CHEMWATCH

BULLETIN

Week of 8 May 2026

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GOSSIP

Scientists discover enzyme that could supercharge Ozempic

Science Daily · 5 May 2026

Researchers at the University of Utah have identified an enzyme called PapB that can reshape therapeutic peptides, a class of protein-like drugs, by linking their ends together into tight rings. This process, known as macrocyclization, creates compact structures that can improve how these medicines perform in the body.

The discovery could be especially useful for enhancing GLP-1 medications such as semaglutide, the active ingredient in Ozempic and Wegovy, which are widely used to treat diabetes and obesity. By converting these drugs into ring-shaped forms, scientists may be able to make them more durable and effective.

Why Cyclic Peptides Matter for Drug Performance

Ring-shaped peptides offer several advantages over their open-chain counterparts. According to co-author Karsten Eastman, a research associate in the university's Department of Chemistry and CEO and co-founder of Sethera Therapeutics, these structures are more stable, remain active longer, and can better interact with their biological targets.

"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 co-founded Sethera last year to bring their discoveries toward real-world applications, supported by funding from the National Institutes of Health. Their work was recently recognized by the university's Technology Licensing Office, which named them 2025 Founders of the Year for developing the PolyMacrocyclic Peptide (pMCP) Discovery Platform.

A Simpler Alternative to Traditional Chemical Methods

Closing peptide chains into rings has traditionally required complex and costly chemical techniques, especially when attempted late in drug development. PapB provides a cleaner and more efficient approach. The enzyme forms a precise bond that links the ends of a peptide without needing extra "leader" sequences, which are typically required for enzymes to recognize their targets.

In the study, published in ACS Bio & Med Chem Au , the team used PapB, a "radical SAM" (S-adenosyl-L-methionine) enzyme, to connect the ends of GLP-1-like peptides. The linkage forms a sulfur-carbon bond called...

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This new aluminum could replace rare metals and cut costs dramatically

Science Daily · 16 Mar 2026

A team of scientists at King's College London has identified a new form of aluminum, one of the most abundant metals on Earth, that could offer a far less expensive and more sustainable alternative to widely used rare earth metals.

Led by Dr. Clare Bakewell, a Senior Lecturer in the Department of Chemistry, the researchers created highly reactive aluminum molecules capable of breaking some of the strongest chemical bonds. Their findings, published in Nature Communications , also reveal entirely new molecular structures, opening the door to previously unknown types of chemical behavior.

The researchers reported the first known example of a cyclotrialumane, a compound made of three aluminum atoms arranged in a trimeric -- triangular -- structure. This unusual configuration shows remarkable reactivity. Importantly, the structure remains intact even when dissolved in different solutions, giving it the stability needed for a variety of chemical reactions.

These reactions include splitting dihydrogen and enabling the step-by-step insertion and chain growth of ethene, a simple 2-carbon hydrocarbon. Such capabilities highlight the compound's potential for building more complex molecules.

Metals play a central role in producing both everyday and specialized chemicals used across industry. Many of these processes rely on precious metals like platinum, which are costly and can have significant environmental impacts due to extraction.

Scientists have been searching for alternatives that are easier to obtain and more sustainable. Dr. Clare Bakewell explained: "Transition metals are the workhorses of chemical synthesis and catalysis -- but many of the most useful are becoming increasingly difficult to access and extract -- often being located in regions of political instability, increasing the demand and price.

"Chemists have been looking towards more common elements from the periodic table, and we chose aluminum, as it's super abundant, making it ~20,000 times less expensive than precious metals such as platinum and palladium."

Expanding the Possibilities of Aluminum Chemistry

In addition to designing aluminum compounds for use in chemical synthesis, the team is uncovering entirely new reactions.

Dr. Bakewell said, "What's special about this work, is that we're pushing the boundaries of chemical knowledge. Most excitingly, we can use this aluminum trimer to build completely new compounds with levels of reactivity that have never been observed before -- these include the 5- and 7-membered aluminum and carbon rings formed through reaction with ethene. These capabilities go beyond the transition metals we were originally trying to mimic, to the forefront of...

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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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Thousands of tonnes of hazardous chemicals entered environment due to EU delays

Chemistry World · 6 May 2026

Flame retardants are among those chemicals the EU has been accused of being slow to act on

Europe's plan to restrict thousands of hazardous chemicals has stalled, according to a new study from an environmental group . These delays have led to around 100,000 tonnes of chemicals contaminating food, drinking water and the environment that would otherwise have been avoided. The report blames the European Commission for regulatory inaction and succumbing to industry pressure. Meanwhile, the commission has recently confirmed that it's no longer planning to revise the Reach chemicals regulation. The 2020 EU Chemicals Strategy for Sustainability had outlined the importance of urgently updating Reach to reflect current science.

Launched in April 2022, the European Commission's chemical 'roadmap' was the most far-reaching programme of chemical controls in the world. It listed 22 chemicals or groups of chemicals with proven carcinogenic, reprotoxic and allergenic effects, and set deadlines to restrict the use of nearly all 22 groups. Designed to accelerate the use of existing laws, the roadmap effectively bans flame retardants, bisphenols, PVC and all PFAS. Estimates at the time suggested that all 22 groups would be restricted and largely off the European market by 2030.

ClientEarth and the European Environmental Bureau have now checked the regulatory status of all 22 files. They benchmarked progress against deadlines in the roadmap and a legal obligation on the commission to act within three months of advice from the European Chemicals Agency (Echa).

They report that, after making rapid early progress, the commission has 'effectively frozen' 14 of the 22 files. Of these, it has yet to begin regulating seven and is largely responsible for holding up the finalisation of seven others. Only six restrictions have been adopted into law. The three-month legal deadline has never been met. Delays range from 13 to 47 months, with an average of two years between Echa evaluation and a legislative proposal by the commission. The report estimates that at least 98,355 tonnes of chemical pollution could be attributable to unlawful commission delays from just six of the roadmap files.

The report accuses the commission of prioritising the interests of major polluters, citing the wave of deregulation during President Ursula von der Leyen's second term. It also notes the commission's argument that industry stakeholders provide new information at the decision stage for analysis, adding that this is a well-known industry stalling tactic.

'The commission is rolling back...

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This town found clean energy deep inside old coal mines

Science Daily · 13 May 2026

Cumberland, British Columbia, grew out of coal mining. For decades, the industry defined daily life, employing thousands of workers and sending millions of tonnes of coal around the world. When mining operations shut down after roughly 80 years, they left behind more than empty tunnels. The closures also created a lasting economic gap in the community.

Today, the same underground network that once fueled industry could help power a cleaner future. Through a partnership with the University of Victoria-led Accelerating Community Energy Transformation (ACET) initiative, Cumberland is exploring how its abandoned mine shafts and tunnels can support a new source of energy.

At the center of this effort is the Cumberland District Energy project. Researchers are studying how water trapped in the old mine system can be used to generate geothermal energy capable of heating and cooling buildings throughout the town.

Mayor Vickey Brown believes the project could help reshape Cumberland's identity. Already known for outdoor recreation like mountain biking and hiking, the village could also become a model for clean energy innovation.

"This is a way to highlight the history of Cumberland and bring it into a sustainable-future, clean-energy ethos," she says. "It's something that old Cumberland can be proud of, because we're using the waste of that old resource to transition to cleaner energy."

How Underground Mine Water Could Heat and Cool Buildings

The concept relies on a simple but powerful idea. Water sitting deep inside abandoned mines tends to stay cooler than the air during summer and warmer during winter. According to ACET project lead Zachary Gould, this steady temperature difference can be harnessed using heat pumps.

These systems would draw on the underground water to regulate indoor temperatures, offering heating in colder months and cooling during warmer periods. The approach could deliver energy at relatively low cost while producing very little carbon.

"[The Cumberland District Energy project] is technically a very large ground-source heat exchanger," explains Emily Smejkal of the Cascade Institute, who focuses on geothermal energy.

Because the tunnels extend beneath much of the town, this system could potentially serve a wide area. Mapping efforts by geologists have already revealed the scale of the underground network, helping researchers estimate how much energy it might provide.

Initial plans are focusing on key areas, including a proposed civic redevelopment site with a community center, municipal buildings, and affordable housing, as well as an industrial zone near Comox...

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This startup's squeezable solid could upend cooling and refrigeration – cheaply

New Atlas · 5 May 2026

A startup founded by a material physicist has been working for the past seven years to change the way we cool our food and interior spaces, and it's now taken a big step toward that goal.

Here's the short version: instead of an ozone-depleting substance that can leak out and cause enormous damage to the environment, Barocal is developing a class of solid materials that can absorb and transfer heat when subjected to pressure, with a high degree of efficiency and safety. Expect to see these in action in refrigerators and air conditioning systems.

TechCrunch reported the company, founded by University of Cambridge professor Xavier Moya, has just raised US$10 million to commercialize its solution . That's on top of the $4.5 million in funding it had previously received from the European Innovation Council and a $1 million prize in the TERA-Award energy solutions competition , so this fresh injection will likely help accelerate its efforts.

To understand Barocal's approach, let's first look at how refrigeration works. Today's fridges circulate a liquid refrigerant (typically a greenhouse gas) through coils inside the fridge's cold

compartment. As it evaporates into a gas, it absorbs heat from the food and air around it, cooling the interior. The refrigerant gas is drawn into a compressor, which pressurizes and heats it. The hot pressurized gas flows through coils on the back of the fridge, where a fan helps dissipate the heat to the outside air. As it cools, the gas condenses back into a liquid, and this passes through an expansion valve which reduces pressure, and it then flows back to the evaporator coils. The cycle then repeats in this loop.

Barocal is working on an inexpensive solid-state refrigerant in the form of plastic crystals which have molecules freely rotating inside them at rest, and can absorb heat in that state – and their temperature can stably vary by 90 ºF (50 ºC).

When they're compressed, the molecules stop rotating, and the crystals give off heat. Transferring heat out from a fridge can be achieved by flowing water past the material toward a radiator where said heat can dissipate.

It's basically the barocaloric effect at work – hence the firm's name. This could negate the need to use greenhouse gases for cooling, which can not only cause outsized global warming effects when they leak out, but are also energy inefficient and require plenty of electricity...

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Brembo's fluid-free electronic braking system is coming to a car near you

New Atlas · 6 May 2026

For the past few years, Brembo has been working on a whole new way to stop a vehicle in its tracks. The company says its fluid-free Sensify system is going into production, and it shouldn't be long before you can stomp the pedals on one of these in a new car.

The all-electronic Sensify tech has been in development for years now – we last wrote about it in 2021 , and the Italian components giant showed it off to content creators in the flesh on a test track the following year. With a wholly different approach compared to hydraulic braking systems, it boldly promises safer, more precise braking, and enhanced driving pleasure. Indeed, folks who tried it reported that making a hard stop felt smoother, more exact and linear , and without the usual stutter of a hydraulic ABS system.

By and large, you'll use a Sensify brake the same as a traditional one. A pedal simulator in the footwell will allow you to deliver input as before, and it'll give you the sort of pedal feel you're used to. But rather than having that connect to the wheels like a conventional setup, the system reads your pedal stroke, and sends a signal to its electronic control units (ECUs).

These in turn create pressure requests directed at the front calipers, where electrohydraulic actuators with pistons push on them to apply braking pressure to the wheels. Each wheel gets its own actuator, so the system can independently optimize the braking intensity. Brembo says this allows for a more enjoyable experience, and better performance across a range of road conditions.

The main advantage here is the driver's physical action is decoupled from the wheels, so there's more precise control in the way braking pressure is applied, and the driver gets more consistent feedback. And since there's no brake fluid like in a hydraulic braking system, you no longer have to refill or bleed your brakes, and you can look forward to lower maintenance costs and more accurate braking.

Brembo says it's developing Sensify as a plug-and-play platform, which means it should be easy for manufacturers to integrate into all kinds of models. It can also work with ADAS and autonomous driving systems, which can allow for enhanced safety on the road in both self-driving cars, and those with a human behind the wheel.

As the tech is finally entering production after...

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Don’t toss cannabis leaves: Scientists found rare compounds with medical potential

Science Daily · 10 Sep 2026

Scientists at Stellenbosch University (SU) have uncovered the first evidence of a rare group of phenolic compounds known as flavoalkaloids in Cannabis leaves, adding a surprising new dimension to the plant's chemistry.

Phenolic compounds, particularly flavonoids, are already highly valued in medicine for their antioxidant, anti-inflammatory, and anti-carcinogenic effects. This new finding suggests Cannabis may contain even more biologically important compounds than previously recognized.

Dozens of Previously Unknown Cannabis Compounds Identified

In their study, researchers analyzed three commercially grown Cannabis strains from South Africa and identified 79 phenolic compounds. Of these, 25 had never before been reported in Cannabis . Among them were 16 compounds tentatively classified as flavoalkaloids, a group that is rarely found in nature.

Interestingly, these flavoalkaloids were concentrated mainly in the leaves of just one of the strains, highlighting how much chemical variation can exist between different types of Cannabis . The findings were recently published in the Journal of Chromatography A .

Dr. Magriet Muller, an analytical chemist in the LC-MS laboratory of the Central Analytical Facility (CAF) at Stellenbosch University and the study's first author, explains that studying plant phenolics is especially difficult because they occur in very small amounts and have highly diverse structures.

"Most plants contain highly complex mixtures of phenolic compounds, and while flavonoids occur widely in the plant kingdom, the flavoalkaloids are very rare in nature," she explains.

She also notes just how chemically complex Cannabis is. "We know that Cannabis is extremely complex -- it contains more than 750 metabolites -- but we did not expect such high variation in phenolic profiles between only three strains, nor to detect so many compounds for the first time in the species. Especially the first evidence of flavoalkaloids in Cannabis was very exciting."

Advanced Techniques Reveal Hidden Chemistry

As part of her postgraduate work in SU's Department of Chemistry and Polymer Science, Muller developed advanced analytical methods that combine comprehensive two-dimensional liquid chromatography with high-resolution mass spectrometry. These tools allow scientists to separate and identify compounds in extraordinary detail.

"We were looking for a new application for the methods that I developed, after successfully testing them on rooibos tea, grapes and wine. I then decided to apply the methods to Cannabis because I

knew it was a complex sample, and that Cannabis phenolics have not been well characterized," she explains.

Prof. André de Villiers, who led the study and heads the analytical...

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Versatile skeletal editing strategies upgrade nitrogen compounds into drug building blocks

Chemistry World · 7 May 2026

The two new skeletal editing techniques offer novel ways to create and modify nitrogen-containing heterocycles

Two new skeletal editing techniques offer a way to create an array of nitrogen-containing rings. Nitrogen heterocycles are valuable structures in many drug molecules, with the researchers behind the studies saying that these synthetic strategies could help accelerate the discovery of candidate drug compounds.

More than 80% of new small molecule drugs approved by the US Food and Drug Administration between 2013 and 2023 contained nitrogen heterocycles, such as piperidines. Chemists often make such rings through the Beckmann rearrangement, which involves reacting a cyclic oxime with an acid to create an amide. However, this approach suffers from poor regioselectivity, requires harsh reaction conditions to reduce the amide to the amine and only leads to ring expansion.

Equally, ‘indoles are highly important structural motifs in pharmaceuticals and natural products’, says Huiying Zeng at Lanzhou University in China. Adding substituents onto the pyrrole ring of an indole can alter the biological and physical properties of such compounds, but the ‘aromatic stability [of indoles] makes precise modification of the core skeleton challenging’, says Zeng.

Zeng’s team has now developed a method that intramolecularly transfers substituents to the C2 position of indole rings. 1 Equally, another team led by Lumin Zhang at the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences is using an iodine-based reagent to make nitrogen-containing rings of various sizes and types from primary amines. 2

‘These two [studies] are a wonderful demonstration of the creativity and innovation that the concept of skeletal editing is inspiring,’ says Richmond Sarpong at the University of California, Berkeley in the US, who was not involved with either study.

Skeletal editing techniques often struggle with aliphatic compounds and are only capable of a single transformation, says Zhang. He explains that their new method is instead able to produce a range of nitrogen-containing heterocycles from primary amines through a common imino ether intermediate. ‘From the same starting material, we can achieve [products] B, C, D and so on,’ Zhang says. He hopes that this will speed up drug discovery by making it easier to introduce these rings into molecules and study how they affect the properties of drug compounds. ‘I want to push the boundary of skeletal editing,’ he adds.

Lumin Zhang’s group’s work offers a range of ways to consecutively edit a wide range of nitrogen-containing frameworks

Key to...

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Scientists create plastic that destroys viruses on contact

Science Daily · 20 Sep 2026

Scientists have created a thin plastic film that can physically destroy viruses the moment they land on its surface. The breakthrough could help reduce the spread of disease from frequently touched items like smartphones, keyboards, and hospital equipment.

Beyond its effectiveness, the material is also designed to be practical for real-world use. Unlike earlier antiviral surfaces made from metals or silicon, this new approach uses flexible plastic that can be produced at scale.

The film is made from acrylic and covered with extremely small structures known as nanopillars. These tiny features grip onto a virus and stretch its outer layer until it breaks apart. Instead of relying on chemical disinfectants, the surface uses mechanical force to disable the virus.

Research published in Advanced Science found that this stretching method is more effective than earlier designs that attempted to puncture viruses.

In experiments using the human parainfluenza virus 3 (hPIV-3) -- which causes bronchiolitis and pneumonia -- the results were striking. Within one hour of contact, about 94% of virus particles were either torn apart or damaged so severely that they could no longer reproduce and cause infection.

Study lead author and PhD candidate Samson Mah from Australia's RMIT University said the team intentionally used low-cost materials that could be manufactured easily.

"As nanofabrication tools get better, our results give a clearer guide to which nanopatterns work best to kill viruses," he said.

"We could one day have surfaces like phone screens, keyboards and hospital tables covered with this film, killing viruses on contact without using harsh chemicals.

"Our mold can be adapted to roll-to-roll manufacturing, meaning antiviral plastic films could be produced at scale with existing factory equipment."

The researchers also discovered that how closely the nanopillars are spaced plays a much bigger role than how tall they are.

"By tweaking the spacing and height of the nanopillars, we discovered how tightly they are packed together is far more important than how tall they are for breaking viruses apart," Mah said.

"When the nanopillars are closer together, more of them can press on the same virus at once, stretching its outer shell past breaking point."

A Simple Design Rule for Virus-Killing Surfaces

Earlier work on rigid materials like nanospike silicon showed that viruses could be physically disrupted. This study expands on that idea by showing that both sharp and blunt nanoscale features can be effective when arranged correctly.

The findings...

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CURIOSITIES

Harmless viruses trap Salmonella on flexible polymer in portable microfluidic sensor

Phys Org · 7 May 2026

Researchers at Worcester Polytechnic Institute (WPI) have developed a solid polymer coated with harmless viruses to detect the bacteria Salmonella enterica (S. enterica), an advance that could lead to new ways of finding contamination in the food supply. The work is published in the journal ACS Applied Bio Materials .

The group, led by Yuxiang "Shawn" Liu, an associate professor in the Department of Mechanical and Materials Engineering, reports that the technology can rapidly capture and visualize foodborne bacterial contaminants in tiny fluid samples. With no need for incubation or complicated equipment in research centers, the technology has the potential to be used as a rapid biosensor in field applications and in areas with few resources.

"We have a solid surface that can be used anywhere in the food supply chain, from farm to fridge, to detect foodborne bacteria with minimum human intervention," Liu says.

Foodborne diseases cause millions of illnesses and an estimated 420,000 deaths worldwide annually. S. enterica, a leading cause of foodborne illness, can spread through fecal matter and has been found in raw and undercooked foods, such as eggs, meat, milk, and fresh produce. The bacterium infects the intestines, causing diarrhea, fever, and abdominal cramps.

Conventional tests for foodborne bacteria typically involve lab techniques that require special equipment and training. Samples may need to be incubated to allow bacteria to grow so they can be counted, and tests at research centers can take 24 to 48 hours. Other approaches involve amplifying segments of genetic material in samples or detecting antibacterial antibodies in a sample, but those tests may not differentiate live pathogens from dead pathogens. Testing devices with antibodies also tend to have a limited shelf life at room temperature.

The WPI researchers went a different route, starting with a flat, textured, and flexible polymer . They attached bacteriophages (phages)—which are viruses that develop through natural processes—to the polymer using a chemical process. Phages can identify and trap specific bacteria that are passing by.

The polymer, about the size of a small fingernail, was then placed on the bottom of a channel in a palm-size microfluidic device , and the channel was sealed from the top by a piece of biocompatible plastic tape. The researchers pumped small drops of fluid containing S. enterica through the channel, and the phages concentrated the bacteria on the solid polymer for detection.

As a final step, the researchers used a...

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Scientists just uncovered a 3 million-year climate mystery in Antarctic ice

Science Daily · 29 Jan 2026

Scientists studying ancient Antarctic ice are uncovering new details about how Earth's climate has changed over the past 3 million years. By analyzing both the ice and the tiny pockets of air trapped inside it, researchers are building a longer and more complete record of past climate conditions.

Two new studies published in the journal Nature reveal a surprising pattern. While the planet gradually cooled over this time, levels of heat-trapping greenhouse gases in the atmosphere declined only slightly.

For more than a century, scientists have known that Earth was significantly warmer about 3 million years ago. Evidence includes fossils of temperate and subtropical forests found in places like Alaska and Greenland, as well as ancient shorelines along the U.S. East Coast from Georgia to Virginia, showing that sea levels were much higher.

However, the reason behind this warm period and the cooling that followed has remained unclear. One major challenge has been the difficulty of accurately reconstructing both global temperatures and greenhouse gas levels from so far back in time.

Searching for the Oldest Ice in Antarctica

The new research comes from the National Science Foundation Center for Oldest Ice Exploration, known as COLDEX, a collaborative effort led by Oregon State University. The team focuses on locating and analyzing some of the oldest ice on Earth.

The studies were led by Julia Marks-Peterson, a doctoral student at OSU, and Sarah Shackleton, who conducted the work as a postdoctoral researcher at Princeton University and is now a professor at Woods Hole Oceanographic Institution. They examined ancient ice recovered from Allan Hills, a unique region along the edge of the East Antarctic ice sheet.

Unlike typical ice core sites, Allan Hills contains ice that has been pushed up and distorted by movement within the ice sheet. This disrupts the original layering, so instead of a continuous timeline, researchers get "snapshots" of climate conditions from different points in the past.

"Those snapshots extend climate records from ice much further than previously possible," said COLDEX Director Ed Brook, a paleoclimatologist in OSU's College of Earth, Ocean, and Atmospheric Sciences. "These longer records are also now raising new questions about Earth's climate evolution and how far back in time we might be able to go with ice core data."

One study used measurements of noble gases preserved in the trapped air bubbles to estimate changes in ocean temperature over time. These gases provide a...

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A forgotten drug is giving new hope to kids with a rare disease

Science Daily · 31 Mar 2026

A medication that has been around for decades and used to treat several conditions, including a chronic parasitic infection, is now emerging as a potential option for patients with a different and far rarer disease. Early findings suggest the drug could help people with Bachmann-Bupp syndrome (BABS), a life-threatening genetic disorder that affects only a small number of individuals worldwide.

This progress is being driven by a new collaboration between Corewell Health, Michigan State University, and Every Cure, a nonprofit biotech group focused on finding new uses for existing drugs.

"Beyond helping us build preclinical studies and retrospective analyses, the team at Every Cure has already begun helping us navigate regulatory pathways and compliance on so many levels in the hopes that we can treat more of our BABS patients," said Caleb Bupp, M.D., pediatric geneticist for Corewell Health Helen DeVos Children's Hospital in Grand Rapids, Michigan. "They are opening doors that we never would have been able to crack open. It's a hopeful and exciting time for all of us and more importantly, our patients."

The drug, called difluoromethylornithine, also known as DFMO or eflornithine, has a long history in medicine. It has been used to treat West African sleeping sickness, a chronic illness spread by the tsetse fly. It is also used to reduce unwanted facial hair in women and to help prevent neuroblastoma from returning.

Researchers at Corewell Health and Michigan State University College of Human Medicine have now identified another possible use. They found that DFMO may help treat Bachmann-Bupp syndrome and have already administered it to a small number of patients through an FDA-approved, single-patient investigational protocol.

Understanding Bachmann-Bupp Syndrome (BABS)

BABS is caused by gain-of-function mutations in the ornithine decarboxylase, or ODC1 gene. These mutations lead to serious developmental challenges, including significant delays, low muscle tone, and hair loss.

DFMO directly targets this pathway. It works by inhibiting the ODC protein, which in turn reduces the excessive enzyme activity caused by the mutated gene. In the limited number of patients treated so far, this approach has led to improvements in several symptoms.

"I've studied DFMO and its effect on the ODC1 gene for three decades, including its clinical use in pediatric neuroblastoma," said MSU pediatrics professor André Bachmann, Ph.D., who along with Dr. Bupp collaborated to be the first to identify BABS in a patient. "It was a chance encounter with Dr. Bupp that...

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Giant octopuses ruled the oceans 100 million years ago, study finds

Science Daily · 15 Apr 2026

Modern octopuses are known for their intelligence and flexibility, slipping through tight spaces, hiding in reefs, or drifting through the deep ocean. However, new research suggests their distant ancestors lived very differently. Scientists now believe that the earliest octopuses were not quiet, elusive creatures but massive predators that hunted at the very top of the marine food chain

alongside large vertebrates. The study, led by researchers at Hokkaido University, was published in Science on April 23, 2026.

Tracing the origins of octopuses has long been difficult because their soft bodies rarely fossilize. Unlike animals with bones or shells, they leave behind very little physical evidence. To overcome this, researchers focused on fossilized jaws, a part of the body more likely to survive over millions of years, to uncover clues about their early evolution.

Using high-resolution grinding tomography along with an artificial intelligence model, the team discovered fossil jaws embedded within rock samples dating from the Late Cretaceous period, between 100 and 72 million years ago. These fossils were recovered from sites in Japan and Vancouver Island, where calm seafloor conditions helped preserve delicate details. Fine wear marks on the jaws provided valuable insight into how these ancient animals fed.

The fossils belonged to an extinct group of finned octopuses known as Cirrata. By studying the size, shape, and surface wear of the jaws, researchers determined that these animals were active hunters capable of crushing hard prey with strong bites.

"Our findings suggest that the earliest octopuses were gigantic predators that occupied the top of the marine food chain in the Cretaceous," says Professor Yasuhiro Iba of Hokkaido University. "Based on exceptionally well-preserved fossil jaws, we show that these animals reached total lengths of up to nearly 20 meters, which may have surpassed the size of large marine reptiles of the same age."

"The most surprising finding perhaps was the extent of wear on the jaws," says Iba. The fossil jaws showed extensive chipping, scratching, cracking, and polishing, all signs of a strong biting force. "In well-grown specimens, up to 10% of the jaw tip relative to the total jaw length had been worn away, which is larger than that seen in modern cephalopods that feed on hard-shelled prey. This indicates repeated, forceful interactions with their prey, revealing an unexpectedly aggressive feeding strategy." These observations point to highly active predators that regularly consumed tough, abundant prey.

This discovery significantly reshapes what...

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Scientists Map Thousands of Brain Connections With RNA Barcodes

Sci Tech Daily · 7 May 2026

Scientists have created a new way to map how brain cells connect by assigning each neuron a unique molecular “barcode.” Using this approach, they were able to trace connections among thousands of neurons in the mouse brain with a level of speed and detail that was not possible before.

This technique could help researchers better understand how complex brain networks are organized, how they operate, and what changes when things go wrong. It may also offer new insight into how neurodegenerative diseases develop and progress.

“When engineering a computer, you need to know the circuitry of the central processing unit. If you don’t know how everything is wired together, you can’t understand its function, optimize it, or fix it

when something breaks. We are approaching the brain the same way," said study leader Boxuan Zhao, a professor of cell and developmental biology at the University of Illinois Urbana-Champaign.

"Our technology enables simultaneous mapping of thousands of neural connections with single-synapse resolution — a capability that doesn't exist in any current technology. It is directly applicable to understanding circuit dysfunction in neurodegenerative diseases and could provide a platform for developing circuit-guided therapeutic interventions," he said.

Building a map of the brain has historically been slow and difficult. Researchers typically had to slice brain tissue into extremely thin sections, image those slices with microscopes, and then reconstruct the pathways by hand. While newer sequencing-based tools can label many neurons at once, they usually show where a neuron extends rather than identifying the exact partner it connects with at the synapse , Zhao said.

To overcome these limits, Zhao's team developed a system called Connectome-seq. This method uses RNA "barcodes" to uniquely label each neuron. Specialized proteins transport these barcodes from the neuron's main body to the synapse, the point where two neurons meet.

Once there, the synaptic junctions are isolated and analyzed using high-throughput sequencing. By reading which barcode pairs appear together, scientists can determine which neurons are directly connected, allowing large-scale mapping of neural networks.

"We translated the neural connectivity problem into a sequencing problem. Imagine a big bunch of balloons. The main body of each balloon has its unique barcode stickers all over it, and some move down to the end of the string. If two balloons are tied together at the end, the two barcodes meet at the junction," Zhao said. "Then we snip out the knots and sequence...

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Male Birth Control Breakthrough: Scientists Find Way To Turn Sperm Production Off and Back On

Sci Tech Daily · 7 May 2026

Cornell University scientists have made significant progress toward what many consider the holy grail of male birth control: a safe, long-acting, fully effective, and nonhormonal contraceptive that can be reversed.

In a proof-of-principle study conducted in mice over six years, researchers showed that interrupting a natural checkpoint in meiosis, the process responsible for producing sex cells, can temporarily halt sperm production. Importantly, this approach worked without causing permanent damage.

The findings were published in the Proceedings of the National Academy of Sciences .

To achieve this, the team used JQ1, a small molecule inhibitor originally developed as a research tool for studying cancer and inflammatory diseases. Although JQ1 is not suitable as a treatment due to neurological side effects, it is known to interfere with a specific stage of meiosis called prophase 1. This allowed the researchers to demonstrate for the first time that sperm production can be safely and reversibly stopped by targeting meiosis and sperm production at this stage.

"We're practically the only group that's pushing the idea that contraception targets in the testis are a feasible way to stop sperm production," said Paula Cohen, professor of genetics and director of the Cornell Reproductive Sciences Center.

"Our study shows that mostly we recover normal meiosis and complete sperm function, and more importantly, that the offspring are completely normal," Cohen said.

Today, men have limited contraceptive choices, mainly condoms and vasectomies. While vasectomies offer a long-term solution, many men are hesitant to undergo the procedure, even though it can sometimes be reversed with additional surgery. At the same time, efforts to develop hormonal male contraceptives have faced concerns, partly because similar treatments have shown risks in women.

Cohen and her colleagues focused specifically on meiosis instead of other stages of sperm development to ensure that sperm production could be fully stopped while remaining reversible and without affecting overall reproductive function.

"We didn't want to impact the spermatogonial stem cells, because if you kill those, a man will never become fertile again," Cohen said. Also, once sperm entered spermiogenesis, there was a potential for viable sperm to leak out and fertilize an egg.

JQ1 disrupts meiosis by eliminating cells during prophase 1 and preventing the gene activity needed for later stages of sperm development.

In the study, male mice were given JQ1 for three weeks. During this time, sperm production stopped completely, and key aspects of meiosis, including chromosome behavior...

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World's first vaccine for Lyme disease could be available in 2027

refractor.io · 6 May 2026

Based on the results of two completed Phase III trials, scientists are confident that we could see an effective vaccine against Lyme disease by next year.

The final hurdle will be US Food and Drug Administration (FDA) approval, which the drug-makers will seek despite some study endpoints not being met. It remains to be seen whether this will be enough to derail the vaccine's progress to market.

Pfizer's researchers have had their fair share of optimism and letdowns in their quest to develop the first-of-its-kind vaccine. Despite hopes in 2022 that the pharmaceutical company would be the first to deliver a Lyme disease vaccine within a few years, progress stalled during later stages of the high-stakes Vaccine Against Lyme for Outdoor Recreationists (VALOR) trial.

This time the drug-maker is hoping regulatory bodies focus on the vaccine's efficacy, which was found to be more than 70%.

"Lyme disease can cause potentially serious consequences – where individuals and families face symptoms that can disrupt daily life, work, and long-term health – and there is currently no vaccine available," says Annaliesa Anderson, Senior Vice President and Chief Vaccines Officer at Pfizer.

"The efficacy shown in the VALOR study of more than 70% is highly encouraging and creates confidence in the vaccine's potential to protect against this disease that can be debilitating."

According to the US Centers for Disease Control and Prevention (CDC), 89,000 cases of tick-borne Lyme disease were reported in the US in 2023. Accurate measures are uncertain due to factors,

including the treatment of symptoms without a diagnosis. Researchers suggest figures could be closer to nearly 500,000 people being infected annually.

Transmission also makes things more difficult. While it's primarily contracted following a bite from a certain species of infected ticks (deer ticks, or Ixodes scapularis) that carry the bacteria Borrelia burgdorferi , people often don't realize they've come in contact with the parasites until the appearance of symptoms, which includes fever, fatigue, joint pain and rashes, and, at the more serious end of the spectrum, chronic cardiovascular, and nervous-system conditions.

And while the tick's common name suggests deer are its only host, these efficient vectors live on many animals – rodents, birds, for example.

While seasonal weather changes don't impact Lyme disease prevalence, warming climates with increased humidity broaden the tick's range. An effective vaccine for those at risk – hikers, campers, people who work or spend a lot...

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Want to make earthquake-resistant buildings? Try butterfly wings

New Atlas · 6 May 2026

When you hear about designers biomimicking butterflies, your first thought is probably about creating remote-controlled flying toys or small, artificial flying machines that could be useful in pollination, especially in regions experiencing bee colony collapse . But butterfly mimicry goes far beyond those uses to include scattering light to replace toxic paints or as an anti-fraud mechanism against counterfeiters , advancing optical computing , and even creating superior eye implants .

And it now also includes making buildings.

Because when you think of designing massive, heavy, structures that require durability to withstand hundreds of tons of pressure from people, furniture, equipment, and their own components – not to mention the stresses of wind and the potential for earthquakes – why wouldn’t you immediately think of applying the structure of the tiny, delicate, organic stained-glass windows that we call butterfly wings?

In their International Journal of Mechanical Sciences paper, Jing Wei, Xiao Wong, and colleagues at Wuhan University of Technology in China, and Eric Jianfeng Cheng at Japan’s Tohoku University, explain how despite the low-mass and high energy-absorbing design value of traditional lattices, their vulnerability is in stress concentration.

One hit in the wrong place and boom! – total collapse and disaster. To counter that shatterability, the researchers applied the uniform stress distribution of butterfly wings to architecture, using a butterfly-inspired body-centered cubic (BCCB) topology (shapes that can sustain twisting or stretching).

The superpower of this design, which increases its ability to absorb energy and resist impact, is its anisotropic lattice. In anisotropy, the opposite of isotropy, a structure isn’t uniform in all directions. Think of a tree – hit a cut section of it with an axe along the grain of its wood, and it easily splits. Hit that tree with that same axe against the grain, and it takes forever to make it fall. Polarized lenses, crystals, steel polymers, and 3D-printed objects are all anisotropic , whereas a rubber ball or the contents of a glass of water are isotropic.

By applying anisotropy to architecture, the designers achieve controlled deformation and, during compression, non-destructive stress redistribution. As Chen explains, “This structural mechanism is particularly remarkable, since most lightweight lattice materials aren't able to withstand forces like local buckling or shock. In contrast, our design shows a much greater resistance to sudden mechanical loading.”

If the researchers continue achieving useful results with anisotropic designs, their aim is applying its strength...

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Hidden virus in your gut may be linked to colon cancer

Science Daily · 25 Jan 2026

Colorectal cancer is among the most common cancers in Western countries and remains a major cause of cancer-related deaths. While factors like age, diet, and lifestyle are known to influence risk, the exact triggers behind the disease are still not fully understood.

In recent years, scientists have increasingly focused on the gut microbiome, the vast ecosystem of bacteria, viruses, and other microorganisms living in the digestive system.

Now, researchers from the University of Southern Denmark and Odense University Hospital have identified a previously unknown virus inside a common gut bacterium. This virus appears more often in people with colorectal cancer, offering a new clue about how the disease may develop.

A Common Gut Bacterium With a Longstanding Mystery

For years, researchers have linked one specific bacterium, Bacteroides fragilis , to colorectal cancer. However, this connection has been difficult to explain because the same bacterium is also found in most healthy individuals.

"It has been a paradox that we repeatedly find the same bacterium in connection with colorectal cancer, while at the same time it is a completely normal part of the gut in healthy people," says Flemming Damgaard, medical doctor and PhD at the Department of Clinical Microbiology at Odense University Hospital and the University of Southern Denmark.

To resolve this contradiction, the team investigated whether there might be important differences within the bacterium itself.

The key difference turned out to be a virus living inside the bacterium. In patients who later developed colorectal cancer, Bacteroides fragilis was much more likely to carry a specific bacteriophage, a virus that infects bacteria.

"We have discovered a virus that has not previously been described and which appears to be closely linked to the bacteria we find in patients with colorectal cancer," says Flemming Damgaard.

The researchers believe this virus represents entirely new types that have not been identified before.

"It is not just the bacterium itself that seems interesting. It is the bacterium in interaction with the virus it carries," he explains.

Although the study shows a strong statistical link between the virus and colorectal cancer, it does not prove that the virus causes the disease.

"We do not yet know whether the virus is a contributing cause, or whether it is simply a sign that something else in the gut has changed," says Flemming Damgaard.

The discovery began with data from a large Danish population study involving about two million people....

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Ultrasound waves rupture COVID-19 and flu viruses without damaging cells

Phys Org · 7 May 2026

Researchers at the University of São Paulo (USP) in Brazil have discovered that high-frequency ultrasound waves similar to those used in medical exams can eliminate viruses such as SARS-CoV-2 and H1N1 without damaging human cells. In an article published in Scientific Reports , they describe how the phenomenon, known as acoustic resonance, causes structural changes in viral particles until they rupture and become inactivated.

"It's kind of like fighting the virus with a shout. In this study, we proved that the energy of sound waves causes morphological changes in viral particles until they explode, a phenomenon comparable to what happens with popcorn. By degrading the structure of the pathogen, the protective membrane of the virus called the envelope bursts and deforms, preventing the virus from invading human cells," explains Odemir Martinez Bruno, a professor at the São Carlos Institute of Physics (IFSC) at USP who coordinated the study.

Ultrasound-mediated inactivation of enveloped viruses opens up a new treatment possibility for viral diseases. In fact, the team is already conducting in vitro tests against other infections, such as dengue, Chikungunya, and Zika. This alternative treatment is particularly interesting given that antiviral drugs are generally difficult to develop.

"Although it's still far from clinical use, this is a promising strategy against enveloped viruses in general, since developing chemical antivirals is complex and yields difficult results. Furthermore, it's a 'green' solution, as it generates no waste, causes no environmental impact, and doesn't promote viral resistance," says Flávio Protásio Veras, a professor at the Federal University of Alfenas (UNIFAL) and a FAPESP postdoctoral fellow.

The research brought together scientists from various fields. In addition to theoretical physicists and acousticians from the IFSC, the initiative benefited from the collaboration of specialists from the Virology Research Center and the Center for Research in Inflammatory Diseases (CRID), both affiliated with the Ribeirão Preto Medical School (FMRP-USP), the School of Pharmaceutical Sciences (FCFRP-USP), and the Faculty of Science and Technology at São Paulo State University (UNESP).

These specialists contributed structural and toxicological analyses using techniques such as microscopy and light scattering.

The initiative also benefited from the collaboration of Charles Rice, a professor at Rockefeller University in the United States and the 2020 Nobel Prize winner in medicine. Rice provided fluorescent viruses for real-time visualization.

The discovery surprised the researchers because it contradicts classical physics theories, as the wavelength of ultrasound is much longer than the size of...

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REACH UPDATE

IUCLID 6 major release (v10.0.0) including format updates

IUCLID News · 30 Apr 2026

A new major version of IUCLID, including format changes, is available for download on the IUCLID website. The full documentation of the format (v10) has also been published.

The changes to the format cover updates relevant to all IUCLID users, such as:

- Changes to the OECD Harmonised Templates (OHT) to follow the evolution of the OECD Test Guidelines
- Update of the EU test guidelines.

Format changes that are relevant to specific stakeholders are also included, for example:

EU REACH: updates to the format of REACH Microplastic reporting.

EU BPR: updates to the BPR formats including:

- update of the dossier header of the working context Active substance application (representative product)
- changes to the Use document to accommodate human health and environment scenarios

improvement of directions for use by expanding and refining the set of frequently used sentences, including their translations.

EU DWD: update of the format for current notifications and future applications.

EU TSR: new working context to be used by industry to provide derogation requests to use substances banned in toys.

EFSA: updates to the formats of EU Plant Protection Products and EU Food Contact Materials including:

- update of the dossier header for the working context Maximum Residue Level (MRL)
- the creation of a new document to report the characterisation of microorganisms
- new documents to report data on batches used in mammalian toxicity and ecotoxicity studies
- a new document to report data on antimicrobial substances in food contact materials.

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REGULATORY UPDATE

ASIA PACIFIC

Why transport must sit at the center of India's air quality strategy

ICCT · 30 Apr 2026

As another winter draws to a close, so does a familiar cycle: air pollution spikes, emergency measures follow, yet air quality barely improves. Meanwhile, residents remain exposed to toxic pollutants that harm public health. Instead of recurring short-term responses, what is needed is sustained structural reform. If clean air is the goal, transport must be placed at the center of air-quality policy.

A decade of evidence from Delhi explains why. Transport is consistently a dominant source of toxic combustion pollutants and among the largest contributors to fine particulate matter (PM2.5), exposure to which can lead to respiratory illness, cardiovascular disease, and other health issues. Studies show transport contributes 20%–40% of PM2.5 in Delhi annually, but this rises to over 50% during peak pollution months when local sources are isolated. Health assessments attribute 30%–35% of PM2.5-related deaths in Delhi to transport, equivalent to around 13,000 premature deaths annually, making it the single largest contributor to mortality.

Exposure studies show that citywide air-quality readings understate the risk to the local population: according to one study, PM2.5 levels are about 40% higher while walking, 30% higher riding two-wheelers and auto-rickshaws, and 20%–30% higher for those on buses and at bus stops. As a result, for millions of commuters, street vendors, delivery workers, and traffic police, pollution exposure is high and continuous rather than episodic.

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AMERICA

CBI Claim Expiration

US EPA · 30 Apr 2026

TSCA section 14(e) (26 USC 2613) limits the duration of most confidential business information (CBI) claims to 10 years from the date of the original submission, unless the submitting company requests and EPA approves an extension. Without an approved extension, EPA may make the claimed information public without further notice. The first group of CBI claims submitted by companies after the Lautenberg Act was signed into law in 2016 will expire in June 2026 unless requests for extension for those claims are submitted and substantiated within established timeframes.

To reassert an expiring CBI claim for up to an additional 10 years, a company must submit a request for an extension that substantiates the need for continued protection of the information from disclosure. The information below describes which CBI claims require an extension, how EPA will notify submitters of expiring CBI claims, the process for requesting an extension, and the EPA review process.

List of Expiring Claims

Below is a list of TSCA CBI claims that will expire between June 22, 2026, and July 31, 2026. To maintain accuracy and provide timely updates, EPA will refresh this list on a monthly basis as claims approach their expiration date. Companies are strongly encouraged to carefully review the list (and future lists) and verify whether any of their claims are included.

CBI submissions with expiring claims (xlsx) (15.45 KB)

For confidentiality claims for specific chemical identities, submitters can consult the TSCA inventory to determine expiration dates for substances for which they have made TSCA submissions. Those dates are contained in the column labeled “EXP.”

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Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances— 2026 Version

US EPA · 20 Apr 2026

This 2026 update of the U.S. Environmental Protection Agency (EPA) interim guidance presents currently available information on the destruction and disposal of perfluoroalkyl and polyfluoroalkyl substances (PFAS) and PFAS-containing materials. This guidance focuses on updates to the current state of science and associated uncertainties for three large-scale capacity technologies that can destroy PFAS or control PFAS release into the environment: thermal treatment, landfills, and underground injection. This guidance document also discusses emerging technologies and provides a framework for evaluating these technologies for PFAS destruction or disposal. This guidance is non-binding and does not have the force and effect of law. EPA published the first edition of this guidance on December 18, 2020, as required by the National Defense Authorization Act (NDAA) of 2020, and the second edition of this guidance on April 16, 2024. The NDAA directs EPA to address the destruction and disposal of PFAS and specific PFAS-containing materials, including aqueous film-forming foam (AFFF), contaminated media, textiles (other than consumer goods), and various wastes from water treatment. The NDAA also requires EPA to review and update the guidance as appropriate, but no less frequently than every three years. On April 28, 2025, the EPA Administrator committed to providing more frequent updates to the interim guidance— changing from every three years to annually—as EPA continues to assess the effectiveness of available treatment technologies.

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Green Data for Health: ANSES's ambitions for leveraging environmental health data

ANSES · 27 Apr 2026

For the past year, the Agency has been coordinating Green Data for Health (GD4H), an initiative that aims to improve understanding of the impact of environmental factors on health. What is its current status, and in what way is it strategic in addressing the challenges of using environmental health data and, more broadly, One Health data? We talked to Pierre Breton, its director at ANSES, about the progress made on GD4H and its future prospects.

A year after ANSES took over Green Data for Health, where do things now stand?

The first important point to make is that Green Data for Health did not start from square one. This initiative, which was announced in the Fourth National Environmental Health Action Plan, was launched by the Ecolab laboratory of the General Commission for Sustainable Development (CGDD). The CGDD played a pivotal role by laying the groundwork from 2020 and bringing together an initial group of partners with the shared belief that better cross-referencing of environmental and health data was needed. The support provided by the CGDD during the transfer to ANSES ensured real continuity and enabled us to ramp up our activities quickly.

The Agency had been involved in the project as a partner since its launch, which ensured a smooth transition when it was entrusted with the coordination of GD4H on 2 April 2025, on the signature of the cooperation agreement. A year on, the "transplant" has been a success! We have moved from an initiative that was still in its exploratory phase to a structured scheme that now brings together 18 national partners, with an interministerial governance framework in place and a community of several hundred stakeholders from the research community, national public institutions, local authorities and the voluntary sector.

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Regulatory Sandboxes for Net-Zero Innovation

European Commission · 24 Apr 2026

This report aims to contribute to the discussion on the use of regulatory sandboxes to promote innovation in the field of net-zero technologies. Several net-zero technologies are still in the demonstration phase. They could greatly benefit from regulatory sandboxes, which would help speed up their development and deployment into the market by lifting unnecessary regulatory burdens. The EU Net-Zero Industry Act establishes a regulatory framework that encourages the use of regulatory sandboxes to support the development of innovative net-zero technologies. Several other EU policy documents indicate the potential of regulatory sandboxes to foster innovation and support the entrance of innovative net-zero technologies into the market, while promoting regulatory learning and development.

The report explores the concept of regulatory sandboxes and the potential for their application in the context of the net-zero industry act. Building on work previously published by the JRC, the report contributes to the design of NZIA sandboxes and more generally supports evidence-based policy

making in Member States and at EU-level. The report offers an overview of the state of play of regulatory sandbox schemes in the energy sector in the EU, providing an analysis of the current regulatory sandbox projects in the EU Member States, highlighting the net-zero technologies deployed, the actors involved, and the derogations granted. Furthermore, the report provides lessons learned and insights into the design and operation of net-zero regulatory sandboxes.

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Integration of Landfills into the EU-ETS 1

Umwelt Bundesamt · 30 Apr 2026

An option to prevent possible waste diversion from municipal waste incineration?

This exploratory study assesses whether the potential integration of landfills into the EU-ETS 1 could be a viable strategy to prevent waste streams from being diverted from municipal waste incineration (MWI) to landfills. Such a diversion could result from the potential and currently discussed inclusion of MWI in the EU-ETS 1, leading to additional methane emissions. To this end, the study briefly reviews the existing legal framework, provides an overview of existing data and statistics on relevant waste streams, and assesses factors related to the risk of diversion. After this, the study sketches a potential landfill integration design and discusses its advantages and disadvantages. The study concludes with an outline of further research needs.

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Ban on cigarette filters can reduce the amount of microplastics in the environment

RIVM · 20 Apr 2026

A ban on cigarette filters could reduce the amount of microplastics in the environment, without any negative impact on smokers' health. According to research by RIVM, there are no indications of additional environmental harm resulting from the absence of a filter.

After smoking a filter cigarette, the cigarette butt is left behind. This butt consists of a cigarette filter, a small amount of tobacco, paper and ash. The filter is almost always made of cellulose acetate, a type of plastic. Because this substance decomposes only slowly, the filters remain in the environment for decades. At the same time, the filter offers no proven health benefit for smokers.

RIVM has mapped out the available information about substances released from cigarette butts, both with and without filters. Scientific literature describes little about differences in the environmental impact. However, studies do show that various hazardous substances are released from cigarette butts. These include nicotine, metals, microplastics, PAHs and pesticides. A ban on cigarette filters will reduce the amount of microplastics entering the environment from cigarette butts. Unfiltered cigarette butts contain around three times as much tobacco as butts with a filter. This level of increase is not expected to be sufficient to cause a demonstrable impact on the environment. Additional research could help to provide a clearer picture of these differences.

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Norway nominates new POP to the Stockholm Convention

Norwegian Environment Agency · 29 Apr 2026

The Norwegian Environment Agency has submitted a nomination report for the brominated flame retardant decabromodiphenylethane (DBDPE).

The Directorate believes that the substance is relevant for a global ban through the Stockholm Convention. This brominated flame retardant is also included in a restriction proposal for aromatic brominated flame retardants under REACH regulation that is currently underway.

The nomination report will be discussed in the Convention's expert committee, which will meet in September 2026.

Brominated flame retardants are used to make products less flammable. The substances can be found in electric vehicles, aircraft, building materials, plastic insulation materials (polystyrene) and in textiles for mattresses, bedding, furniture and workwear.

Several of the substances are persistent organic pollutants (POPs). They are characterized by being poorly biodegradable, accumulating in animals and humans, having serious long-term effects, and being transported over large geographical distances by air and ocean currents. The Stockholm Convention is a global agreement for the regulation of POPs.

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Food additives

EFSA · 13 Apr 2026

Food additives are substances added to food and drinks for various reasons, such as to maintain or improve their safety, freshness, taste, texture or appearance.

Many substances used as additives occur naturally, such as vitamin C (E 300) and pectin (E 440) in fruit, lycopene (E 160d(ii)) in tomatoes, and lecithin (E 322), which is present in a range of foods, such as egg yolks, soya beans, peanuts and maize.

Food additives can also be derived from animals (e.g. carminic acid or E 120, obtained from cochineal insects) or minerals (e.g. calcium carbonate or E 170, obtained from ground limestone), or they can be chemically synthesised (e.g. synthetic lycopene or E 160d(i)).

In the European Union (EU) all food additives are identified by an E number, and their safety is evaluated before they can be permitted for use in food.

More than 300 substances are authorised for use as food additives in the EU. The European Food Safety Authority (EFSA) has evaluated the safety of the majority of these, while the remainder were assessed by the European Commission’s Scientific Committee on Food before EFSA was established. Our scientists are re-evaluating the safety of those remaining substances in line with the latest scientific knowledge.

Food additives must always be included in the ingredients list of food and drinks in which they are used.

Food and drink labels must identify both the function of the additive in the finished food (e.g. colour or preservative) and the specific substance used, either by referring to the appropriate E number or its name (e.g. E 415 or Xanthan gum).

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Addressing ground-level ozone pollution in Europe

European Environment Agency · 30 Apr 2026

This overview of ground-level (or tropospheric) ozone pollution in Europe is based on data reported by EU Member States (EU-27) and is published in the context of the revised Ambient Air Quality Directive. Country-specific factsheets have been prepared for all EU-27 countries.

Key messages

Ozone affects human health and ecosystems; in 2023, 63,000 deaths could be attributed to it in the European Union (EU) and it caused billions of euros of damage due to crop losses.

Despite reductions in the emissions of pollutants that contribute to ozone, ground-level ozone levels have not decreased significantly.

The revised Ambient Air Quality (AAQ) Directive requires countries to take additional action to address the risks from ozone. Global action is also required to reduce transboundary pollution, which can limit the impact of national and local actions.

A deeper understanding of the role of different volatile organic compounds (VOCs) is required to identify the most effective mitigation measures to address ozone levels; this would also support the development of effective air quality plans for ozone.

Efforts to reduce nitrogen oxides (NOX) should take into account international shipping emissions in addition to road traffic, particularly in coastal areas.

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HAZARD ALERT

Malathion

8 May 2026

Malathion is an organophosphate parasympathomimetic that binds irreversibly to cholinesterase and has the molecular formula C10H19O6PS2. [1] It is a colourless liquid in pure form and a brownish-yellow liquid with a garlic smell when part of a technical grade solution. It is manufactured and does not occur naturally in the environment. [2] Malathion is an insecticide of relatively low human toxicity. In Australia and New Zealand it is known as maldison. [1]

Uses [3]

Malathion is a pesticide that is used to kill insects on agricultural crops, on stored products, on golf courses, in home gardens, and in outdoor sites where trees and shrubs are grown at home; it is also used to kill mosquitoes and Mediterranean fruit flies (medflies) in large outdoor areas. Additionally, malathion is used to kill fleas on pets and to treat head lice on humans. It is usually sprayed on crops or sprayed from an airplane over wide land areas, especially in the states of California and Florida.

In the Environment [3]

Once malathion is introduced into the environment, usually from spraying on crops or in wide urban/residential areas, droplets of malathion in the air fall on soil, plants, water, or man-made surfaces. While most of the malathion will stay in the areas where it is applied, some can move to areas away from where it was applied by rain, fog, and wind. Malathion stays in the environment from a few days to several months, but is usually broken down within a few weeks. It is broken down to other chemical compounds by water, sunlight, and bacteria found in soil and water. Malathion does not tend to stick to the soil and is rapidly broken down by bacteria; thus, it is unlikely that malathion will reach groundwater in significant amounts. In water, malathion breaks down quickly by the action of the water and the bacteria in the water. In air, malathion is broken down by reacting with other chemicals formed naturally in the air by sunlight, to form a more toxic product called malaoxon. If malathion is present on dry soil or on man-made surfaces such as sidewalks, pavements, or playground equipment, it usually does not break down as fast as it would in moist soil.

Sources & Routes of Exposure [2]

Sources of Exposure

General Populations

- The general population is not likely to be exposed to high levels of malathion.
- Exposure to malathion predominantly occurs through ingestion of contaminated food or water.

- People living near areas where malathion is sprayed have a greater risk of being exposed through dermal contact with contaminated plants and soils, inhalation of mist formed during application, and ingestion of residues in food or water.

Occupational Populations

- Workers involved in the production, formulation, handling, and application of malathion are likely to have the highest levels of exposure.
- Farm workers who enter treated fields prior to the passage of the appropriate restricted entry intervals may also be exposed to high levels of malathion.

Routes of Exposure

The following are the routes of exposure for malathion:

- Inhalation – Minor route of exposure for the general population.
- Oral – Predominant route of exposure for the general population through ingestion of contaminated food or water.
- Dermal – Minor route of exposure for the general population. Predominant route of occupational exposure.

Health Effects [3]

Malathion interferes with the normal function of the nervous system. Because the nervous system controls many other organs, malathion indirectly can affect many additional organs and functions. Exposure to high amounts of malathion in the air, water, or food may cause difficulty breathing, chest tightness, vomiting, cramps, diarrhoea, watery eyes, blurred vision, salivation, sweating, headaches, dizziness, loss of consciousness, and death. If persons who are exposed accidentally or intentionally to high amounts of malathion are rapidly given appropriate treatment, there may be no long-term harmful effects. If people are exposed to levels of malathion below those that affect the function of the nervous system, few or no health problems seem to occur. This has been shown in studies with volunteers who inhaled or swallowed small known amounts of malathion. There is no evidence that malathion affects the ability of humans to reproduce. There is also no conclusive proof that malathion causes cancer in humans, although some studies have found increased incidence of some cancers in people who are regularly exposed to pesticides, such as farmers and pesticide applicators. The International Agency for Research on Cancer (IARC) has determined that malathion is unclassifiable as to carcinogenicity to humans.

Safety [4]

First Aid Measures

- Inhalation: Remove source of contamination or move victim to fresh air. Keep affected person warm and at rest. Supply oxygen if necessary. Treat symptomatically and supportively. Seek medical advice immediately.
- Skin contact: Remove contaminated clothing, shoes and leather goods. Gently wipe of excess chemical. Wash skin gently and thoroughly with water and non-abrasive soap. Seek medical advice if necessary. Persons who become sensitised may require specialised medical management with antiinflammatory agents.
- Eye contact: Immediately flush eyes with gently flowing cold water or saline solution for 20 minutes, holding the eyelid(s) open. Seek medical attention immediately.

- Ingestion: Have victim rinse mouth thoroughly with water. Do not induce vomiting, due to the aromatic solvent. Seek medical advice immediately.
- Advice to physician: Atropine must be administrated as early as possible and could save lives, if given in time and in an adequate dosage.

Exposure Controls & Personal Protection

Engineering controls

- It is essential to provide adequate ventilation.
- Ensure that control systems are properly designed and maintained.
- Comply with occupational safety, environmental, fire and other

applicable regulations.

Personal Protective Equipment

If engineering controls and work practices are not effective in controlling exposure to this material, then wear suitable personal equipment including approved respiratory protection.

- Respirator: An approved full-face respirator suitable for protection from dusts or mists of pesticides is required. Limitations of respirator use specified by the approving agency and the manufacturer must be observed.
- Clothing: Employee must wear appropriate protective (impervious) clothing and equipment to prevent skin contact with the substance.
- Gloves: Employee must wear appropriate chemical resistant protective gloves to prevent contact with this substance.
- Eye protection: Employee must wear splash-proof safety goggles and face shield to prevent contact with this substance.
- Emergency eye wash: Where there is any possibility that an employee's eyes may be exposed to this substance, the employer should provide an eye wash fountain or appropriate alternative within the immediate work area for emergency use.

Regulation [3,5]

United States

OSHA: The Occupational Safety & Health Administration has set the following Permissible Exposure Limit (PEL) for malathion:

- General Industry: 29 CFR 1910.1000 Z-1 Table -- 15 mg/m3 TWA; Skin
- Construction Industry: 29 CFR 1926.55 Appendix A -- 15 mg/m3 TWA; Skin
- Maritime: 29 CFR 1915.1000 Table Z-Shipyards -- 15 mg/m3 TWA; Skin

ACGIH: The American Conference of Governmental Industrial Hygienists has set a Threshold Limit Value (TLV) for malathion of 1 mg/m3 TWA - Inhalable fraction, Vapour and aerosol; Skin; Appendix A4 - Not Classifiable as a Human Carcinogen; BEI - Appendix A: Carcinogens

NIOSH: The National Institute for Occupational Safety and Health has set a Recommended Exposure Limit (REL) for malathion of 10 mg/m3 TWA; Skin

EPA: The Environmental Protection Agency states that the following levels of malathion in drinking water are not expected to cause effects that are harmful to health:

0.2 milligrams per litre (mg/L) for 1 day, 10 days, or longer-term exposure for children, and

0.1 mg/L for lifetime exposure of adults.

EPA also has set maximum levels of malathion residues in meat and dairy products, vegetables, fruits, tree nuts, cereal grains, and grass forage, fodder, and hay. EPA requires notification to the Agency of spills or accidental releases of 100 pounds or more of malathion to the environment.

Australia

Safe Work Australia: Safe Work Australia has established a Time Weighted Average Concentration (TWA) for malathion of 10 mg/m3 for a 40-hour workweek.

References

- http://en.wikipedia.org/wiki/Malathion
- http://www.atsdr.cdc.gov/toxguides/toxguide-154.pdf
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- http://msdssearch.dow.com/PublishedLiteratureDAS/dh_0060/0901b80380060a74.pdf?filepath=/011-10176.pdf
- https://www.osha.gov/dts/chemicalsampling/data/CH_250000.html
- http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/772/Workplace-exposure-standards-airborne-contaminants.pdf

JANET'S CORNER

Who Am I?

8 May 2026

I am the king of chemicals, and my production volume speaks louder than any throne.

My oily appearance belies my devastating corrosive power—I can dissolve flesh and bone with terrifying efficiency.

I was first synthesized by alchemists in the 8th century, who called me the oil of vitriol.

My industrial uses range from fertilizer production to metal processing, and I'm so vital that my manufacturing capacity is a barometer of economic health.