack. Michal Chowers and her colleagues at Tel Aviv University in Israel measured the ciprofloxacin sensitivity of the bacterium *Escherichia coli* from urine samples before, during and after this period.

A near 50% drop in ciprofloxacin use reduced the percentage of samples containing resistant bacteria from 12% to 9%. But resistance surged as soon as people started popping the pills again.

C. KREBS/CORBIS

FOOD CHEMISTRY

Bee-devilled by corn syrup

J. Agric. Food Chem. **57,** 7369–7376 (2009)

Dangerous levels of toxins that can form in high-fructose corn syrup and endanger domesticated honeybees can now be easily predicted and eliminated.

Blaise LeBlanc, while at the US Department of Agriculture in Tucson, Arizona, and his colleagues measured the rate of formation of hydroxymethylfurfural (HMF), a heat-generated contaminant found in high-fructose corn syrup, honey and other foods. Over a 35-day period, they tracked HMF content in several brands of syrup stored at different temperatures. They also established the concentration at which HMF becomes toxic to caged bees.

Although temperatures of around 32 °C had little effect, those of 40 °C and above caused the HMF content to rise markedly. The rate of the increase can be precisely predicted from pH and other variables, the scientists say. HMF formation was lower in syrups of higher pH, and adding bases to syrup reduced levels of the toxin.

JOURNAL CLUB

Richard Bennett
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A microbiologist wonders what turns us on.

An Internet search for the words 'pheromone attractant' pulls up products ranging from human aphrodisiacs to control measures for the Colorado potato beetle.

But sexual chemistry is not only important to humans and beetles, it is also relevant to many fungi. Fungal peptide pheromones are often released by one mating type to attract a partner of the opposite sex, thereby initiating the programme of sexual differentiation. This signalling is often highly specific so that pheromones attract only potential partners and not unwanted suitors.

Work by Joseph Heitman and his colleagues at Duke University in Durham, North Carolina, provides a new spin on pheromone signalling in fungi (Y.-P. Hsueh *et al. EMBO J.* **28,** 1220–1233; 2009). While studying the fungal pathogen *Cryptococcus neoformans*, the authors became curious about the function of an uncharacterized pheromone-receptor-like gene.

It turns out that this gene, *CPR2*, encodes a constitutively active receptor that stimulates downstream mating events in both the presence and absence of pheromones. During sexual differentiation, expression of *CPR2* is upregulated and supplements the activity of conventional pheromone receptors. A single amino-acid substitution in the Cpr2 protein, in a transmembrane domain that is highly conserved among pheromone receptors, was shown to be responsible for constitutive signalling activity.

This demonstrates that the sexual lifestyles of unicellular organisms can be much more complicated than they first seem. Furthermore, constitutively active receptors have been implicated in many signal-transduction processes in mammalian cells. It remains to be seen whether sexual activity in more complex organisms also involves signalling components that are continuously turned on.

Discuss this paper at **http://blogs.nature.com/nature/journalclub**