Molecular Biology

CRISPR tweaked to edit RNA

The CRISPR–Cas9 gene-editing system snips DNA, but a newly characterized version targets RNA instead.

The CRISPR–Cas system is used by many bacteria to combat viruses. Feng Zhang of the Broad Institute of MIT and Harvard in Cambridge, Massachusetts, Eugene Koonin of the US National Institutes of Health in Bethesda, Maryland, and their colleagues mined this natural diversity for alternatives to the DNA-cutting Cas9 enzyme. They found that an enzyme called C2c2 from the bacterium Leptotrichia shahii can be programmed to cut specific, single-stranded RNA targets in another bacterium, Escherichia coli.

With further tweaks, the system could be used to attach fluorescent tags to RNA, direct RNA to specific compartments in the cell or otherwise chemically modify RNAs to study their function. Science http://dx.doi.org/10.1126/science.aaf5573 (2016)

Geology

Magma pool under New Zealand

Molten rock is accumulating in a magma chamber beneath New Zealand, raising questions about volcanic hazards.

Ian Hamling and his colleagues at GNS Science in Lower Hutt, New Zealand, used satellite radar data to study ground motions in the Taupo Volcanic Zone, an area of high volcanic activity. They found one region, adjacent to this area, where the ground rose by around 5 millimetres per year from the 1950s onwards. That rate more than doubled to about 12 millimetres a year in the mid-2000s, and has since dropped back to the lower rate. Calculations suggest that about 9 million cubic metres of magma pushed its way into the crust each year during peak growth, about 10 kilometres below the surface.

It's not clear whether the magma chamber will increase the risk of volcanic eruptions. Sci. Adv. 2, e1600288 (2016)

For more on this research, see go.nature.com/28ew7kh

Aging Cell

Chemical extends worm lifespan

A chemical lengthens the nematode worm's lifespan by interfering with its perception of whether food is present.

Model organisms are known to live longer when they are fed a restricted diet. Mark Lucanic and Gordon Lithgow at the Buck Institute for Research on Aging in Novato, California, and their colleagues screened 30,000 synthetic compounds and found several that extended the lifespan of the nematode Caenorhabditis elegans. The most potent, NP1, mimicked the effects of dietary restriction by masking the activity of a sensory pathway that normally signals that food is abundant. The chemical does this by boosting signalling of a specific neurotransmitter called glutamate to the pharynx, which in nematodes is a tube-like organ that pumps food into the gut.

Further investigation of nutrient-sensing pathways could identify other life-extending chemicals, the authors say. Aging Cell http://doi.org/bjhh (2016)

Astrophysics

Relativity passes black-hole test

General relativity holds true, even under the extreme conditions of colliding black holes.

In 2015, the Advanced Laser Interferometer Gravitational-Wave Observatory (LIGO) saw the first evidence of gravitational waves, which had been created by two merging black holes. Walter Del Pozzo at the University of Birmingham, UK, and his colleagues used scientific satellites to confirm that ice has been retreating along the coast of West Antarctica since at least 1975.

Plastic pollution hurts perch

Tiny fragments of plastic in the ocean could change fish behaviour and decrease their survival.

Research indicates that the world’s oceans are polluted with many thousands of tonnes of ‘microplastic’ debris — particles measuring less than 5 millimetres in diameter. Oona Lönnstedt and Peter Eklöv at Uppsala University in Sweden exposed European perch (Perca fluviatilis) to levels of microplastic similar to those found in the environment. Although 96% of fertilized eggs not exposed to plastic hatched, only 81% of those placed in water with high levels did so. Moreover, 46% of fish larvae that had been raised in a tank containing plastic-free water were still alive after 24 hours in a tank with a predatory pike, whereas 100% of those raised with high levels of plastic were eaten within 16 hours.

Larvae reared with high concentrations of plastic did not show anti-predator responses such as freezing or reduced movement when exposed to alarm signals from other animals.

Science 352, 1213–1216 (2016)

Ancient dog DNA shows dual origins

The first complete genome sequence of an ancient dog suggests that dogs were independently domesticated twice, in two different regions.

Researchers have debated whether domestic dogs originated in Asia or Europe about 15,000 to 12,500 years ago. Laurent Frantz of the University of Oxford, UK, and his team sequenced the mitochondrial DNA of 59 ancient dogs and the complete genome of a 4,800-year-old dog from Ireland. They also analysed DNA from hundreds of modern dogs and wolves, and found that populations of Western European and East Asian canines diverged several millennia after the first appearance of the animals.

Owing to a lack of archaeological evidence of ancient dogs between these regions, the authors propose that the animals were domesticated separately in Western Europe and East Asia from distinct wolf populations.

Science 352, 1228–1231 (2016)

For more on this research, see go.nature.com/1pzqqwr

How desert moss drinks from air

Researchers have revealed minuscule features on the leaves of a common desert plant that allow it to collect water from moist air.

Syntrichia caninervis (pictured) is a small moss that lacks roots. To understand how it uses its leaves to capture moisture, Tadd Truscott of Utah State University in Logan and his co-workers altered the relative humidity in their lab and used high-speed cameras and electron microscopy to study the plant’s response. They found that a hair-like structure called an awn at the tip of each leaf has grooves and bars that collect and transport water. Nanogrooves about 200 nanometres wide allow water from humid air to nucleate on the awn’s surface, and larger microgrooves collect bigger water droplets from fog.

Small bars along the cone-shaped awn provide places for droplets to collect before being transported down the awn to the leaf.

Nature Plants http://dx.doi.org/10.1038/nplants.2016.76 (2016)

Bacterium could curb malaria

West African mosquitoes infected with the bacterium Wolbachia are less likely than uninfected ones to carry the malaria parasite Plasmodium. Wolbachia infection has long been proposed as a way to reduce the spread of mosquito-borne diseases such as malaria. To study natural Wolbachia infection, Flaminia Catteruccia at the Harvard T. H. Chan School of Public Health in Boston, Massachusetts, and her colleagues collected and studied 221 Anopheles coluzzii mosquitoes from a village in Burkina Faso. They found that about half of the insects carried a Wolbachia strain. Only one infected mosquito (less than 1%) was also infected with Plasmodium, whereas roughly 10% of the 105 mosquitoes free of Wolbachia tested positive for the malaria parasite.

Mathematical modelling suggested that even at this rate of Wolbachia infection, the bacterium could decrease the prevalence of malaria in humans.

Nature Commun. 7, 11772 (2016)

EVOLUTION

Age robs monkeys of vocal control

Monkeys lose the ability to consciously control their calls as they age, which may have limited the evolution of language in non-human primates.

Steffen Hage and his colleagues at the University of Tübingen in Germany studied the vocalizations of two male captive rhesus macaques (Macaca mulatta; pictured) over a roughly five-year period. The monkeys were trained to produce a specific call in response to a coloured cue to receive a reward. At five years old, the macaques scored highly, but by eight years of age neither monkey could perform the task. Adult macaques still produced spontaneous, instinctive calls in their enclosure, indicating that they maintained vocal ability.

Language may have evolved in humans by first extending the vocal flexibility of juveniles into adulthood.


GENOMICS

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INFECTION

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