CHEMWATCH

BULLETIN

Week of 17 April 2026

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GOSSIP

Popular Sweetener Linked to DNA Damage – "It's Something You Should Not Be Eating"

Sci Tech Daily · 16 Apr 2026

A widely used artificial sweetener may not be as biologically "inert" as once believed. Research has raised concerns that a little-known chemical linked to sucralose, the main ingredient in Splenda, can damage DNA and interfere with key processes in the body.

Splenda is one of the most common sugar substitutes worldwide. It is found in diet sodas, sugar-free desserts, protein products, and many low-calorie or "no sugar added" foods. It is also sold in small packets for sweetening coffee and tea. Sucralose itself is hundreds of times sweeter than table sugar, so only very small amounts are needed.

The research centers on a compound called sucralose-6-acetate. This substance is not only formed when the body processes sucralose, but is also present in small amounts in the sweetener as a byproduct of manufacturing. Analyses have found it can make up as much as 0.67% of some commercial sucralose products, and levels may increase further after digestion.

"Our new work establishes that sucralose-6-acetate is genotoxic," says Susan Schiffman, a biomedical engineering researcher at North Carolina State University and the University of North Carolina at Chapel Hill. "We also found that trace amounts of sucralose-6-acetate can be found in off-the-shelf sucralose, even before it is consumed and metabolized."

Earlier research by the same team showed that consuming sucralose leads to the production of several fat-soluble compounds in the gut.

Genotoxic substances are a concern because they can damage DNA, which may increase the risk of mutations linked to diseases such as cancer. In laboratory experiments using human cells, sucralose-6-acetate caused DNA strand breaks, a type of damage known as clastogenicity.

Researchers confirmed this effect using multiple approaches, including a high-throughput DNA damage screening system and a micronucleus test that detects chromosomal damage. Both methods showed that the compound can disrupt genetic material in exposed cells.

Exposure levels may also exceed safety benchmarks. The European Food Safety Authority sets a threshold of toxicological concern for genotoxic substances at 0.15 micrograms per person per day (about 0.000000005 ounces). According to the findings, a single sucralose-sweetened drink could surpass that limit, even before considering additional amounts formed in the body or repeated daily intake.

Earlier safety assessments of sucralose described it as passing through the body unchanged, with minimal biological impact. However, more recent evidence suggests it can be metabolized into compounds like sucralose-6-acetate and may interact with the body in more complex ways.

The study...

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New catalyst makes plastic upcycling 10x more efficient than platinum

Science Daily · 28 Mar 2026

Many common products, including plastics and detergents, rely on chemical reactions that depend on catalysts made from precious metals such as platinum. These metals are effective but costly and limited in supply. For years, scientists have been searching for alternatives that are cheaper and more sustainable. One promising option is tungsten carbide, an Earth-abundant material already widely used in industrial machinery, cutting tools, and chisels.

Despite its potential, tungsten carbide has not been easy to use as a catalyst. Its chemical behavior can be unpredictable, which has restricted its broader adoption. Researchers led by Marc Porosoff, an associate professor in the University of Rochester's Department of Chemical and Sustainability Engineering, have now made important progress that could allow tungsten carbide to compete with platinum in key chemical reactions.

According to Sinhara Perera, a chemical engineering PhD student in Porosoff's lab, one of the main challenges lies in how tungsten carbide atoms arrange themselves.

Tungsten carbide's atoms can form many different configurations, known as phases, says Perera. These phases can strongly influence how well the material performs as a catalyst.

"There's been no clear understanding of the surface structure of tungsten carbide because it's really difficult to measure the catalytic surface inside the chambers where these chemical reactions take place," she says.

To address this problem, the research team designed a method to precisely control the structure of tungsten carbide during active reactions. In a study published in ACS Catalysis , Porosoff, Perera, and chemical engineering undergraduate student Eva Ciuffetelli '27 manipulated tungsten carbide particles at the nanoscale inside chemical reactors that operate at temperatures above 700 degrees Celsius.

Using a technique called temperature-programmed carburization, the researchers created tungsten carbide catalysts in specific phases directly inside the reactor. They then ran chemical reactions and analyzed which versions delivered the strongest performance.

"Some of the phases are more thermodynamically stable, so that's where the catalyst inherently wants to end up," says Porosoff. "But other phases that are less thermodynamically stable are more effective as catalysts."

The team identified one phase in particular, β-W2C, that showed exceptional performance in reactions that convert carbon dioxide into key building blocks for fuels and useful chemicals. With additional optimization by industry, the researchers believe this form of tungsten carbide could match platinum's effectiveness without its high price or supply limitations.

Beyond carbon dioxide conversion, Porosoff and his collaborators have also explored tungsten carbide as a catalyst...

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Scientists turn CO2 into fuel using breakthrough single-atom catalyst

Science Daily · 17 Apr 2026

Every chemical reaction must overcome an energy hurdle before it can occur. Substances need an initial input of energy to start reacting. Sometimes this barrier is small, like lighting a match. In many industrial processes, however, the required energy is much higher, which increases costs.

To make reactions easier and more efficient, chemists rely on substances called catalysts. These "reaction helpers" reduce the energy needed. The most effective catalysts often contain metals, including rare and expensive ones.

Breakthrough Catalyst Turns CO 2 Into Methanol

Researchers at ETH Zurich have now made a major advance in catalyst design. Their new system significantly lowers the energy needed to produce methanol (an alcohol) from carbon dioxide and hydrogen.

The team also achieved an unusually efficient use of the metal indium. In this catalyst, each individual indium atom acts as its own active site. This is a major shift from traditional approaches, where metals are grouped in particles.

Another key advantage is improved precision. In the past, catalyst development often relied on trial and error. This new design allows scientists to better observe and understand the reactions happening on the surface, opening the door to more deliberate and optimized catalyst development.

"Methanol is a universal precursor for the production of a wide range of chemicals and materials, such as plastics -- the Swiss army knife of chemistry, so to speak," says Javier Pérez-Ramírez, Professor of Catalysis Engineering at ETH Zurich.

Methanol is essential for producing fuels and materials, and it plays a growing role in efforts to move away from fossil fuels. If the hydrogen and energy used in the process come from renewable sources, methanol production could become climate neutral.

This approach also offers a new way to use CO 2 . Instead of releasing it into the atmosphere, it can be captured and turned into a valuable raw material.

Single Atom Catalysts Maximize Efficiency

"Our new catalyst has a single atom architecture, in which isolated active metal atoms are anchored on the surface of a specially developed support material," Pérez-Ramírez explains.

In conventional catalysts, metals are typically grouped into small particles that can contain hundreds or even thousands of atoms. Many of those atoms are not directly involved in the reaction, making the process less efficient.

Single atom catalysts represent a more efficient alternative. By using metals at the level of individual atoms, scientists can make better use of scarce and costly...

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Bursting bubbles break down PFAS

Chemistry World · 15 Apr 2026

The sea-dwelling mantis shrimp strikes its prey with enough force that even if it misses, it creates bubbles of gas that rapidly collapse, sending shockwaves that can stun or kill. Mantisonix – a spin-out from the University of Surrey, UK – is using a similar technique to break down persistent fluorochemicals with high-frequency sound waves.

Mantisonix co-founder and chief technology officer Mehrdad Zare

Per- and polyfluoroalkyl substances (PFAS) are persistent, man-made pollutants, sometimes called ‘forever chemicals’. These materials are hydrophobic, oleophobic, durable and chemically inert, owing to their strong carbon–fluorine bonds. These same properties make PFAS extremely hard to break down. Such chemicals are associated with a variety of health and environmental effects.

Strategies such as pyrolysis or supercritical water oxidation can destroy PFAS compounds, but these methods often require high temperatures and pressures. Electrolysis, photolysis and plasma chemistry offer ways to break down PFAS at ambient conditions. However, these typically require catalysts and other additives. Sonolysis using high-frequency ultrasound could be a way to treat PFAS contamination in water without these issues.

‘The [sound] wave creates high- and low-pressure regions in the liquid… which cause any dissolved gas in the solution to expand and contract,’ explains co-founder Madeleine Bussemaker . She adds that these bubbles ‘expand a little bit more than they contract’, leading them to become unstable once they reach a certain size. The bubbles then collapse, generating local pressures and temperatures strong enough to break down PFAS on the bubbles’ surfaces. This creates fluoride, carbon oxides and other naturally occurring compounds, depending on the exact PFAS compounds present.

For PFAS degradation to occur, the team generally uses frequencies between 200 and 1000kHz; humans can typically hear up to 20kHz. The technology works without the need for catalysts or other chemicals, uses electricity and can operate in the field, reducing the need to transport contaminated materials.

‘It’s very difficult to measure and observe the process because it happens in microseconds,’ says Bussemaker. Measuring levels of fluoride and tracking PFAS concentrations helps determine the rate of PFAS destruction.

‘If we have parts per million of our initial PFAS, we will see the shorter chain PFAS at concentrations about 1000 times lower. So, we kind of hypothesise that this degradation process occurs via chain shortening,’ explains Bussemaker.

‘PFAS in the environment normally occurs or is legislated down to levels where we’re talking about grains of sand in a swimming pool,…

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A 67-year-old “crazy” theory about vitamin B1 has finally been proven

Science Daily · 18 Jul 2026

Chemists have achieved what many once considered impossible by stabilizing an extremely reactive molecule in water, confirming a 67-year-old theory about vitamin B1. The breakthrough not only resolves a long-standing biochemical puzzle, but also points toward cleaner, more efficient methods for producing pharmaceuticals.

At the center of the discovery is a carbene, a form of carbon with just six valence electrons. Under normal conditions, carbon atoms are most stable with eight electrons. With only six, carbenes are highly unstable and react almost instantly with their surroundings. In water, they typically break down right away.

For decades, scientists believed that vitamin B1, also known as thiamine, might briefly form a carbene-like structure inside cells to help drive essential biochemical reactions. However, because of the molecule's extreme instability, no one had been able to directly observe it in such conditions.

Researchers have now succeeded in creating a carbene that remains stable in water. Not only did they generate it, they also isolated it, sealed it in a tube, and observed it staying intact for months. The findings are detailed in a study published in Science Advances.

"This is the first time anyone has been able to observe a stable carbene in water," said Vincent Lavallo, a professor of chemistry at UC Riverside and corresponding author of the paper. "People thought this was a crazy idea. But it turns out, Breslow was right."

Lavallo is referring to Ronald Breslow, a Columbia University chemist who proposed in 1958 that vitamin B1 could transform into a carbene to enable key biochemical reactions. While the idea was influential, it remained unproven because carbenes were known to be too unstable, especially in water, to capture or study.

To overcome this challenge, Lavallo's team developed a protective molecular structure that surrounds the carbene. He describes it as "a suit of armor," designed to shield the reactive center from water and other nearby molecules. With this protection, the carbene becomes stable enough for detailed analysis using nuclear magnetic resonance spectroscopy and x-ray crystallography, offering clear evidence that such molecules can exist in water.

"We were making these reactive molecules to explore their chemistry, not chasing a historical theory," said first author Varun Raviprolu, who completed the research as a graduate student at UCR and is now a postdoctoral researcher at UCLA. "But it turns out our work ended up confirming exactly what Breslow proposed all those years ago."

Toward...

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In-situ electron microscopy probes how atoms adsorb on surfaces at solid–liquid interfaces

Chemistry World · 16 Apr 2026

An in-situ microscopy technique has allowed chemists to study how gold atoms adsorb on graphene in a range of solvents, helping to increase understanding of solid–liquid interfaces. The researchers hope that this technique will aid the design of better catalysts, fuel cells and batteries.

One of the main ways to visualise individual atoms is by using transmission electron microscopy (TEM), a technique that uses a beam of electrons to image samples. However, this method requires a vacuum, making it challenging to study atoms in solution.

Materials scientist Sarah Haigh co-led the work on visualising atoms at the solid–liquid interface

Nanosized cells that trap liquids between two graphene sheets can help get around this issue. Yet, sealing these cells can be difficult, with glue residues often contaminating the interface. Solvents can also evaporate during cell formation, meaning that the concentration of solutions can change, altering the behaviour of atoms at the interface.

The new method instead submerses cells in solution, where a silicon nitride cantilever then seals the cells with graphene before peeling away 'like a Post-it note', explains Sarah Haigh at the University of Manchester, UK, who led the work.

Using this method, the team studied the effect of five solvents – acetone, ethanol, water, butanol and cyclohexanone – on how gold atoms adsorbed onto a graphene surface. An artificial intelligence tool developed by the team tracked and analysed the location of more than 1 million gold atoms in images of the cells.

A cantilever helps to seal nanosized graphene–liquid cells before peeling away 'like a Post-it note'

Analysis revealed that in acetone, adsorbed gold atoms were mostly isolated particles. The researchers suggest that this is because acetone's low polarity leads gold ions to repel each other more strongly in solution. However, in more polar solvents like water and cyclohexanone, gold atoms tended to cluster together in large nanoparticles.

'Usually you have to infer what's happening at the solid–liquid interface by looking at the dried [surface],' explains Haigh. She adds that this technique now allows chemists to directly see what's happening at the surface.

This TEM image shows gold atoms adsorbed on a surface made of alternating graphene layers

Alex Roberston , a materials scientist at the University of Warwick who uses TEM, describes the work as a 'technical tour de force'. '[This new] approach gives us understanding as to the nature of atomic interactions that occur with 2D materials...

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'Fireproof' batteries create their own internal firewall when the heat is on

New Atlas · 15 Apr 2026

Years of research and development, precision manufacturing, extreme testing, constant monitoring, and dozens of failsafes all go into preventing thermal runaway in batteries. Now, researchers from the Chinese Academy of Sciences are proposing a shockingly simple solution: batteries that simply cannot catch fire.

Their solution is a sodium-ion battery design that uses a polymerizable, non-flammable electrolyte that rapidly solidifies under extreme heat, forming an internal safety barrier.

Thermal runaway has long been a challenge in battery technology, especially in lithium-ion batteries, which typically use flammable electrolytes. The concern has received an even greater spotlight with the rise in electric vehicle (EV) usage, given the size of the batteries in these vehicles.

This phenomenon is a self-accelerating chain reaction wherein a battery enters an uncontrollable heating state. Once a certain temperature is reached, the battery's internal chemicals begin to react, releasing more heat. This heat then speeds up the reactions, creating even more heat in a vicious cycle. Within milliseconds or minutes, temperatures can skyrocket to 1,292-1,832 °F (700-1,000 °C). This often leads to the release of toxic gases, violent fires, or explosions.

What's more, because the battery creates its own oxygen during this reaction, traditional fire extinguishers often can't put it out. You usually have to wait for the battery to burn itself out. Thermal runaway can be triggered by a variety of conditions, including battery damage, overheating, overcharging, manufacturing defects, exposure to salt water, and external fires.

Sounds really scary, but do not fret. According to EV FireSafe , the chance that your EV will spontaneously combust due to battery issues is about 0.0012%. This figure is possible thanks to really advanced engineering and an immense amount of resources and effort.

Battery manufacturers spend years researching and designing every aspect of the battery, from cell chemistry to electrical architecture. This is usually followed by very precise manufacturing, then several rounds of rigorous testing. In addition to these factors, manufacturers design multiple monitoring, cooling, protective, and failsafe systems around the batteries.

All of these measures require literal years of effort and cost that could easily run into the billions of dollars. Therefore, you can understand why the researchers' proposed solution, a battery with an inherent fire prevention system, is a significant breakthrough.

Their system is a battery with a built-in smart firewall that automatically prevents potential fires before they start.

Unlike traditional lithium-ion batteries that use flammable liquid electrolytes –...

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Scientists Discover Enzyme That Could Supercharge Ozempic-Like Weight Loss Drugs

Sci Tech Daily · 16 Apr 2026

Researchers have identified a versatile enzyme capable of reshaping peptide-based drugs into more stable, longer-lasting forms.

Chemistry researchers at the University of Utah have identified an enzyme called PapB that can "tie off" therapeutic peptides, which are protein-like drugs, into compact ring structures. This process is known as macrocyclization.

According to new research, this approach could help scientists develop stronger and longer-lasting versions of GLP-1 drugs such as semaglutide, the active ingredient in Ozempic and Wegovy, which are used to treat diabetes and obesity.

Forming peptides into rings is especially valuable because these structures improve stability, extend how long drugs remain active in the body, and can enhance how effectively they interact with biological targets. This is according to co-author Karsten Eastman, a research associate in the university's Department of Chemistry and CEO and co-founder of Sethera Therapeutics.

“Peptides themselves can be extremely difficult to work with because they have a lot of reactive chemical handles. But this is what makes them so great in biology. You can get the type of reaction that you want in the body, but it’s difficult to modify them in hyper-specific ways,” said Eastman, who completed his Ph.D. in 2023 in the lab of Utah chemistry professor Vahe Bandarian. “What we show in the study is an enzymatic method—using a tiny molecular machine to modify or hyper-modify peptides in extremely controlled ways—enabling what we believe will be next-generation peptide therapeutics.”

Eastman and Bandarian, a coauthor of the study, founded Sethera last year to bring their university discoveries to market with support from the National Institutes of Health . Their work was recently recognized by the university’s Technology Licensing Office, which named them the 2025 Founders of the Year for creating the PolyMacrocyclic Peptide (pMCP) Discovery Platform.

Conventional chemical approaches for closing peptide rings are often costly and difficult to apply late in drug development. PapB offers a more straightforward alternative. It forms a specific chemical bond that closes the peptide into a ring without requiring the extra “leader” sequences that many enzymes depend on to identify their targets.

The study, published in ACS Bio & Med Chem Au , explains how the team used PapB, a “radical SAM” (S-adenosyl-L-methionine) enzyme, to link the ends of GLP-1-like peptides through a sulfur-carbon bond called a thioether. Laboratory experiments confirmed that the rings formed successfully, even when the peptides contained nonstandard building blocks commonly used in modern...

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Breakthrough water filter removes 98% of toxic PFAS forever chemicals

Science Daily · 27 Jul 2026

Contamination from perfluoroalkyl and polyfluoroalkyl substances (PFAS) has spread into groundwater, surface water, and even drinking supplies, affecting millions of people around the world.

Researchers at Flinders University have now developed a promising new approach that could help remove some of the hardest-to-capture forms of these long-lasting pollutants from water.

The team, led by Flinders ARC Research Fellow Dr. Witold Bloch, created specialized materials known as adsorbents that can effectively capture PFAS. Their method is particularly successful at trapping short-chain PFAS, which are notoriously difficult to remove with current water treatment technologies.

Their findings, published in the journal Angewandte Chemie International Edition , highlight the use of a nano-sized molecular cage designed to act as a highly selective 'PFAS trap'.

"While some long-chain PFAS can be partially removed using existing water treatment technologies, the capture of short-chain PFAS -- which are more mobile in water -- remains a major unresolved challenge," says project leader Dr. Witold Bloch, from Flinders University's College of Science and Engineering.

"We discovered that a nano-sized cage captures short-chain PFAS by forcing them to aggregate favourably inside its cavity. This unusually strong binding mechanism is different from that of traditional adsorbent materials."

To make the system effective, the researchers embedded these molecular cages into mesoporous silica, a material that typically does not bind PFAS on its own.

First author Caroline Andersson, a PhD candidate in chemistry at Flinders University, explains that adding the nanosized cage allows the material to remove a wide range of PFAS compounds from water, including those that are especially difficult to isolate.

"The most exciting aspect of this project was that we first conducted in-depth studies of how PFAS bind within the cage on the molecular level," she says. "That allowed us to understand the precise binding behaviour and then use that knowledge to design an effective adsorbent for PFAS removal."

High Efficiency and Reusability in Water Filtration

Laboratory tests showed that the new material can remove up to 98% of PFAS at environmentally relevant concentrations in model tap water.

"The adsorbent also demonstrated reusability, remaining highly effective after at least five cycles of reuse. These results highlight its potential for integration into water filtration systems for polishing drinking water at the final stage of treatment," adds Dr. Bloch.

"This research represents an important step toward the development of advanced materials capable of tackling one of the world's most persistent environmental contaminants,"...

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'Spin-flip' system pushes solar cell energy conversion efficiency past 100%

New Atlas · 14 Apr 2026

Energy can never be created or destroyed. That's basic Physics 101. You simply cannot create energy out of thin air. Yet researchers at Kyushu University in Japan say they have developed a technology that pushes the energy conversion efficiency of solar cells to 130%!

At first glance, the results of the research, conducted with collaborators at Johannes Gutenberg University in Germany, sound fanciful at best. However, the reality is far more nuanced. Using a molybdenum-based “spin-flip” metal complex paired with a singlet fission material, the scientists managed to generate more usable energy carriers than incoming photons.

At any given moment during the day, the Earth receives roughly 89,000 terawatts of solar energy – almost 5,000 times the global human energy consumption annually. However, modern solar technologies capture only a fraction of it.

Photovoltaic solar cells, the kind that most likely come to mind when you think of solar panels, convert only about 20% of the sunlight that hits them into usable electricity. The conversion limitations primarily stem from the Sun itself.

Solar cells convert light into electricity through a relatively simple process. Photons, which are packets of light energy, stream in from the Sun and strike a semiconductor material, typically silicon. When a photon hits, it transfers its energy to an electron in the semiconductor, knocking it loose and setting it in motion. The energized moving electrons constitute an electric current.

The problem is that photons are not all equal. They arrive with wildly different energy levels depending on their wavelength. Infrared photons, at the low-energy end of the spectrum, do not carry enough energy to knock electrons loose at all. Instead, they pass through or are absorbed as heat, wasted. Blue light photons, on the other hand, carry far more energy than is needed to free an electron. The excess is shed as heat, also wasted.

This fundamental mismatch between the energy supply and the semiconductor's electron threshold imposes a hard ceiling on efficiency known as the Shockley-Queisser limit . For a standard single-junction solar cell, that ceiling is around 33%.

Even with perfect engineering, you cannot extract more than a third of incoming solar energy this way. This is why even the very best commercially available solar panels do not surpass 25% conversion efficiency.

Now, under normal conditions, one photon excites one electron, creating a single unit of usable energy, known as an exciton. Even when a photon...

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CURIOSITIES

Students Found an Ancient Star That Shouldn't Be in the Milky Way

Sci Tech Daily · 16 Apr 2026

Students discovered an ultra-ancient star with almost no heavy elements, making it one of the most pristine ever found. Surprisingly, it appears to have formed in another galaxy before drifting into the Milky Way .

A team of undergraduate students at the University of Chicago has identified one of the oldest known stars in the universe using data from the Sloan Digital Sky Survey (SDSS). The star is especially unusual because it did not originate in the Milky Way. Instead, it formed in a nearby companion galaxy and later moved into our own.

The discovery was made by ten students in the university's "Field Course in Astrophysics," led by Professor Alex Ji, the deputy Project Scientist for SDSS-V, along with graduate teaching assistants Hillary Andales and Pierre Thibodeaux.

SDSS is a long-running international collaboration involving more than 75 institutions. For 25 years, it has focused on collecting and sharing large volumes of astronomical data with the public. In its current phase, robotic systems gather spectra from millions of celestial objects, helping scientists study how stars, black holes, and galaxies evolve over time.

As part of their coursework, the students worked directly with SDSS data. Over several weeks, they reviewed thousands of stars from the latest dataset, looking for unusual candidates. From this initial search, they selected 77 stars for detailed follow-up observations during a trip to Las Campanas Observatory.

The students traveled to Carnegie Science's Las Campanas Observatory in Chile during Spring Break, where they used the Magellan Inamori Kyocera Echelle (MIKE) instrument on the Magellan telescopes. On their first night, March 21st, 2025, they began observing their selected targets. The second star they examined, known as SDSSJ0715-7334, quickly stood out.

"We found it the first night, and it completely changed our plans for the course," Ji said.

Initially, each star was scheduled for a 10-minute observation. However, after recognizing the importance of this object, the team devoted three hours to studying it the following night.

"I was looking at that camera the whole night to make sure it was working," said Natalie Orrantia, one of the students involved in the discovery.

The star's composition revealed just how extraordinary it is. It consists almost entirely of hydrogen and helium, indicating it formed very early in cosmic history. This makes it one of the most pristine and oldest stars ever observed.

Further analysis of its orbit showed that it originated in...

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This Strange Material Can Turn Superconductivity on and off Like a Switch

Sci Tech Daily · 15 Apr 2026

Researchers have uncovered new evidence that superconductivity can be steered by a material's surroundings, opening a potential path toward electronics that waste far less energy. Instead of changing the material itself, the team showed that subtle environmental tuning can reshape how electrons behave at a fundamental level.

Superconductivity allows certain materials to carry electrical current with zero resistance once cooled below a critical temperature. This eliminates energy loss as heat, a limitation that affects everything from power grids to microchips. Yet the microscopic processes that enable this frictionless flow remain one of the biggest open questions in condensed matter physics.

New research, led by Chun Ning (Jeanie) Lau, a professor of physics at The Ohio State University , focused on a carefully designed material known as twisted bilayer graphene . This structure is made by stacking two layers of carbon and rotating one slightly relative to the other.

The team placed this material on a synthetic substrate called strontium titanate, which allowed them to monitor and adjust how electrons, the tiny particles responsible for electrical behavior, interact. These interactions occur in pairs and play a key role in determining properties such as magnetism and chemical bonding. By tuning these paired interactions, the researchers were able to turn superconductivity on and off.

"Electrons normally repel each other, but in superconductors they form pairs; this pair formation is the key to a superconductor's ability to conduct electricity without dissipation," said Lau. "Our evidence suggests that electrons themselves, depending on their sensitivity to their nearby environment, are unexpectedly important for material changes."

The researchers observed an unexpected trend. Increasing their adjustments reduced superconductivity, which contrasts with traditional superconductors where weakening repulsive forces between electrons typically strengthens pairing. This difference highlights the unusual behavior of materials like twisted bilayer graphene.

"If you could transmit electricity without energy loss, that would be hugely important for technologies used in our everyday life," said Lau. "Despite the fundamental questions that still need answers, this work basically provides a path toward a new type of physics mechanism."

This discovery could help scientists design materials that operate as superconductors at higher temperatures, potentially even at room temperature. Achieving this long-standing goal would have major implications for electronics, power transmission, and communication systems.

The findings were published April 7 in the journal Nature Physics .

Overall, the work points to a more direct way of controlling the conditions that enable...

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Scientists say we've been treating Alzheimer's all wrong

Science Daily · 22 Apr 2026

Alzheimer's disease (AD) remains one of the most pressing global health challenges, especially as aging populations continue to grow. The condition steadily erodes memory and thinking abilities, deeply affecting daily life. New treatments, including monoclonal antibodies such as lecanemab and donanemab, have offered some optimism by slowing cognitive decline. However, these therapies still fall short of reversing the disease or restoring normal brain function.

A recent review published in Science China Life Sciences by Professor Yan-Jiang Wang and colleagues explores why progress has been limited. The researchers argue that focusing on a single cause has not worked because Alzheimer's is far more complex. It arises from the combined effects of amyloid-beta (Aβ) buildup, Tau protein tangles, genetic risk factors, aging-related changes, and broader health conditions. Because of this complexity, they suggest that future treatments must take a more comprehensive and coordinated approach.

Alzheimer's Disease Involves Multiple Interconnected Factors

The review highlights several key areas that are reshaping how scientists understand Alzheimer's.

Amyloid-beta has long been a central target in Alzheimer's research, but treatments aimed only at this protein have produced limited results. Scientists are now paying closer attention to Tau hyperphosphorylation, a process that leads to the formation of neurofibrillary tangles and the loss of brain cells. Addressing both Aβ and Tau may be necessary to slow disease progression more effectively.

Genetics play a major role in determining Alzheimer's risk. While APOE ε4 remains the most widely recognized genetic factor, researchers are identifying additional variants linked to specific populations. Advances in genome editing (CRISPR/Cas9) are also being explored as potential one-time treatments that could modify disease risk at its source.

Aging and Whole-Body Health Shape Alzheimer's Progression

Aging is the strongest risk factor for Alzheimer's and involves a range of biological changes. These include declining mitochondrial function, the buildup of damaged cells, and increased DNA damage. The review points to "senolytic" therapies, which aim to remove aging glial cells, as a possible way to improve brain health and slow decline.

Systemic Health and the Gut-Brain Connection

Alzheimer's is also influenced by conditions that affect the entire body. Issues such as insulin resistance, high blood pressure, and imbalances in gut bacteria can worsen disease processes. Researchers are investigating whether existing diabetes medications and therapies targeting the gut-brain axis could help reduce these effects.

Toward Integrated and Multi-Target Alzheimer's Therapies

The authors emphasize the need to move away from "reductionist" thinking and...

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Goodbye colonoscopy? New stool test detects 90% of colorectal cancers

Science Daily · 17 Sep 2026

Colorectal cancer is the second leading cause of cancer-related deaths worldwide. When caught early, it is often highly treatable. However, colonoscopies -- the primary screening method used today -- can be costly and uncomfortable, which discourages many people from getting tested on time.

Researchers at the University of Geneva (UNIGE) have developed a new approach that could change this. Using machine learning, they created the first detailed catalogue of all human gut bacteria at a level precise enough to reveal how different microbial subgroups function in the body. They then used this information to detect colorectal cancer based on bacteria found in simple stool samples, offering a non-invasive and low-cost alternative. The findings, published in Cell Host & Microbe, could also help scientists better understand how gut microbiota influences overall health and disease.

Many cases of colorectal cancer are diagnosed late, when treatment options are more limited. This highlights the urgent need for easier and less invasive screening methods, especially as cases continue to rise among younger adults for reasons that remain unclear.

Scientists have long known that gut microbiota plays a role in colorectal cancer. However, turning that knowledge into practical medical tools has been difficult. One major challenge is that different strains within the same bacterial species can behave very differently. Some may contribute to cancer development, while others have no effect at all.

"Instead of relying on the analysis of the various species composing the microbiota, which does not capture all meaningful differences, or of bacterial strains, which vary greatly from one individual to another, we focused on an intermediate level of the microbiota, the subspecies," explains Mirko Trajkovski, full professor in the Department of Cell Physiology and Metabolism and in the Diabetes Centre at the UNIGE Faculty of Medicine, who led this research.

"The subspecies resolution is specific and can capture the differences in how bacteria function and contribute to diseases including cancer, while remaining general enough to detect these changes among different groups of individuals, populations, or countries."

The research required analyzing massive amounts of biological data. "As a bioinformatician, the challenge was to come up with an innovative approach for mass data analysis," says Matija Trickovic, PhD student in Trajkovski's lab and the study's first author.

"We successfully developed the first comprehensive catalogue of human gut microbiota subspecies, together with a precise and efficient method to use it both for research and in the...

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Gene discovery opens new path for disease-resistant rice breeding

Phys Org · 16 Apr 2026

Bacterial blight (BB) is a serious plant disease that mainly affects rice plants, especially in warm, humid regions. Due to the severity of BB, discovering and applying BB-resistance genes is strategically important for ensuring stable rice production in Asia. However, genetic strategies to improve disease resistance face a trade-off between crop yield and immunity to disease—since better immunity may be associated with lower yield.

To date, most BB resistance genes (Xa) that have been "cloned"—i.e., identified, isolated, and functionally validated—either originate from wild rice relatives or are loss-of-function mutations in susceptibility genes, suggesting that BB resistance may have been negatively selected during rice domestication.

Despite this finding, researchers have recognized the importance of elucidating how resistance genes and their regulatory networks are differentially selected during domestication in order to guide disease resistance breeding in rice.

To achieve this goal, Prof. He Zuhua's team from the Center for Excellence in Molecular Plant Sciences of the Chinese Academy of Sciences, along with Prof. Chen Gongyou's team from Shanghai Jiao Tong University and Prof. Deng Yiwen's team from Zhejiang University, have cloned the broad-spectrum BB resistance gene Xa48. They elucidated a new model for broad-spectrum, durable BB resistance involving an NLR immune receptor and its cognate effector, and revealed the molecular mechanism by which XA48 coordinates growth and immunity during crop domestication.

Through large-scale germplasm mining, the researchers identified a novel BB resistance gene, Xa48, in the indica rice variety Shuangkezao (SKZ). Combining map-based cloning with GWAS analysis, they cloned the gene and showed that it encoded an NLR receptor protein. Screening and functional characterization identified its pathogenic cognate effector, XopG, and demonstrated that XA48 directly recognized XopG, thus triggering immune responses.

Systematic genetic, biochemical, and cell biology studies revealed that upon XopG recognition, XA48 promoted degradation of the downstream immune suppressor OsVOZ1/2, ultimately activating immune responses. This discovery provides a foundation for breeding high-yielding, disease-resistant rice varieties.

Moreover, the researchers investigated the domestication trajectory of XA48 to understand how it balances growth and immunity. They discovered that the gene encoding the downstream transcription factor, OsVOZ1, has evolved into two allelic variants: OsVOZ1 A and OsVOZ1 S . Japonica rice carries only OsVOZ1 A , while indica rice has retained both.

The combination of Xa48 and OsVOZ1 A imposed a reproductive penalty in japonica—an effect not seen in indica, ultimately leading to the functional loss of Xa48 in japonica. Accordingly, Xa48 was present...

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Cheeky caterpillars trick ants into treating them as queens

refractor.io · 14 Apr 2026

Baby caterpillars have figured out how to get themselves the royal treatment in certain ant colonies – getting carried around like precious cargo, fed on demand, guarded and being rescued from danger. But why would ants give this celebrity status to a caterpillar? The secret lies in perfect mimicry: the caterpillar copies not just the queen ant’s chemical scent, but the exact rhythm of her vibrations.

“In order not only to fool the ants, but to achieve a high social status in the colony hierarchy, they (caterpillars) are emitting sounds that are queen-like,” Francesca Barbero, a biologist at the University of Turin, told Refractor.

In an interview, Barbero told us that many butterfly larvae are myrmecophilous (ant-loving). These caterpillars have evolved in such a way that they need to be adopted by a specific genus of ants to complete their life cycles, “otherwise they cannot survive”. The level of myrmecophily varies; some caterpillars do this to secure shelter and food in the nest, while others just exploit the colony’s surrounding area.

This relationship may be parasitic or mutualistic, and is based on the butterfly’s ability to break the communication code of the host colony. Scientists have observed this myrmecophilous behavior for years, but the previous studies focused only on the chemical cues and simple acoustic signals, excluding the rhythms and precision.

Jeremy Thomas, a biologist at the University of Oxford, who was not involved in this study, tells us that in a paper in 2009 , he and his co-authors found that Myrmica queens made distinctly different sounds from the workers' acoustics, which, when played back, induced extra protection from workers within the colony. Both Maculinea larvae and pupae mimic these acoustics and gain similar royal protection from the workers.

To analyze the sounds produced by caterpillars in detail, Barbero and her colleagues studied the vibroacoustic signals from two ant and nine butterfly species, differing in the extent of myrmecophily. The team used a custom-made, highly sensitive recording device to record the vibrations produced by ants and caterpillars.

They found that every species they studied, regardless of whether they liked ants or not, used a regular rhythm, or isochrony. However, only highly myrmecophilous caterpillar species exhibit the complex rhythm known as double meter.

“The higher the level of myrmecophily, the more complex the signal, and this complexity is achieved through a specific rhythmic pattern," Barbero told us. “This complexity in...

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Scientists thought this was a young T. rex. They were wrong

Science Daily · 23 Dec 2026

A long-running scientific debate may finally be nearing its end. New research involving the University of Nebraska State Museum's Ashley Poust provides strong evidence that Nanotyrannus , often described as a smaller version of Tyrannosaurus rex , was in fact a real and separate species.

The research team, led by Christopher Griffin of Princeton University, focused on the original Nanotyrannus fossil, a skull housed at the Cleveland Museum of Natural History. To determine the animal's age at death, they examined a rarely studied bone known as the ceratobranchial, or hyoid, which was preserved with the skull.

Using bone histology, or the study of fossilized bone microstructure, the team analyzed this small throat bone and identified growth patterns that indicate the animal had reached or was close to full maturity. This finding is critical because it shows the specimen was not a young Tyrannosaurus rex still growing.

These findings were published in Science .

"This small-bodied -- in relation to the T. rex -- meat-eater's hyoid bone showed growth patterns that suggest maturity or approaching maturity," said Poust, Voorhies Endowed Curator of Vertebrate

Paleontology. "This lets us be confident in keeping the name Nanotyrannus, because this animal is clearly not on a growth path to becoming a Tyrannosaurus rex ."

Estimates suggest Nanotyrannus reached about 18 feet in length, making it significantly smaller than a full-grown T. rex , which could exceed 40 feet. This size difference supports the idea that it was not simply a younger stage of the larger species.

The Nanotyrannus skull was first discovered in 1942 and initially classified as Gorgosaurus. In 1988, further study led scientists to rename it Nanotyrannus lancensis . However, many researchers later argued that it was actually a juvenile T. rex , fueling decades of debate.

The new findings challenge that long-standing assumption.

"At the time, the prevailing consensus was that the Nanotyrannus holotype skull represented an immature Tyrannosaurus rex , and was not a separate species," said Griffin, assistant professor of geosciences at Princeton. "Our expectations were simply following along with that consensus, but once we sampled the hyoid and saw features that strongly indicated maturity, we knew that we had to examine that idea more skeptically."

A New Method for Studying Dinosaur Growth

To strengthen their conclusions, Poust compared hyoid bones from a range of species, including modern relatives of dinosaurs (ostriches, alligators and lizards), as well as other fossil...

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A strange new eye cell is rewriting how vision works

refractor.io · 13 Apr 2026

For more than 150 years, vertebrate vision has been understood as a two-part system: rods for low-light conditions, and cones for bright light and color. That tidy division is now under the microscope, as researchers from the University of Queensland have discovered a new hybrid cell that breaks the rule: rod-shaped photoreceptors that run cone-specific genetic programs.

In larval deep-sea fish, these cells dominate early development. The result suggests vision can follow a different path, tuned to the dim, in-between light these animals inhabit.

What we know of most vertebrates is that vision develops in a set sequence: cones first, rods later. Deep-sea fish appear to break that pattern, relying instead on hybrid photoreceptors to navigate low, diffuse light conditions.

That alternative pathway may reflect the unusual light environment these fish inhabit early in life. Unlike most marine larvae which begin life in sunlit surface waters, many deep-sea species develop deeper in the water column, within the mesopelagic, or “twilight,” zone. Here, sunlight fades to a faint, filtered glow – just enough to see, but far from the brightness most young fish experience.

In this dim, transitional layer, neither rods nor cones alone are ideal, creating a niche where a hybrid system may offer a clear advantage.

To understand how these hybrid photoreceptors function, the researchers examined the retinas of larval deep-sea fish across three species: Vinciguerria mabahiss, Maurolicus mucronatus, and Benthosema pterotum . These specimens were collected in the Red Sea, between 65 and 650 ft (20

and 200 m) below the surface, during a series of marine expeditions led by researchers including Lily Fogg and Fanny de Busserolles.

Upon examination, the team found that the samples were telling a different story at the molecular level: these rod-shaped cells overwhelmingly expressed cone-specific genes. In other words, they had the form of rods, while functioning like cones.

Rod-like structures are optimized to capture as many photons as possible in low-light conditions, while cone-derived molecular machinery supports faster response and recovery. Together, that combination gives these hybrid photoreceptors an edge in dim, shifting light.

As these fish develop, that hybrid setup doesn’t always carry through unchanged. In Maurolicus mucronatus , those rod-shaped, cone-expressing cells remain dominant into adulthood. In the other species, Vinciguerria mabahiss and Benthosema pterotum , the retina eventually settles into a more familiar low-light system, shifting toward true rods.

The findings point to a more flexible visual system,...

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Antibiotics Can 'Inflame' Bacteria, Making Infections Harder to Treat

sciencealert.com · 15 Apr 2026

Antibiotics are designed to kill harmful bacteria and help the body recover from infection. But some antibiotics may also push bacteria to release tiny particles that can make inflammation worse .

While inflammation is part of the body's natural defense against infection, too much inflammation can damage healthy tissue and interfere with healing . In severe cases, excessive inflammation can become life-threatening .

These particles are called bacterial extracellular vesicles, or BEVs . These microscopic, bubble-like structures carry proteins, toxins, and other molecular signals that influence how the immune system of the host responds.

Bacteria naturally release BEVs into their surroundings as a way to communicate with their environment, remove damaged cellular material, and interact with host cells.

Although incredibly small, these structures can have powerful effects on the human body. When BEVs enter the bloodstream, they can interact with cells that line blood vessels and trigger an immune response .

In some cases, this can increase inflammation and lead to sepsis , a condition where the body's response to infection becomes dangerously uncontrolled, damaging tissues and sometimes leading to organ failure.

I am a biomedical engineer studying how bacterial extracellular vesicles influence inflammation during infection.

In my recently published research, I found that certain types of antibiotic cause bacteria to release significantly more of these vesicles than others. This finding suggests that the way an antibiotic kills bacteria may also influence how much inflammatory material is released into the body.

Antibiotics work in different ways . Some target the bacterial cell wall, weakening it until the cell breaks apart and dies. Others interfere with key cellular processes such as protein production or DNA replication , preventing bacteria from growing.

Whatever their mechanism, antibiotics control infection by killing the bacteria that are causing it.

But antibiotics also place bacteria under stress, and that stress can cause bacteria to release more extracellular vesicles carrying inflammatory molecules.

To explore this process, I exposed the bacteria E. coli to several commonly used antibiotics and measured how many vesicles they made.

The goal was simple: Compare how different types of antibiotics influence vesicle release and determine whether the way an antibiotic kills bacteria affects vesicle production.

The results showed that not all antibiotics have the same effect on the vesicles bacteria produce.

Antibiotics that target the bacterial cell wall, including a widely used group of drugs known as beta-lactams , led to a noticeable...

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Scientists just solved a 160-million-year fossil mystery “I’ve never seen anything like it”

Science Daily · 28 Feb 2026

At first glance, sea sponges seem almost too simple to be mysterious.

They have no brain and no gut, and scientists have long believed they originated around 700 million years ago. Yet clear fossil evidence only dates back to about 540 million years ago, leaving a puzzling 160 million-year gap in the record.

In a study published in the journal Nature , Virginia Tech geobiologist Shuhai Xiao and his collaborators describe a 550 million-year-old sea sponge fossil that falls squarely within this missing interval. The team also proposes a key explanation for the gap: the earliest sponges may not have had mineral skeletons, making them far less likely to fossilize.

This idea helps resolve a long-standing paradox in evolutionary science.

Scientists have used molecular clock estimates, which track the accumulation of genetic mutations over time, to suggest that sponges first evolved around 700 million years ago. However, rocks from that era have not yielded convincing sponge fossils.

This disconnect has fueled years of debate among zoologists and paleontologists.

The new discovery helps bridge that divide. It adds an important piece to the evolutionary history of one of Earth's earliest animals and offers an explanation for why older fossils have been so difficult to find. It also connects back to questions first raised by Darwin about when early animal life emerged.

A Surprising Discovery Along the Yangtze River

Xiao first encountered the fossil about five years ago when a collaborator sent him a photo of a specimen uncovered along the Yangtze River in China.

"I had never seen anything like it before," said Xiao, a faculty member in the College of Science. "Almost immediately, I realized that it was something new."

Working with researchers from the University of Cambridge and the Nanjing Institute of Geology and Paleontology, Xiao began testing different possibilities. The fossil did not match known features of sea squirts, sea anemones, or corals. That left one intriguing possibility: an ancient sea sponge.

In earlier work published in 2019, Xiao and his team suggested that the first sponges may not have produced the hard, needle-like structures called spicules that define modern sponges.

By examining the fossil record, the researchers found that sponge spicules become more mineralized over time. The further back they looked, the more organic and less mineral-based these structures appeared.

"If you extrapolate back, then perhaps the first ones were soft-bodied creatures with entirely organic skeletons and...

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REACH UPDATE

Workshop: Forum pilot project on enforcement of notifications to poison centres

ECHA · 8 Apr 2026

Online | 23/04/2026 | 11:00 - 13:30

The workshop will present the results of the Forum pilot project on the enforcement of notifications to poison centres.

It will bring together interested stakeholders and enforcement authorities to discuss the findings and recommendations, with the aim of supporting future compliance efforts.

Representatives from ECHA's accredited stakeholder organisations that have expressed interest in participating, as well as national inspectors, will take part in the workshop.

The event will be broadcast live, allowing anyone interested in the project results to follow the discussions online.

Event scope and programme

The workshop will:

Give an overview of the pilot project findings and their implications for enforcement

Facilitate discussion between enforcement authorities and stakeholders

Collect feedback to support future improvements in compliance checks

Programme

Draft Agenda [PDF]

Who should attend?

Representatives of ECHA's accredited stakeholder organisations

National enforcement authorities, including inspectors and national coordinators of the pilot project

Anyone interested in the topic can follow via the public live stream

Presentations

Presentations will be available after the event.

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REGULATORY UPDATE

ASIA PACIFIC

Have your say about AICIS fees and charges 2026–27

AICIS · 10 Apr 2026

We're seeking feedback on proposed AICIS fees and charges for the 2026–27 registration year – 1 September 2026 to 31 August 2027 – including potential impacts to industrial chemical introducers (importers and manufacturers).

Summary of proposed changes

For fees and charges in the 2026–27 registration year, we propose:

A one-off 90% discount in the 2026–27 registration levy charge to reduce surplus AICIS funds and return the scheme's cash balance to target levels. Reinstate the pre-2026–27 levy charge in 2027–28 with 2 years of indexation applied to support the financial sustainability of the scheme.

Reduce the total number of certificate application types from 5 to 3 to increase efficiency, support full cost recovery and make it easier for applicants to choose the correct application type

Increase certificate application fees to recover from the applicant the full cost of processing and assessing these applications.

Apply indexation only to other fees for services with no change to their structure.

About AICIS fees, charges and reserves

We – the Australian Industrial Chemicals Introduction Scheme (AICIS) – regulate the importation and manufacture (introduction) of industrial chemicals in Australia under the Industrial Chemicals Act 2019 (IC Act) to help protect Australians' health and the environment. Fees and charges paid by introducers fund our regulatory activities:

Pre- and post-market risk assessment of the introduction and use of industrial chemicals in Australia to identify risks to human health and the environment.

Publication of risk assessments for public use, including other government regulators, workers, employers and consumers.

Monitoring post-market compliance and enforcing legal obligations on industrial chemical introducers.

Managing the Australian Inventory of Industrial Chemicals (Inventory), a national database of chemicals available for industrial use in Australia.

Maintaining a Register of Industrial Chemical Introducers who can lawfully import and manufacture industrial chemicals.

Meeting Australia's obligations under international agreements for industrial chemicals.

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Inventory variation notice: revoked CBI and updates to terms of listing on specific information requirements - 1 April 2026

AICIS · 1 Apr 2026

The AICIS Executive Director varied the terms of the Inventory listing under section 94 of the Industrial Chemicals Act 2019 for the following chemical because approval had been revoked for the proper name of the industrial chemical to be treated as confidential business information (CBI).

The Executive Director has also subsequently varied the terms of Inventory listing under section 85 of the Industrial Chemicals Act 2019 to provide more details on specific information requirements (SIR) for the chemical shown in this list.

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Asbestos Framework Review

Safe Work Australia · 25 Feb 2026

Safe Work Australia is reviewing how asbestos risks are managed and how asbestos-containing materials are safely removed. The review will look at possible changes to the model Work Health and Safety (WHS) regulations for asbestos and related Codes of Practice and guidance materials. You can read the full Terms of Reference for the Asbestos Framework Review here.

Why are we doing this review

The third phase of the Asbestos National Strategic Plan 2024–2030 has been endorsed by the Commonwealth and all state and territory governments. The plan continues national efforts to eliminate asbestos-related diseases in Australia and focuses on practical steps to safely remove old asbestos-containing materials from buildings. There are a number of actions for Safe Work Australia to lead or support in the Asbestos National Strategic Plan.

This review will:

support Safe Work Australia's actions under the Asbestos National Strategic Plan

address policy issues identified in the 2023 asbestos-related review 'Consultation on the requirements for competent persons in relation to asbestos-related tasks'

consider whether the technical guide 'NOHSC Guidance Note on the membrane filter method for estimating airborne asbestos fibres (2005)' is still current and technically accurate.

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AMERICA

Update on Reporting Deadline for TSCA PFAS Reporting Rule

US EPA · 10 Apr 2026

Today, U.S. Environmental Protection Agency (EPA) is finalizing the start of the reporting period for a perfluoroalkyl and polyfluoroalkyl substances (PFAS) reporting rule under the Toxic Substances Control Act (TSCA) section 8(a)(7). This action moves the start of the reporting period from April 13, 2026, to 60 days following the effective date of the agency's forthcoming revision to the PFAS 8(a)(7) rule.

Addressing PFAS contamination is an urgent human-health priority for EPA. Communities across the country, especially families, pregnant women, and children deserve swift action rooted in gold-standard science to reduce exposure and ensure the safety of water, soil, and consumer products.

TSCA section 8(a)(7) requires any person that has manufactured (including imported) PFAS in any year between 2011 and 2022 to report information related to chemical identity, uses, volumes made and processed, byproducts, environmental and health effects, worker exposure, and disposal to EPA. In support of the Trump EPA's efforts to effectively address PFAS, EPA is reviewing the TSCA section 8(a)(7) PFAS reporting rule to ensure the agency obtains comprehensive, reliable information from manufacturers and importers.

A finalized start date for this rule gives companies clear direction and accountability. This also allows additional time for EPA to review the thousands of public comments on the November 2025 proposed updates so that the agency can refine the rule to better deliver timely, actionable reporting guidance without unnecessary loopholes that could delay health-protective decisions. The agency plans to issue a final rule later this year.

EPA's guidance and reporting tool will help ensure the collected data are complete, accessible, and useful to regulators, communities, and researchers. This transparency is essential to help families understand PFAS in their environment and supports informed decisions about health and safety.

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EUROPE

EU reinforces the stability and predictability of its carbon market

European Commission · 1 Apr 2026

The Commission has today announced a first concrete measure to reinforce the European Union Emissions Trading System (EU ETS). Today's proposal, which follows President von der Leyen's announcement at the March European Council, adapts the ETS's Market Stability Reserve (MSR) enhancing stability and predictability.

The Commission has proposed an amendment to the Market Stability Reserve Decision to strengthen the instrument that ensures a stable, well-functioning carbon market. Under the current system, all allowances in the reserve above 400 million are invalidated. The proposed amendment will stop the invalidation mechanism, allowing these allowances to be kept as a buffer that can

support market stability. The MSR reduces the supply of allowances to the market when there are too many in circulation and injects allowances when there is market scarcity.

The EU ETS is a key driver for decarbonisation. It has massively reduced fossil fuel consumption, lowering the Union's dependence on imports and strengthening its resilience. In addition, it has driven major investments in the clean energy transition in renewables and low-carbon energy sources. These are homegrown and enhance our energy independence. However, in light of recent challenges, the EU ETS needs to be modernised and made more agile.

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The NDA group Strategy Effective from March 2026

Gov.UK · 23 Feb 2026

At the Nuclear Decommissioning Authority (NDA), we have an obligation, under the Energy Act (2004), to decommission the UK's earliest nuclear sites safely, sustainably and responsibly, with care for the environment and the communities adjacent to our sites. Our strategy is founded on a commitment to overcoming the challenges of nuclear clean-up and decommissioning, to ensure our actions and decisions deliver a positive and long-lasting legacy for future generations.

This Strategy sets the long-term direction for how the NDA carries out its functions under the Energy Act (2004). It also provides the context for government oversight by the Department for Energy Security and Net Zero (DESNZ) and for public accountability.

We work with the UK and devolved governments to ensure their policies are reflected in our strategy and implemented at our sites. Our sponsoring department is DESNZ, with additional obligations to Scottish Ministers for matters affecting Scotland.

In 2025, we marked our 20th anniversary, and when published in early 2026, this document will represent the fifth iteration of the NDA Strategy.

This Strategy explains our purpose, challenges and approach. Delivery commitments, funding detail and annual priorities are set out in our Business Plan and reported through our Annual Report and Accounts and Mission Progress Report.

We operate in an evolving landscape shaped by changing global economics, policies, environmental imperatives and societal trends. The UK Government's Nuclear Regulatory Review undertaken in 2025 proposed a range of recommendations to improve the efficiency of nuclear delivery across the sector, including decommissioning. We will continue to support Government and the regulators on this work and in particular where it relates to opportunities to enhance our mission delivery. We demonstrate value for public investment by embedding sustainability as a cross-cutting principle; we must also demonstrate value for the grant we receive from the UK Government and explore ways to deliver maximum performance through innovation and efficient ways of working across our estate. We must exploit the opportunities offered by our One NDA subsidiary model (see 1.3 One NDA) and prioritise expenditure against our strategic imperatives.

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EU Customs reform to help curb dangerous products sold online

The European Consumer Organisation · 26 Mar 2026

The EU has agreed on a customs reform that will help to stop the flood of unsafe products sold to Europeans from outside the EU. This deal is an important win for consumers, after years of testing by consumer groups of the BEUC network of dangerous toys, textiles, and other products sold on online marketplaces like Temu and Shein. The reform marks the end of the impunity of sellers and platforms that have long ignored EU safety rules.

What will change for consumers:

E-commerce platforms who import into the EU will face clearer responsibilities, and consequences such as fines, when goods sold on their webstore harm consumers.

Authorities will be able to share data and spot rogue traders and dangerous products more quickly, so unsafe goods can be stopped before reaching people's homes.

The reform will ensure the price paid by consumers upfront is clear and without surprise customs duties.

Agustín Reyna, Director General of BEUC, commented:

"Europe has been swamped by a tsunami of packages from China, and customs authorities could simply not cope with this. Consumer groups' tests of products bought on online platforms have revealed toys that can fatally injure children and textiles laced with banned chemicals which can cause serious skin reactions. This reform begins to turn the tide and makes it harder for dangerous products to enter the EU.

"This reform will also protect fair competition by supporting companies that respect EU rules against those that profit from cutting corners. Lawmakers must now finish the job by backing customs with strong enforcement and proper resources, such as staff, tools and funding necessary to protect consumers."

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The UK's new product safety framework

Gov.uk · 31 Mar 2026

Ministerial foreword

Many of us may not give a second thought to whether the products we buy – on our high street or online – are safe, but product safety matters to every individual and family across the UK. We rightly should be able to take for granted that the products in all our homes and workplaces are safe.

As we build upon the UK's status as a global leader in innovation and harness the benefits of technology and free trade, our product safety regulations must keep pace to reflect the modern world and grasp new opportunities of the future.

We must build a regulatory system that works for British businesses, attracting investment, driving innovation and delivering growth.

But we have inherited a detailed and lengthy body of law, the complexity of which can hold back businesses – particularly the small and innovative businesses central to this government's mission to deliver economic growth.

Today I am setting out this government's vision for a necessary and long overdue upgrade to our product safety framework in the UK.

We will ensure consumers can rely on the products they buy and use being safe by bringing the protections for consumer safety up to date.

We will realise the great opportunities of new online supply chains without this being at the expense of our own high street shops and family businesses.

We will update the rules to reflect the modern world to give our businesses the certainty and clarity they need to grow.

And we will harness technology to give businesses and consumers new and better ways to give and receive product information.

The ambitious set of proposals in this consultation is the first, fundamental step in our comprehensive overhaul of product safety regulation to benefit both businesses and consumers.

Read More →

The Control of Lead at Work Regulations 2002 exposure values and associated guidance

UK HSE · 30 Mar 2026

The Health and Safety Executive (HSE) undertakes a wide range of regulatory functions fundamental to enabling a safe and healthy workplace. We are dedicated to protecting people and places and helping everyone lead safer and healthier lives. Our role goes beyond worker protection to include public assurance. We work to ensure people feel safe where they work and protect others who may be affected by such work.

Great Britain (GB) has one of the best workplace health and safety performances in the world and achieves some of the lowest rates of occupational injury and fatality in Europe.

HSE's work supports innovation, productivity and economic growth in GB and businesses that adopt effective, proportionate health and safety practices increase productivity and employee engagement. HSE's strategy - Protecting people and places: HSE strategy 2022 to 2032 also commits HSE to reducing work related ill-health such as the harm to workers and others resulting from exposure to lead.

This consultative document is issued by the Health and Safety Executive (HSE) in compliance with its duty to consult under section 50(3) the Health and Safety at Work etc. Act 1974 and in line with the Consultation principles: guidance for consulting with stakeholders.

The purpose of this consultation is to seek stakeholder views on proposals and to update, where necessary, the blood lead exposure levels in the Control of Lead at Work Regulations 2002 (CLAW) and the Approved Code of Practice (ACOP) and guidance for CLAW. HSE is also taking the opportunity to gather evidence on 'lead in air' monitoring.

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Consultation outcome - Summary of responses and government response

Gov.UK · 30 Mar 2026

1. This document sets out the government response to a consultation on the UK REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) regulation (UK REACH), including the proposed alternative transitional registration model (ATRm). It also provides a summary of the feedback received by the Department for Environment, Food and Rural Affairs (Defra) to the consultation questions. The consultation began on 16 May 2024, under the previous government, and concluded on 25 July 2024.

2. A total of 241 responses were received, and Defra is grateful to everyone who took the time and effort to respond. The responses have been analysed by Defra staff dealing with the consultation proposals.

Government response

3. UK REACH is one of the main pieces of legislation overseeing chemical manufacture, supply and use in Great Britain (England, Scotland and Wales). Registration is a key function of this regulation and built into its overall framework. Registration drives producer accountability and provides regulators with critical data. Unlike an approval regime, UK REACH does not require substances to be pre-approved for market entry. Instead, the information collected through registration enables regulators to assess risks and, where necessary, take action in due course by adding substances to the UK REACH:

candidate list (which classes a substance of being ‘of very high concern’)

authorisation list (which requires a business to secure regulatory approval to use a substance)

restriction list (which bans or otherwise restricts a substance for all users)

4. Before EU exit, about 20,000 on the GB market were already registered with EU REACH. This data was not passed to the UK REACH regulator, the Health and Safety Executive (HSE), when we left. As a result, UK REACH requires businesses to re-register key information with the HSE to ensure transparency about the chemicals on the market. This process also maintains confidence that these chemicals can be used safely in GB. This is known as ‘transitional registration’ and was the focus of this consultation on the alternative transitional registration model (ATRm).

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HAZARD ALERT

Guthion (Azinphos-methyl)

17 Apr 2026

Guthion is the common name of an organophosphorus insecticide. It is a formulation that includes the active ingredient of azinphos-methyl. The molecular formula for azinphos-methyl is C10H12N3O3PS2. Pure guthion is a colourless to white odourless crystalline solid. Technical-grade guthion is a cream to yellow-brown granular solid. It does not occur naturally in the environment. [1,2]

Uses [3]

Guthion has been used on a variety of orchard fruits, cotton, almonds, sugarcane, and other crops; many of these uses have been cancelled and all remaining uses are scheduled to be phased out.

In the Environment [3]

- Guthion can be released into the environment during its production and use as a pesticide.
- Guthion is found in all environmental compartments with no pronounced tendency to partition to a particular compartment.
- Guthion is not highly persistent in the environment; mobility in soil and sediment is moderate to low.
- In air, guthion is relatively quickly degraded by photolysis and reaction with hydroxyl radicals; the estimated half-life is a few hours.
- Guthion released to surface water or soil is subject to biodegradation, photolysis, and hydrolysis.
- The half-life of guthion ranges from approximately 3 to 50 days in surface water and 32 to 150 days in soil.
- Guthion is not expected to bioconcentrate or bioaccumulate.

Sources & Routes of Exposure

Sources of Exposure [1]

- Food—primary source of exposure: Exposure to guthion is primarily by ingesting foods treated with this pesticide. Apples, pears, peaches, and cherries are crops most likely to contain guthion residues, but fewer residues are being found as guthion use in agriculture has been diminishing.
- Air: Exposure may occur via air in areas close to fruit orchards or other crops where guthion is used.

- Workplace: People who work in agricultural jobs such as pesticide applicators, fruit pickers, and other farm workers can be exposed to higher levels of guthion than the average individual, probably by skin contact with the insecticide and by inhalation.
- Families of workers can also be exposed because residues on workers' hands, clothes, vehicles, or other personal items can be brought into the home.
- Children playing on or near areas that have been treated with guthion may be exposed to guthion in soil by skin contact, when they accidentally or intentionally put soil into their mouths, and through hand-to-mouth activity.

Routes of Exposure [3]

- Inhalation – Is the predominant route of exposure for workers during production, handling, and application.
- Oral – Is the predominant route of exposure for the general population from ingestion of contaminated drinking water and particularly food containing guthion residue.
- Dermal – Is the predominant route of exposure for workers during production, handling, and application.

Health Effects

Acute Health Effects [5]

The following acute (short-term) health effects may occur immediately or shortly after exposure to Guthion:

- Exposure to Guthion can cause rapid, fatal organophosphate poisoning with headache, sweating, nausea and vomiting, diarrhoea, muscle twitching, and death.
- Breathing Guthion can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary oedema), a medical emergency, with severe shortness of breath.

Chronic Health Effects [5]

- High or repeated exposure may damage the nerves causing weakness, "pins and needles," and poor coordination in arms and legs.
- Repeated exposure may cause personality changes of depression, anxiety or irritability.

Cancer Hazard [4]

It is not known if guthion causes cancer in humans. Guthion was not carcinogenic in male or female mice or in female rats that were fed this substance for more than 1 year. Some tumours were observed in male rats, but it could not be conclusively shown that guthion had caused the tumours. The Department of Health and Human Services (DHHS), International Agency for Research on Cancer (IARC), and EPA have not classified guthion as to its carcinogenicity.

Reproductive Effects [4]

It is unknown if guthion affects the ability of humans to reproduce. Exposure to guthion did not affect fertility in animal studies.

Safety [6]

First Aid Measures

- General: When possible, have the product container or label with you when calling a poison control centre or doctor or going for treatment.
- Eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a physician or poison control centre immediately.
- Skin: Wash off immediately with plenty of water for at least 15 minutes. Take off contaminated clothing and shoes immediately. Call a physician or poison control centre immediately.
- Ingestion: Call a physician or poison control centre immediately. Rinse out mouth and give water in small sips to drink. DO NOT induce vomiting unless directed to do so by a physician or poison control centre. Never give anything by mouth to an unconscious person. Do not leave victim unattended.
- Inhalation: Move to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a physician or poison control centre immediately.
- Notes to Physician: This product is a cholinesterase inhibiting organophosphorous pesticide.
- Treatment: Administer atropine sulfate in large therapeutic doses. Repeat as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine. The product inhibits cholinesterase resulting in stimulation of the central nervous system, the parasympathetic nervous system, and the somatic motor nerves. Do not give morphine. Watch for pulmonary oedema, which may develop in serious cases of poisoning even after 24-48 hours. At first sign of pulmonary oedema, the patient should be placed in an oxygen tent and treated symptomatically.

Exposure Controls & Personal Protection

General Controls

- Follow all label instructions.
- Train employees in safe use of the product.
- Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and warm/tepid water. Keep and wash PPE separately from other laundry.

Engineering Controls

- Maintain exposure levels below the exposure limit through the use of general and local exhaust ventilation.

Personal Protective Equipment

The following personal protective equipment is recommended when handling guthion:

- Eye/Face Protection: tightly fitting safety goggles
- Hand Protection: Chemical resistant nitrile rubber gloves
- Body Protection: Wear long-sleeved shirt and long pants and shoes plus socks.
- Respiratory Protection: When respirators are required, select NIOSH approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or Industry recommendations.

Regulation

United States [4,5]

OSHA: The Occupational Safety & Health Administration has established a legal airborne permissible exposure limit (PEL) for guthion of 0.2 mg/m3 averaged over an 8-hour workshift.

NIOSH: The National Institute for Occupational Safety & Health has set a recommended airborne exposure limit for guthion of 0.2 mg/m3 averaged over a 10-hour workshift.

ACGIH: The American Conference of Governmental Industrial Hygienists has set a recommended airborne exposure limit for guthion of 0.2 mg/m3 averaged over an 8-hour workshift.

EPA: The Environmental Protection Agency has established tolerances for guthion residues that range from 0.2 to 5 parts per million in raw agricultural commodities.

Australia [7]

Safe Work : Safe Work Australia has set a Time Weighted Average (TWA) concentration for guthion of 0.2 mg/m3 averaged over an 8-hour workshift.

References

- http://www.atsdr.cdc.gov/phs/phs.asp?id=986&tid=207
- http://en.wikipedia.org/wiki/Azinphos-methyl
- http://www.atsdr.cdc.gov/toxguides/toxguide-188.pdf
- http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=987&tid=207
- http://nj.gov/health/eoh/rtkweb/documents/fs/0966.pdf
- http://www.agrian.com/pdfs/Guthion_Solupak_50_Wettable_Powder_Crop_Insecticide_(102000014237_Version_10_05122006)_MSDS.pdf
- http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/772/Workplace-exposure-standards-airborne-contaminants.pdf

JANET'S CORNER

Who Am I?

17 Apr 2026

I am the King of Chemicals, and my production volume is so vast that industrial nations measure their prosperity by how much of me they manufacture.

My oily appearance belies my corrosive nature—I can dissolve flesh, char wood, and release tremendous heat when mixed with water, yet I'm produced by the billions of tons annually.

I'm born from burning sulfur or roasting sulfide ores, and my colorless, dense liquid form serves everything from battery acid to fertilizer production.

My chemical formula is H_2SO_4, and I've been called the lifeblood of the chemical industry for over a century.