Research highlights

TURNING UP THE HEAT ON FAT CELLS COULD HELP TARGET OBESITY

Warming fat tissue in both humans and mice stimulates fat cells to produce heat, and might be an effective treatment to counter obesity.

Local hyperthermia treatment (LHT), or the heating of small areas of the body to around 41 °C, is already used to kill some small tumours. To determine how the treatment would affect fat cells, Xinran Ma at East China Normal University in Shanghai and his colleagues applied heating pads to people's upper backs for 20 minutes and then analysed heat production by their fat tissues. The authors also injected the fat pads of mice with a gel-like material that heats up when exposed to a laser, and then exposed the animals to laser light.

In both rodents and humans, heat jump-started an innate heat-generating process that depletes fat cells' stored energy. Obese mice exposed to LHT for 10 minutes every 3 days weighed about one-third less after 10 weeks than mice in a placebo group.

The researchers hope to refine use of the gel to make LHT more accessible for treating obesity.

Cell https://doi.org/hkpw (2022)

SLEEPING POSITION: A CLUE THAT SHARKS HAVE DRIFTED OFF

All animals sleep, but not every species sleeps like we do.

Shaun Collin at La Trobe University in Melbourne, Australia, Craig Radford at the University of Auckland in New Zealand, and their colleagues filmed seven draughtsboard sharks (*Cephaloscyllium isabellum*, pictured) over 24 hours while measuring the oxygen levels in the sharks' tank. The faster the stocky fish pulled oxygen out of the water, the higher their metabolic rate.

The researchers found that when sharks stopped swimming for more than 5 minutes, their metabolic rate dropped, suggesting that they were sleeping. Sleeping sharks typically — but not always — had a "flat posture", lying level on the bottom of the tank, whereas sharks that were merely resting propped themselves up on their front fins. Closed eyes were not a good indicator of whether a shark was asleep.

The team says that shark sleep probably functions to conserve energy. Sharks have not changed very much in 450 million years, implying that sleep might be nearly as ancient as vertebrates. Whether sharks dream, however, is still unknown.

Biol. Lett. **18**, 20210259 (2022)

A HIGH-ACCURACY, LOW-COST TEST FOR DREADED VIRUSES

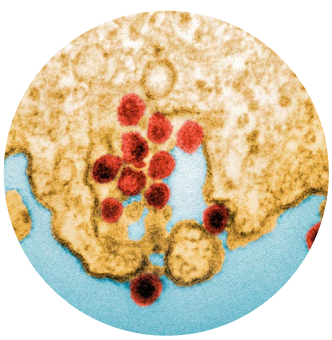
A cheap, easy way to diagnose Zika and chikungunya infections could streamline testing for these pathogens in areas lacking expensive laboratory equipment, experiments show.

Both Zika and chikungunya viruses (chikungunya particles pictured in red) can cause severe health problems, and both are particularly prevalent in low- and middle-income countries. To ease diagnosis, researchers reported in 2016 that they had developed a test that uses molecular 'switches' to signal the presence of viral RNA.

Some members of the team, including Keith Pardee at the University of Toronto in Canada, and others have now assembled off-the-shelf electronics into a device to read the test results. They piloted the system in Brazil and found that the accuracy of their test was similar to the gold-standard diagnosis method, real-time quantitative PCR (RT–qPCR).

The test's reagents are half the price of those for RT–qPCR, and can be embedded in paper discs and freeze-dried, making them convenient to distribute to regions without refrigeration. The device for reading the tests is also smaller and cheaper than an RT–qPCR machine.

Nature Biomed. Eng. https://doi.org/hkpt (2022)



MICROBIAL ENZYME HELPS TO CHURN OUT SCARCE COVID DRUG

An engineered bacterial enzyme turbocharges the manufacture of the antiviral molnupiravir, one of the few approved drugs that can prevent severe COVID-19.

Current methods for making the drug require multiple steps and yield relatively low amounts. A more efficient route involves a precursor molecule called *N*-hydroxy-cytidine: just one chemical reaction converts it to molnupiravir. Anthony Green at the University of Manchester, UK, and his colleagues observed that, under certain conditions, an enzyme from the bacterium *Escherichia coli* could make small amounts of the precursor from the biomolecule cytidine.

The team mutated the DNA encoding the enzyme, improving the enzyme's efficiency, and used *E. coli* cells to make the upgraded enzyme. Finally, the researchers optimized the synthetic process by lowering the reaction's temperature. That prompted *N*-hydroxy-cytidine to crystallize in high purity from solution as soon as it formed.

In a scaled-up demonstration, the authors prepared 137 grams of *N*-hydroxy-cytidine, converting 71% of reactants to the precursor molecule in under 3 hours. During that time, each enzyme molecule facilitated more than 85,000 chemical transformations.

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