



ZOMBIE FUNGUS OR MIRACLE CANCER DRUG

“Zombie” fungus from hit TV show “The last of us” may actually lead to game changing cancer treatment! In the show starring Pedro Pascal, an adapted version of the fungus, cordyceps militaris (a real-life fungus), takes over humans turning them into crazed zombies. In reality, it's slightly less zombie inducing 🤪.



The parasitic fungus that grows on caterpillars, categorised by its orange hue, may be lifesaving as it contains the potent chemical cordycepin which can inhibit cancer cell growth. In the cell, Cordycepin is converted to cordycepin triphosphate mimicking the energy carrier ATP (adenosine triphosphate). This cordycepin triphosphate affects cell growth preventing that uncontrolled cell division that causes cancer. However, this isn't cordycepin's it's been used in traditional Chinese medicine for 100's of years to treat cancers and other inflammatory diseases! However, there have been some issues surrounding the development as it breaks down quickly in the blood stream minimising the damage dealt to the tumour. The biopharmaceutical company, NuCana has therefore developed cordycepin into a clinical therapy to create a chemotherapy drug with improved potency and efficacy.



The ProTide technology used in their clinical therapy works by attaching small chemical groups to nucleoside analogues (things that inhibit DNA and RNA synthesis, cordycepin), which are later metabolised when it reaches the cancer cells, releasing the drug. This technology has already been successfully used in antiviral drugs, which helped treat infections like Hepatitis C, Ebola and even Covid-19 🤪. Cordycepin is both groundbreaking and exciting as it can lead to a new cancer drug less damaging to healthy tissues than current treatments.

(By April McGowan and Delaena Debre)

THE CHEMICALS THAT MAKE TEENAGERS REEK



Puberty changes just about everything. Bodies get taller, muscles get stronger — and often, body odour becomes more pungent. Now, scientists have identified some of the compounds that give teenagers their natural aroma. Unlike that of infants and toddlers, teenage body odour has two smelly steroids and higher levels of carboxylic acids (a type of acid).

Those chemicals form when bacteria break down armpit sweat and sebum, the oily secretions from our skin, and may contribute to the changes in BO throughout puberty.

They collected body odour samples from teens age 14 to 18 and young children aged 0 to 3 who had slept with cotton pads under their arms for a night. Separating the body odour into individual components revealed that young children and teens have over 40 compounds in common. While some chemicals showed no difference between age groups, the scents of carboxylic acids were more prevalent in teens. These compounds were a mix of pleasant scents, described by a group of scent scientists as fruity, soapy or grassy, and less-appealing ones that smelled cheesy, musty or goatlike.

Researchers also identified two steroids present only in the teens' body odour. One, called 5 α -androst-16-en-3-one, smells of sweat, urine and musk. The other, called 5 α -androst-16-en-3 α -ol, smells of musk and sandalwood.

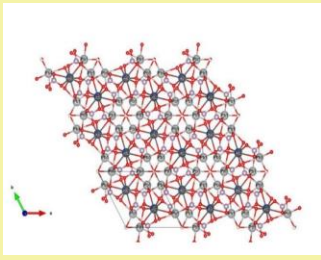
Notably, some compounds known to contribute to strong body odour weren't detected, says biochemist Andreas Natsch of Givaudan. Those chemicals might require different detection techniques, or they may show up more after exercise or working up a sweat.

So next time you decide to give your friend a little sniff, you can tell them all about on why they smell.



(By Ron Zaki)

THE RACE FOR A ROOM TEMPERATURE SUPERCONDUCTOR



Superconductivity has baffled scientists since 1911, when mercury was discovered to be a superconductor. These are materials that have zero resistance and create magnetic fields, making them very useful: they are in MRI scanners, electricity generators, and electromagnetic train lines (like the Bullet trains in Japan).

The Large Hadron Collider at CERN in Switzerland uses superconducting wires that can carry 20,000A of current, creating exceptionally large magnetic fields. However, there is a drawback – so far, the superconductors that we know of can only superconduct at temperatures as low as -269°C . This makes them very expensive and difficult to use. A cuprate of mercury, barium and calcium (meaning they are layered with copper oxide) has been found to superconduct at -140°C , which is the highest temperature superconductor ever discovered. Others can be created at very high pressures, but this still involves high costs.

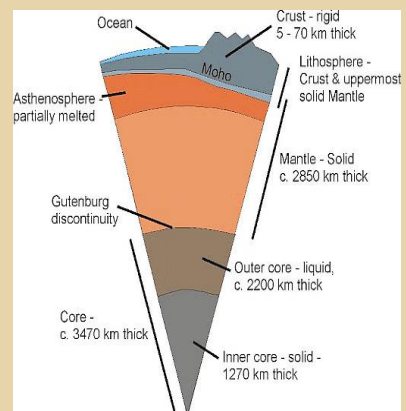
Scientists in South Korea have synthesized a new material, called LK-99, and they claimed it will superconduct at room temperature/pressure. Social media went mad with the possibilities this could bring – but scientists urged caution. The published papers had not been reviewed. Two professors from Oxford said the data was unusual, and the science community started to doubt this new breakthrough. LK-99 is now being tested in laboratories across the world, but in the past, materials have taken decades to be called real superconductors. Will this be the discovery we need, or will it be disproved?



(By Emily Ford)

DOUGHNUTS IN THE EARTH'S CORE ?!

A huge doughnut-shaped ring has been discovered in Earth's molten outer core by Australian scientists, parallel to the equator. The torus 'doughnut' shape was found via seismic waves travelling through Earth's layers (the crust, mantle, outer core, and inner core). Scientists noticed that the waves slowed down in an area close to the mantle. Its buoyancy indicates it being made of lighter elements such as silicon, sulfur, oxygen, and carbon, instead of the iron and nickel that make up the rest of the outer core.



Scientists don't know for sure, but believe it holds the secrets as to why Earth has its magnetic field. Earth's magnetic field is hugely important in protecting us from cosmic radiation emitted from the sun as it deflects the solar winds. Without it, Earth would not be able to sustain life



The Earth's magnetic field or magnetosphere is caused by the movement of the molten outer core. For the field to exist, the planet must rotate fast enough, the interior must be fluid and able to conduct electricity, and the core must have an internal energy store that propels convection currents – in Earth's case, that's thermal energy. Scientists believe that the torus region, because of its composition, helps to stir the iron and nickel, aiding the process of creating electric energy, currents, and ultimately Earth's magnetosphere.

(By Clove Gater)



CAREER PATHS

Medical Physicist

What they do:

Medical physics is all about the application of the concepts of physics to medicine. Physics is a vital part of modern medicine and is used in a wide variety of ways, but particularly in diagnostic imaging and cancer treatment. Medical physicists are typically responsible for developing and testing the scanning and imaging equipment in hospitals along with maintaining the safety of patients and staff by monitoring and preventing unintended exposure to potentially harmful things associated with the equipment (e.g. X-rays and electromagnetic fields). Other roles include applying physics to plan treatment programmes and doing research into developing new treatment options.

The path to medical physics:

- 3 A-levels including maths and physics
- A Bsc and/or Msci in physics. Certain universities offer degrees specifically in medical physics such as: UCL, Birmingham, Nottingham, Liverpool, Cardiff
- With experience, this role could lead to many opportunities such as managing a hospital department, becoming a principal medical physicist, or working in research
- The starting salary is £35,000 whilst experienced medical physicists earn about £58,000. However, top positions could earn up to £108,075.

SCIENCE JOKES

An electron and a proton go into a bar.
Proton: "You're round."
Electron: "Are you sure?"
Proton: "I'm positive."

What is the quickest way to determine the sex of a chromosome?

Pull down its genes

(By Hermione Redwood)

PAST PAPERS

Past Papers. I know you're already yawning, but...

Past exam questions are actually a brilliant resource when it comes to revising. Exam boards don't want you to know this, but they frequently reuse identical question formats from one year to the next, if not the exact same questions.

Why not use this to your advantage?

Even if you only run through a couple of questions before an exam, you'll find it really boosts your confidence in answering questions and knowing what they are actually asking, which is often half the battle.

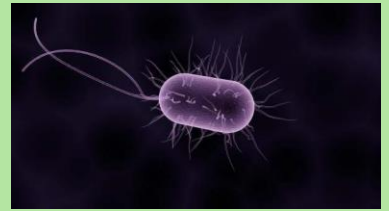
The key is to be honest with yourself about your wrong answers and how much you knew before looking at the mark scheme of a question, and to make a note of any content that keeps tripping you up.

Websites like Physics and Maths Tutor as well as Cognito are fantastic for practising specific topics you find challenging, and you might find it useful before big exams like GCSE's to do some timed revision using their question banks just to feel completely confident in applying the knowledge you've revised.

(By Eloise Martin)

COMPETITION WINNER: WHAT ARE BACTERIA FOR?

What associations come to mind when you hear the word "bacteria"? Probably the first thing you think about is illness. But in fact, bacteria are very necessary for both humans and everything around them. How is it? Let's figure it out. Let's start with you, that is, with myself. There are about 50 trillion (50,000,000,000,000) bacteria - tiny microorganisms - living in the body of each of us. In total, their weight reaches 1.5-2 kg! Why do we need them? Bacteria are responsible for our immunity and protect us when it is necessary to "come to grips" with harmful bacteria and viruses. Beneficial bacteria produce essential substances (amino acids and B vitamins required for the normal functioning of the heart and nervous system), help us cope with stress and diseases. They are better absorbed with iron, calcium and vitamin D, which children need for normal growth, and adults need to maintain immunity. But that's not all. The most common E. coli and bacilli together can create the essential amino acid tryptophan, without which serotonin, a mood-lifting substance, will never be produced. Therefore, if in the world If there were no bacteria, then we would always be in a bad mood. It's clear with the person. And what else are bacteria needed for? It turns out that they are indispensable in food production. Yogurt, cheese, cottage cheese, sour cream, pickled vegetables - all these products would not have appeared on our table if it were not for bacteria.



(By Simon Shamlov)

Edited by Samuel Johnson

Message to readers

If you have got this far, thanks a lot for reading our article and we all hope you enjoyed it. If you have any questions, please email us at

TheLabReport@ccgrammarschool.co.uk

And if you want to help contribute and have the chance to get your article on the Lab Report then email us in your work of around half a page to the email above.

THE TEAM

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