Heart in 3-D silken scaffold

MAX Planck scientists have used silk from the tasar silkworm as a scaffold for heart tissue.

Damaged human heart muscle cannot be regenerated. Scar tissue grows in place of the damaged muscle cells. Scientists from the Max Planck Institute for Heart and Lung Research in Bad Nauheim are seeking to restore complete cardiac function with the help of artificial cardiac tissue. They have succeeded in loading cardiac muscle cells onto a three-dimensional scaffold, created using the silk produced by a tropical silkworm.

Of all the body's organs, the human heart is probably the one most primed for performance and efficiency. Decade after decade, it continues to pump blood around our bodies. However, this performance optimisation comes at a high price: over the course of evolution, almost all of the body's own regeneration mechanisms in the heart have become deactivated. As a result, a heart attack is a very serious event for patients; dead cardiac cells are irretrievably lost. The consequence of this is a permanent deterioration in the heart's pumping power and in the patient's quality of life.

In their attempt to develop a treatment for the repair of cardiac tissue, scientists are pursuing the aim of growing replacement tissue in the laboratory, which could then be used to produce replacement patches for the repair of damaged cardiac muscle. The reconstruction of a three-dimensional structure poses a challenge here. Experiments have already been carried out with many different materials that could provide a scaffold substance for the loading of cardiac muscle cells.

Disks cut from the cocoon of the tasar silkworm grub provide a basic scaffold for heart muscle cells. The disks are around the same size as cent coins

"Whether natural or artificial in origin, all of the tested fibres had serious disadvantages," says Felix Engel, Research Group Leader at the Max Planck Institute for Heart and Lung Research in Bad Nauheim. "They were either too brittle, were attacked by the immune system or did not enable the heart muscle cells to adhere correctly to the fibres." However, the scientists have now found a possible solution in Kharagpur, India.

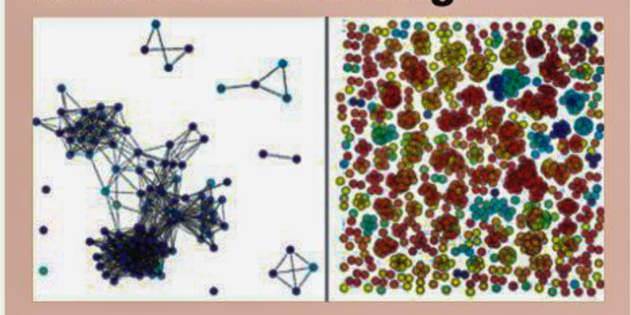
At the university there, coin-sized disks are being produced from the cocoon of the tasar silkworm (Antheraea mylitta). According to Chinmoy Patra, an Indian scientist who now works in Engel's laboratory, the fibre produced by the tasar silkworm displays several advantages over the other substances tested. "The surface has protein structures that facilitate the adhesion of heart muscle cells. It's also coarser than other silk fibres." This is the reason why the muscle cells grow well on it and can form a three-dimensional tissue structure. "The communication between the cells was intact and they beat synchronously over a period of 20 days, just like real heart muscle," says Engel.

Despite these promising results, clinical application of the fibre is not currently on the agenda. "Unlike in our study, which we carried out using rat cells, the problem of obtaining sufficient human cardiac cells as starting material has not yet been solved," says Engel. It is thought that the patient's own stem cells could be used as starting material to avoid triggering an immune reaction. However, exactly how the conversion of the stem cells into cardiac muscle cells works remains a mystery.

Source: Science Daily

COLOUR ME DRUGLIKE

What makes a drug?



In charting the "drug-likeness" of related compounds (represented as dots), a few tight clusters (left) indicate chemical similarity. Smaller, dispersed bunches and free-floating dots (right, for a different type of compound) indicate a lot of chemical variation. The redder the dots, the closer the compounds are to a QED value of 1, meaning they are the most druglike.

A new method for rating the attractiveness of a compound could help chemists discern potential new drugs from duds. Researchers have come up with a way to quantify a compound's drug potential that moves beyond simply "hot or not," instead providing a measure that allows compounds to be ranked as well.

The approach "takes things a step further, looking at multiple factors instead of yes/no," says chemical informaticist David Wild, of the Indiana University Bloomington, who was not involved with the research.

The new technique uses eight molecular properties such as the number of rotatable bonds a molecule has that influence things like a compound's toxic effects or its likelihood of being absorbed in the body. With some clever math, those probabilities are turned into a number between zero and one. When researchers tested their method against existing techniques for screening compounds, it outperformed the standard approaches at distinguishing known drugs from other molecules, the team reports in the February issue of Nature Chemistry.

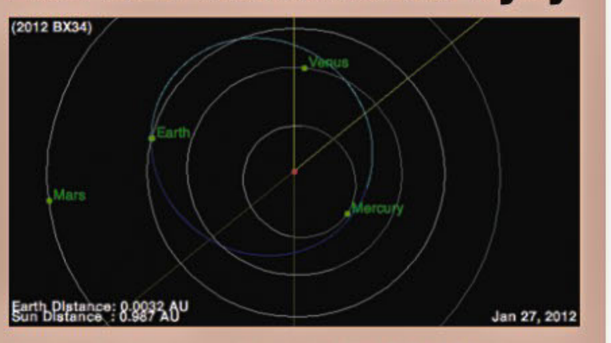
And because the new method, called QED, or quantitative estimate of drug-likeness, provides a numerical rating, it allows chemists to prioritize molecules for drug development, says study leader Andrew Hopkins, an expert in drug discovery and molecular design at the University of Dundee in Scotland.

Existing screening techniques are often used to make pass/fail judgments on compounds' drug potential. Lipinski's famous Rule of Five, for example, which uses measures such as a molecular mass not greater than 500 daltons to evaluate whether a compound might be absorbed and used by the body, has become a way to filter whole libraries of compounds even though it was just meant as a guideline, Hopkins says. This means potential drugs might be routinely screened out before they're even given a chance.

Source: Science News

NOT A CLOSE SHAVE

Bus-size rock in close flyby



The newly discovered asteroid 2012 BX34 (whose orbit is represented by the blue line) came within 0.17 lunar distances of Earth on Jan. 27, 2012.

A small asteroid the size of a city bus zoomed between Earth and the moon's orbit Friday (Jan. 27) just days after its discovery, but it never posed a threat to our planet, NASA says.

The asteroid 2012 BX34 passed within 36,750 miles (59,044 kilometers) of Earth when it made its closest approach at 10:30 a.m. EST (1530 GMT). The space rock is about 37 feet (11 meters) wide and would have broke apart in Earth's atmosphere long before it reached the ground, if it had reached the planet at all, NASA scientists said.

"Asteroid 2012 BX34 is small," astronomers with NASA's Asteroid Watch at the Jet Propulsion Laboratory in Pasadena, Calif., said in a Twitter message. "It wouldn't get through our atmosphere intact even if it dared to try."

The space rock passed Earth at a distance that is only about 0.17 times that between the Earth and the moon. For comparison, the moon typically orbits Earth at a distance of about 240,000 miles (386,000 km).

In September, NASA announced that it has spotted about 90 percent of the largest asteroids (the size of a mountain or bigger) that can come near Earth. About 911 such giant space rocks have been confirmed. Astronomers estimate there are about 981 big near-Earth objects that occasionally creep close to our planet.

Asteroid 2012 BX34 was the second space rock to fly relatively close by Earth this week, Asteroid Watch scientists said. On Jan. 23, another small asteroid called 2012 BS1 passed by the planet at a range of about 745,000 miles (1.2 million km), which is about 3.1 times the Earth-moon distance.

Source: Live Science

FRIENDLY TRACKER

Twitter data accurately tracked Haiti cholera outbreak

DANIELA HIRSCHFELD

THE informal information source, Twitter, was yielding data that would have been a quicker way of detecting and tracking the deadly cholera outbreak in Haiti than traditional methods, according to a study.

The study found that online social media and news feeds were faster than, and broadly as accurate as, the official records at detecting the start and early progress of the epidemic, which hit Haiti after the earthquake in January 2010 and has killed more than 6,500 people.

The results appear in a special section of The American Journal of Tropical Medicine and Hygiene, published on the second anniversary of the earthquake.

The authors used HealthMap, an automated surveillance platform, to measure the volume of news media generated during the first 100 days of the outbreak, and they also looked at the number of "cholera" posts on Twitter.

They found that, as the official number of cases increased and decreased, so did the volume of informal media reports about cholera.

Rumi Chunara, a research fellow at HealthMap and Harvard Medical School, and lead author of the study, emphasized that these informal reports were available online up to two weeks before official government reports, which had to go through the traditional chain-of-command structure of public health.

This means they could be used to get earlier estimates of a disease outbreak

A young woman receiving treatment for cholera symptoms at a Doctors Without Borders cholera treatment center in the Satre neighborhood of Port au Prince, Haiti.

"gain early insight into an evolving epidemic" and help plan a response sooner.

Chunara highlighted that "using informal media is cost-effective, rapid, and can be used to reach populations that otherwise wouldn't have access to traditional healthcare or would not seek it."

Other advantages include finer temporal and spatial resolution, and the study says informal media could be used to study the activity of other disease outbreaks around the world.

James Wilson, executive director of the Haiti Epidemic Advisory System a bio-surveillance reporting network created to support early warning of cholera hotspots in Haiti told SciDev.Net that sources like Twitter were useful for connecting ground responders to each other, but warned that they may not work as a primary source of information on outbreaks to those involved in ground detection.

Social media reports were "often inaccurate due to the geographic bias of the journalists" because most of them were based in the capital city, Port-au-Prince, said Wilson.

Chunara recognised that informal data sources could be biased towards urban or developed areas, and certain age groups, and may contain false alerts, which has to be taken on board.

But she added that the informal data could complement official data in an outbreak to get timely estimates of disease dynamics.

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IT'S POSSIBLE

Dinosaur's temperature

FOR the longest time, most scientists believed it wasn't possible to accurately measure the body temperature of dinosaurs. They could only make educated guesses by, for example, calculating how fast the creatures ran based on the spacing of their tracks, or from measuring the growth rates of their bones.

How warm (or cold) these long extinct creatures were remained an enduring mystery until now.

Using a new approach, a team of researchers led by the California Institute of Technology (also known as Caltech) figured out how to take the body temperatures of dinosaurs by analyzing the concentration of certain isotopes preserved in the mineral bioapatite, found in teeth.

The researchers studied two stable, but slightly heavier, isotopes of carbon and oxygen carbon-13 and oxygen-18. The isotopes tend to bond with each other, or "clump," at lower temperatures, and the lower the temperature, the more carbon-13 and oxygen-18 will clump. By analyzing the clumping of those isotopes, the researchers were able to determine fairly precise temperature values to within a range of 2 to 4 degrees Fahrenheit (1 to 2 degrees Celsius).

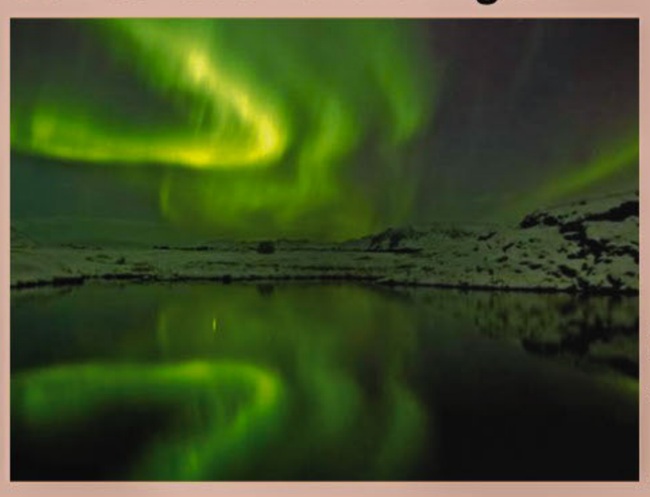
"The foundation of this measurement was an idea I had eight years ago to commission a mass spectrometer capable of analyzing simple gas molecules, including carbon dioxide, containing two or more rare isotopes," said lead study researcher John Eiler, a professor of geology and geochemistry at Caltech. "There were various excuses for doing so, but the real reason was that no one had ever seriously studied such things in natural samples ... so it was done purely out of desire to 'go' somewhere no one had gone in the study of naturally occurring isotopes."

Source: Live Science

A dinosaur tooth is drilled in preparation for an analysis of the concentrations of isotopes in the tooth

OTHERWORLDLY

Surrealistic northern glow



Source: Live Science

The northern lights glow an otherworldly green above southwest Iceland on Jan. 22, boosted by an especially active sun. Auroras, visible mostly at very high and very low latitudes, occur when charged particles from the sun hit atoms in the upper atmosphere, creating curtains of light which often shift and undulate.

"The show on the 22nd was the largest I've seen in recent years, maybe in the last 20 years," photographer Atli Arnarson told Live Science. "The pictures don't really do it justice. They were quite active at times, and danced across the sky."

DID YOU KNOW?

What's the origin of gold?

The origin of gold on our planet is believed to be the result of a bombardment by meteorites which occurred more than 200 million years after Earth was formed.

Sulfur plays very important role in the creation of gold deposits because it enhances gold solubility.

Gold is formed together with dozens of other elements such as iron, manganese, silicon, lithium, in massive stars that become supernova. These all elements come together in a package and gold has no chemical or physical properties that would cause only gold molecules to bind together and form planets or any other space bodies.