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HAZARD ALERT

Lead

JANET'S CORNER

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GOSSIP

Microplastics are falling from the sky and polluting forests

Science Daily · 19 Jan 2026

Microplastics and nanoplastics are widely known for contaminating oceans, rivers, and farmland. New research now shows they are also accumulating in forests. Geoscientists at TU Darmstadt report this finding in a study published in *Nature Communications Earth & Environment*, highlighting a largely overlooked form of environmental pollution.

The study reveals that forests are not just affected by local pollution sources. Instead, most microplastics arrive through the air and gradually build up in forest soils. According to the researchers, these tiny plastic particles first land on the leaves in the upper canopy.

"The microplastics from the atmosphere initially settle on the leaves of the tree crowns, which scientists refer to as the 'comb-out effect,'" explains lead author Dr. Collin J. Weber from the Institute of Applied Geosciences at TU Darmstadt. "Then, in deciduous forests, the particles are transported to the forest soil by rain or the autumn leaf fall, for example."

Once on the forest floor, natural processes take over. The breakdown of fallen leaves plays a key role in trapping and storing microplastics in the soil. The researchers found the highest concentrations in the top layer of leaf litter, where decomposition has just begun. However, significant amounts were also detected deeper underground.

This movement into lower soil layers is linked not only to the decomposition of organic material but also to biological activity, such as organisms that help break down leaves and redistribute particles.

Measuring Microplastics in Soil, Leaves, and Air

To better understand how microplastics accumulate, the research team collected samples from four forest sites east of Darmstadt in Germany. They analyzed soil, fallen leaves, and atmospheric deposition (the transport of substances from the Earth's atmosphere to the Earth's surface) using a newly developed method combined with spectroscopic techniques.

In addition, the scientists created a model to estimate how much microplastic has entered forests from the atmosphere since the 1950s. This helped them assess how much of the total pollution stored in forest soils can be traced back to airborne sources.

Forests as Indicators of Airborne Plastic Pollution

"Our results indicate that microplastics in forest soils originate primarily from atmospheric deposition and from leaves falling to the ground, known as litterfall. Other sources, on the other hand, have only a minor influence," explains Weber. "We conclude that forests are good indicators of atmospheric microplastic pollution and that a high concentration of microplastics in forest soils indicates a high..."

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US moves to roll back ethylene oxide exposure rules

Chemistry World · 20 Mar 2026

The US Environmental Protection Agency (EPA) has moved to relax air pollution limits on ethylene oxide (EtO), a highly reactive gas used to sterilise an estimated 50% of all medical devices in the US every year. The agency proposed the changes on 13 March, citing concerns that current EtO emission standards put in place by former President Joe Biden threaten the ability of facilities to sterilise equipment and jeopardise one of the US' only options for a secure domestic supply chain of essential medical equipment.

Ethylene oxide is used extensively to sterilise medical equipment and devices

Almost two years ago, the EtO Commercial Sterilizer final rule put in place stricter air emission requirements for approximately 90 commercial sterilisers across the US. It required operators to use advanced monitoring systems to confirm pollution controls are working effectively and directed them to regularly report results to the EPA.

If finalised, the revised rule would give facilities the choice of installing new monitoring systems or adjusting ventilation systems to meet new standards.

Biden had put the EtO standards in place after several incidents in recent years involving releases of the chemical, which the EPA has classified as 'carcinogenic to humans' through inhalation. For example, the US Chemical Safety Board concluded in a report last month that an explosion at a Dow facility in Louisiana in 2023 began when EtO entered a pipe and triggered a chain reaction that led to more explosions, resulting in more than 14 tonnes of the chemical entering the air in the surrounding area.

The American Chemistry Council – a lobby group that represents chemical companies – has applauded the EPA's reconsideration of the regulation, calling it 'an important step towards growing domestic chemical production in a streamlined, efficient, and protective way'.

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AI agent accelerates catalyst discovery for sustainable fuel development

Phys Org · 26 Mar 2026

Scientific discovery is often tedious, expensive, incremental trial and error, but the advent of artificial intelligence is accelerating the process. A multi-institutional team based in China recently used AI to identify a key characteristic of compounds called catalysts that are used to initiate and speed up the chemical reactions that convert carbon dioxide into molecules that can be used to develop sustainable fuels. The team then used the AI—dubbed Catalysis AI Agent—to guide their catalyst designs, ultimately discovering the universal design principle for copper-based single-atom alloy (SAAs) catalysts. They published their results on Feb. 24 in *Angewandte Chemie International Edition*.

"Copper-based SAAs represent a promising strategy for optimizing the electroreduction—the process of breaking down or converting a compound into something else via electrochemical

reactions—of carbon dioxide to multi-carbon products," said co-corresponding author Hao Li, distinguished professor at Advanced Institute for Materials Research, Tohoku University.

The challenge, Li said, is that electroreduction catalysis can be induced with a broad variety of chemical additions to produce specific carbon products. The diversity has not yet been rationalized, meaning no one had developed guidelines for designing copper-based SAAs that could produce the desired carbon products.

In an effort to provide such guidelines, the researchers turned to Catalysis AI Agent. A type of AI called a large language model (LLM), the Catalysis AI Agent learned by training with a massive database built by Li and his team. The database, the Digital Catalysis Platform or DigCat, is currently the largest experimental database and AI platform available for catalysis research.

"Stage one of our systematic investigation was to develop the powerful LLM-based Catalysis AI Agent and use it to mine the DigCat database," Li said, explaining that it examined the catalysis research data available to identify trends or similarities.

The Catalysis AI Agent found that copper-based SAAs appeared to produce the desired carbon products by promoting the formation of certain compounds rather than suppressing the development of other byproducts. This insight prompted the researchers to use the Catalysis AI Agent to analyze correlations between experimental and theoretical data, which led to the revelation that the additives—called dopants—that could be used to induce specific carbon products need to be classified before researchers can elucidate how they interact with a compound and produce a predictable reaction.

With this understanding, the researchers established an energy descriptor—a way to describe the amount of energy needed for specific reactions—to classify...

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New supercool alloy could take the heat off helium-3

New Atlas · 23 Mar 2026

The heated race to achieve the extreme cold that quantum technologies demand may have a frontrunner. Chinese scientists have developed an alloy that almost reaches absolute zero, the coldest possible temperature, without using the scarce isotope, helium-3.

Harnessing the strange behavior of particles at the tiniest scales, quantum technologies are enabling applications that are borderline science fiction across various industries. A good example is quantum computing. Unlike conventional computers, which store information as 0s and 1s, quantum computers use qubits, fundamental units of information that can exist in multiple states simultaneously, enabling them to perform calculations that would take conventional computers millions of years to complete.

Other examples include quantum sensors that detect the tiniest changes in magnetic or gravitational fields with unprecedented precision, and quantum communication that enables virtually unhackable networks.

Now, the thing about this technology is that it "detests heat." Atoms are constantly vibrating, giving off energy we perceive as heat. However, quantum technologies require atoms to be nearly

motionless, a state achievable only at extremely low temperatures (below 1 kelvin, or $-272.15\text{ }^{\circ}\text{C}$ / $-457.87\text{ }^{\circ}\text{F}$).

Heat may feel abstract when we talk about temperatures close to absolute zero. However, a stray thermal vibration can scramble qubit states in quantum computing or degrade the coherence in quantum sensors. This requirement is why quantum labs mostly comprise advanced cooling technologies.

Right now, the go-to tool for achieving the deepest chill is the dilution refrigerator, which often relies on a rare isotope, helium-3. The system uses a carefully controlled mixture of helium-3 and helium-4 that can reach millikelvin temperatures, a tiny fraction of a degree above absolute zero.

The trouble is, helium-3 is very scarce. It's a lightweight isotope produced mainly as a by-product of tritium decay in nuclear reactors, and global supplies are tiny compared with demand. High costs and limited availability make it a bottleneck for scaling up quantum computing and other technologies that rely on deep cryogenics.

In addition to this scarcity, helium-3 dilution refrigerators are complex and bulky, consuming significant lab space and infrastructure. These characteristics create significant barriers to making quantum technology more compact, practical, or widespread.

To overcome these barriers, researchers from the Hefei Institutes of Physical Science of the Chinese Academy of Sciences (CAS), the Institute of Theoretical Physics of CAS, and Shanghai Jiao Tong University have developed a solid material that can reach temperatures within a whisker of absolute...

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Scientists Just Broke the Solar Power Limit Everyone Thought Was Absolute

Sci Tech Daily · 25 Mar 2026

A new "energy-multiplying" solar breakthrough could push efficiency beyond 100% and transform how we capture sunlight.

Solar energy is widely seen as a key tool in reducing reliance on fossil fuels and slowing climate change. The Sun delivers a vast amount of energy to Earth every second, but today's solar cells can only capture a small portion of it. This limitation comes from a so-called "physical ceiling" that has long been considered unavoidable.

In a study published today (March 25) in the *Journal of the American Chemical Society*, researchers from Kyushu University in Japan, working with collaborators at Johannes Gutenberg University (JGU) Mainz in Germany, introduced a new approach to overcome this barrier. They used a molybdenum-based metal complex known as a "spin-flip" emitter to capture extra energy through singlet fission (SF), often described as a "dream technology" for improving light conversion.

This method achieved an energy conversion efficiency of about 130%, exceeding the traditional 100% limit and pointing toward more powerful future solar cells.

Solar cells generate electricity when photons from sunlight strike a semiconductor and transfer their energy to electrons, setting them in motion and producing an electric current. This process can be visualized as a relay, where energy is passed along particle by particle.

However, not all sunlight contributes equally. Low-energy infrared photons lack the power to excite electrons, while high-energy photons, such as blue light, lose excess energy as heat. Because of this imbalance, solar cells can only utilize roughly one-third of incoming sunlight. This restriction is known as the Shockley–Queisser limit and has posed a major challenge for decades.

“We have two main strategies to break through this limit,” says Yoichi Sasaki, Associate Professor at Kyushu University's Faculty of Engineering. “One is to convert lower-energy infrared photons into higher-energy visible photons. The other, what we explore here, is to use SF to generate two excitons from a single exciton photon .”

Under typical conditions, one photon produces just one spin-singlet exciton after excitation. With SF, that single high-energy exciton can split into two lower-energy spin-triplet excitons, potentially doubling the usable energy. While materials like tetracene can support this process, efficiently capturing the resulting excitons has remained difficult.

“The energy can be easily ‘stolen’ by a mechanism called Förster resonance energy transfer (FRET) before multiplication occurs,” Sasaki explains. “We therefore needed an energy acceptor that selectively captures the multiplied triplet excitons after fission.”

To solve...

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New catalyst makes plastic upcycling 10x more efficient than platinum

Science Daily · 13 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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Beyond lipid nanoparticles: How custom polymers and AI may reshape gene therapies

Phys Org · 26 Mar 2026

by Torsten Fischer, Helmholtz Association of German Research Centres

Nucleic acids such as DNA and RNA play a central role in gene therapies and vaccines. They store and transmit biological information. In order for them to work in the body, they must enter the cells using chemical carrier systems. Researchers at the Helmholtz-Zentrum Hereon are now proposing a new strategy for developing such systems: instead of using the same carrier material for different nucleic acids, the carrier should be individually adapted to the respective payload. This could improve the effectiveness of vaccines, for example.

The study was conducted in collaboration with the University of Potsdam and Panthera Therapeutics and has been published in the journal *Advanced Science*.

DNA and RNA are rapidly broken down in the body and cannot cross cell membranes on their own. They also encounter the immune system in the organism.

"Our body's protective mechanisms work against these biologically active substances that we want to deliver specifically to the cell," explains Dr. Hanieh Moradian, a researcher at the Institute for Active Polymers at Hereon's Teltow site near Berlin. "A transport system must be able to overcome these barriers without causing damage."

Such carrier systems package the nucleic acids, protect them as they travel through the body, and facilitate their entry into the cell. Today, lipid-based nanoparticles dominate clinical use, known from COVID-19 vaccines, for example. They are efficient, but also have disadvantages such as limited stability.

This is where a new generation of polymer-based carrier systems comes in. "A major advantage of polymers is that they can be chemically modified in a targeted manner," says Moradian.

"This makes it possible to adapt their structure, make them more stable, or modify them so that they remain active in the body for longer." They could be particularly interesting for applications involving delayed or long-term drug release.

Until now, individual polymer carriers have often been used for multiple nucleic acids.

The researchers are now proposing a new design perspective . It aims to tailor carrier systems specifically to the properties of the payload and thus optimize them for the respective application—from cancer research to vaccines to regenerative medicine.

The approach distinguishes between four levels: the chemical structure, size, and mobility of the payload and carrier, their interactions, and the embedding of the carriers in larger structures. The latter has hardly been researched, but could enable controlled, long-term release of...

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This Common Lab Item Could Be Faking Microplastics Pollution

Sci Tech Daily · 26 Mar 2026

The tools meant to detect microplastics—lab gloves—might be quietly skewing the results.

A new University of Michigan study suggests that nitrile and latex gloves, commonly used in labs, could be causing scientists to overestimate levels of microplastics.

Researchers found that these gloves can unintentionally contaminate the equipment used to analyze air, water, and other samples. The contamination comes from particles called stearates, which are not plastics but can closely resemble them during testing. Madeline Clough and Anne McNeil of U-M recommend switching to cleanroom gloves, which release far fewer particles.

Stearates are salt-based, soap-like substances. They are added to disposable gloves during manufacturing to help them separate easily from molds. However, because stearates share chemical similarities with certain microplastics, they can be misidentified during analysis, leading to false positives.

The researchers emphasize that microplastics pollution is still a real and serious issue.

"We may be overestimating microplastics, but there should be none," said McNeil, senior author of the study and U-M professor of chemistry, macromolecular science and engineering, and the Program in the Environment. "There's still a lot out there, and that's the problem."

Clough added, "As microplastic researchers looking for microplastics in the environment, we're searching for the needle in the haystack, but there really shouldn't be a needle to begin with."

Led by Clough, a recent doctoral graduate, the study appears in the journal *RSC Analytical Methods* . Funding was provided by the U-M College of Literature, Science, and the Arts' Meet the Moment Research Initiative.

The investigation began as part of a collaborative effort to study airborne microplastics in Michigan. The project involved faculty and students from multiple U-M departments, including Chemistry, Statistics, and Climate and Space Sciences Engineering. Clough and McNeil worked with collaborators such as chemistry professor Andy Ault and graduate students Rebecca Parham and Abbygail Ayala to collect air samples.

To gather data, the team used air samplers equipped with metal surfaces that capture particles from the air. These collected particles were then analyzed using light-based spectroscopy to identify their composition.

Clough prepared the sampling surfaces while wearing nitrile gloves, following standard practices in the field. However, when she analyzed the results, the number of detected microplastics was thousands of times higher than expected.

"It led to a wild goose chase of trying to figure out where this contamination could possibly have come from, because we just knew this number was far too high..."

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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 CO₂ 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 CO₂. 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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Boron plays a key role in new sleeping sickness drug

Chemistry World · 26 Mar 2026

In February, the European Medicines Agency (EMA) adopted a positive scientific opinion on acoziborole, the first single-dose treatment for both early and late stage sleeping sickness, paving the way for registration and distribution in sub-Saharan African countries affected by the disease. The benzoxaborole compound will become only the sixth licenced medicine to contain boron, whose chemistry is crucial to the drug's efficacy. Charles Mowbray, discovery director at the Drugs for Neglected Diseases initiative (DNDi) says it's not the only active molecule of this class. 'We're quite excited that there could be other uses for benzoxaboroles for parasitic diseases.'

Acoziborole's boron atom provides crucial flexibility to reach parasite infections both in the brain and elsewhere in the body, while the benzoxaborole ring structure slows metabolism and extends its half-life

DNDi is a collaborative drug research and development non-profit, headquartered in Geneva, Switzerland. It brought together public and private partners over two decades, with funding from the Gates Foundation, to develop the drug. Sanofi will now manufacture acoziborole, which will be distributed free of charge via the World Health Organization (WHO). Their ambition is to eliminate the disease by 2030. 'We hope that we will see approval for marketing first in the Democratic Republic of Congo later this year, with other countries hopefully to follow,' says Mowbray

The EMA decision is part of its EU-Medicines for all programme which leads to prequalification of the medicine by the WHO and enables faster registration in relevant countries. Established in 2004, the initiative aims to facilitate patient access to safe, effective, and quality medicines in low- and middle-income countries based on the same rigorous standards as medicines intended for use in Europe.

Sleeping sickness or Human African trypanosomiasis (HAT), is caused by the *Trypanosoma brucei* parasite and transmitted by infected tsetse flies. If untreated, the parasite can enter the brain and ultimately cause death. According to the DNDi there were 40,000 cases reported in 1998, with a suspected further 300,000 going undiagnosed. At that time the only late stage treatment was a painful and toxic injectable arsenic derivative. But the DNDi and others developed several improvements – including in 2018 the first oral 10-day treatment, fexinidazole, a nitroimidazole antimicrobial, which reduced cases to 600 a year.

Now acoziborole offers the real hope for disease eradication, says co-inventor Robert Jacobs. Now retired, Jacobs was head of chemistry at boron drug specialist Anacor Pharmaceuticals, which created...

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CURIOSITIES

After 60 Years, Diabetes Drug Revealed to Unexpectedly Affect The Brain

sciencealert.com · 25 Mar 2026

Metformin has been prescribed to people with type 2 diabetes to manage blood sugar for more than 60 years, but scientists haven't been exactly sure how it works - until now.

A recent study suggests it works directly in the brain, which could lead to new types of treatment.

Researchers from the Baylor College of Medicine in the US identified in 2025 a brain pathway that the drug seems to work through, in addition to the effects it has on biological processes in other areas of the body.

"It's been widely accepted that metformin lowers blood glucose primarily by reducing glucose output in the liver. Other studies have found that it acts through the gut," said Makoto Fukuda, a pathophysiologicalist at Baylor.

"We looked into the brain as it is widely recognized as a key regulator of whole-body glucose metabolism. We investigated whether and how the brain contributes to the anti-diabetic effects of metformin."

Watch the clip below for a summary of their findings;

Previous work by some of the same researchers had identified a protein in the brain called Rap1 as having an impact on glucose metabolism, particularly in a part of the brain called the ventromedial hypothalamus (VMH).

In their 2025 study, tests on mice showed metformin traveling to the VMH, where it helps tackle type 2 diabetes by essentially turning off Rap1.

When the researchers bred mice without Rap1, metformin then had no impact on a diabetes-like condition – even though other drugs did.

It's strong evidence that metformin works in the brain, through a different mechanism than other drugs.

The team was also able to take a close look at the specific neurons metformin was affecting. Further down the line, that could lead to more targeted treatments that take aim at these neurons specifically.

"We also investigated which cells in the VMH were involved in mediating metformin's effects," said Fukuda.

"We found that SF1 neurons are activated when metformin is introduced into the brain, suggesting they're directly involved in the drug's action."

Metformin is long-lasting and relatively affordable. It works by reducing the glucose produced by the liver and increasing how efficiently the body uses insulin, helping to manage the symptoms of type 2 diabetes.

Now we know it very probably works through the brain, as well as the liver and the gut.

Clearly, this needs to be shown in human studies as well, but...

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Newfound giant virus holds clues to how complex life evolved

refractor.io · 26 Mar 2026

For more than two decades, giant viruses have unsettled one of biology's most fundamental boundaries: the line between simple viruses and complex cells. With genomes rivaling some bacteria, and gene sets that resemble those of eukaryotes (cells with membrane-bound nuclei and other internal compartments), they have forced scientists to rethink how cellular complexity may have emerged. A newly discovered giant virus now sharpens that debate, offering fresh clues about how the defining feature of most complex life, the nucleus, may have evolved.

In a study published in the *Journal of Virology*, researchers have describe ushikuvirus, a large DNA virus isolated from a freshwater pond in Ibaraki Prefecture, near the Tokyo metropolitan area. The virus infects the amoeba *Vermamoeba vermiformis*. Genetic comparisons place it closest to clandestinovirus, forming a distinct branch that sits near the giant DNA virus family Mamonoviridae, which includes the nucleus-interacting medusaviruses.

That relationship matters because medusaviruses have long occupied a provocative position in evolutionary debates. Medusavirus replicates its genome inside the host cell nucleus and encodes several eukaryote-like proteins, including a full set of histones, proteins that help package and organize DNA.

In 2001, researchers Masaharu Takemura and Philip Bell proposed what became known as the viral eukaryogenesis hypothesis, suggesting that a virus-like "virion factory" in an ancestral cell may have evolved into the modern eukaryotic nucleus. In other words, the idea argues a key evolutionary step towards complex life like plants and animals was triggered by a virus infecting another cell.

Ushikuvirus enters that debate as both a relative and a complication. Like medusavirus, it encodes a full set of histones. But its behavior inside the cell diverges in a striking way.

"Ushikuvirus also encodes eukaryote-like proteins such as full-set of histones but has an interestingly different mechanism to replicate its genome," Takemura explained to Refractor in an email. "Ushikuvirus destroys its host nuclear membrane and makes a 'virion factory' in former nuclear site."

Rather than replicating inside an intact nucleus, ushikuvirus dismantles the nuclear membrane and establishes its replication center in what had been nuclear space. Closely related viruses, in other words, appear to have adopted different strategies for interacting with one of the defining structures of complex cells.

Takemura cautions that ushikuvirus is only one relative within this broader viral group and does not, by itself, strengthen the viral eukaryogenesis hypothesis. Instead, he argues that researchers must better understand how virus–nucleus interactions...

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This 2-pound dinosaur is rewriting what scientists know about evolution

Science Daily · 3 Feb 2026

Researchers have identified a 90 million year old fossil that helps solve a long standing mystery about a strange group of prehistoric animals. The discovery was led by University of Minnesota Twin Cities scientist Peter Makovicky along with Argentine paleontologist Sebastian Apesteguía.

Their findings, published in the peer reviewed journal Nature, describe a nearly complete skeleton of *Alnashetri cerropolicensis*. This dinosaur belonged to a peculiar group of bird like theropods called alvarezsaurids. These animals are known for their tiny teeth and unusually short arms that end in a single enlarged thumb claw.

For decades, scientists struggled to understand this group because most well preserved fossils had been discovered in Asia. Fossils from South America were often incomplete, leaving major gaps in the evolutionary story.

Patagonia Discovery Provides a Crucial Specimen

The almost complete *Alnashetri* fossil was uncovered in 2014 in northern Patagonia, Argentina, at a fossil rich site famous for exceptionally preserved Cretaceous animals. The species had originally been named several years earlier based on fragmentary remains, but the new skeleton provided a far clearer view of the animal's unusual body structure.

Preparing the specimen was a slow and careful process. Over the past decade, researchers meticulously cleaned and assembled the delicate bones to prevent damage to the small and fragile skeleton.

"Going from fragmentary skeletons that are hard to interpret, to having a near complete and articulated animal is like finding a paleontological Rosetta Stone," said Peter Makovicky, lead author of the study and a professor in the University of Minnesota Department of Earth and Environmental Sciences. "We now have a reference point that allows us to accurately identify more scrappy finds and map out evolutionary transitions in anatomy and body size."

The fossil is providing scientists with valuable insight into how this lineage of dinosaurs evolved, became smaller, and spread across ancient continents.

Insights Into the Evolution of Tiny Dinosaurs

The skeleton reveals that *Alnashetri* differed from its later relatives in several ways. It had longer arms and larger teeth, showing that some alvarezsaurids had already evolved very small body sizes before developing the specialized features that later species used for what scientists believe was an "ant-eating" diet.

Microscopic examination of the bones also showed that the animal was fully grown and at least four years old. These dinosaurs rank among the smallest known non avian dinosaurs, and they remained small throughout their lives. Even the largest...

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Researchers gene-edit the bitterness out of grapefruit

refractor.io · 26 Mar 2026

In the late 1990s, molecular biologist Yoram Eyal, and colleagues at The Volcani Center in Israel, identified the key gene and enzymes responsible for producing the bitterness compounds in grapefruit. Now, using the genome editing technology CRISPR/Cas9, the team has inactivated the gene in a type of grapefruit (*Citrus paradisi*) to eliminate that bitter taste.

"We started from basic research, established the pathway that generates bitter compounds in citrus, and, using genome editing, brought this to agricultural practice to develop new varieties in which the taste was modified," Yoram Eyal told Refractor in an interview. "I think basically it's opening up a bigger market for grapefruits or for any kind of future citrus varieties."

The bitterness receptors on our tongue are significantly more diverse than the other taste receptors. The scientists believe that it allows us to detect a wide array of toxic compounds in our food. Since we still have a limited group of receptors, we "will have off-targets," explains Eyal. Many nutritious compounds are harmless and healthy, for example, but this survival mechanism perceives them as bitter.

For adults who eat bitter foods like grapefruit, they have likely developed an acquired taste for these bitter compounds. The food becomes pleasant through repeated exposures. However, children are generally more sensitive to the bitterness, which can make them turn away from the healthy foods, missing out on several nutritious perks.

Geoffrey Thomson, a plant genome engineer at Yale University who wasn't involved in the study, says that removing bitterness in citrus fruits such as grapefruit is a trait that many consumers of citrus juice would find appealing.

However, eliminating a specific trait from a tree is "more technical and difficult" than genome editing in crops, says Eyal. Previous studies have identified a gene called 1,2RhaT, as a key to bitterness, and in the new research, published in *The Plant Journal*, the team introduced small mutations to this specific gene. This tiny error forced the plant to stop biosynthesizing the protein, effectively abolishing the bitter chemicals.

Analyses of the leaves from the modified plant show no detectable bitter compounds such as naringin, neohesperidin, or poncirin. It should be noted that the study found the metabolic compounds only in the leaves, however the team expects identical results from the fruit as well.

Thompson says that the work is still preliminary because citrus trees have a long juvenile period, so the tree...

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Sperm Get Lost in Space and Scientists Finally Know Why

Sci Tech Daily · 26 Mar 2026

Having a baby in space may be far more complicated than expected, as new research shows sperm struggle to find their way in microgravity.

Starting a family beyond Earth could be more complicated than expected. New research from Adelaide University shows that sperm have a harder time finding their way in low gravity, suggesting that gravity plays an important role in successful reproduction.

Scientists from the Robinson Research Institute, the School of Biomedicine, and the Freemasons Centre for Male Health and Wellbeing explored how space-like conditions affect sperm navigation, fertilisation, and early embryo development.

To test this, sperm from three mammal species, including humans, were placed in a 3D clinostat machine created by Dr. Giles Kirby at Firefly Biotech. This device simulates zero gravity by continuously rotating cells, leaving them disoriented. The sperm were then guided through a maze designed to replicate the female reproductive tract.

"This is the first time we have been able to show that gravity is an important factor in sperm's ability to navigate through a channel like the reproductive tract," said senior author Dr. Nicole McPherson from Adelaide University's Robinson Research Institute.

"We observed a significant reduction in the number of sperm that were able to successfully find their way through the chamber maze in microgravity conditions compared to normal gravity.

"This was experienced right across all models, despite no changes to the way sperm physically move. This indicates that their loss of direction was not due to a change in motility but other elements."

Researchers found that adding the hormone progesterone, which plays a key role in establishing pregnancy, improved navigation in human sperm under simulated microgravity conditions.

"We believe this is because progesterone is also released from the egg and can help guide sperm to the site of fertilization, but this warrants further exploration as a potential solution," said Dr. McPherson.

The team also examined how microgravity exposure during fertilisation affects embryo development in animal models.

They found that after four hours in simulated zero gravity, the number of successfully fertilised mouse eggs dropped by 30 per cent compared to normal Earth conditions.

"We observed reduced fertilisation rates during four-to-six hours of exposure to microgravity. Prolonged exposure appeared to be even more detrimental, resulting in development delays and, in some cases, reduced cells that go on to form the fetus in the earliest stages of embryo formation," said Dr. McPherson.

"These insights..."

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Most people get food's environmental impact completely wrong, study finds

Science Daily · 29 Sep 2026

A new study offers fresh insight into how people judge the environmental impact of the foods they eat, and the results suggest many are getting it wrong. These misunderstandings point to a clear need for simple environmental impact labels to help guide better choices.

Researchers from the University of Nottingham's School of Psychology asked 168 participants in the UK to sort a wide variety of supermarket foods into environmental impact categories of their own making. The findings revealed consistent misconceptions about which foods are more or less harmful to the environment. The study was published in the Journal of Cleaner Production .

Why Food Choices Matter for the Environment

Food production plays a major role in environmental issues, including greenhouse gas emissions and biodiversity loss. Encouraging more sustainable eating habits depends in part on understanding how people perceive the environmental footprint of different foods.

Scientists measure a food's environmental impact using a life cycle assessment, which tracks the entire process from production to disposal. This "cradle-to-grave" approach considers inputs such as fertilizer, water, and energy, along with outputs like emissions and waste. It evaluates multiple factors, including greenhouse gas emissions (often as CO₂ equivalents), land use, and water use.

Study Examines Real-World Grocery Choices

Earlier research has typically focused on a limited selection of foods. This project, funded by the UKRI's Smart Data Research UK, is the first to explore how people perceive the environmental impact of a broad range of products commonly found in a typical grocery shop.

Participants were also shown scientific estimates of each product's environmental impact and asked whether the results were higher or lower than they expected.

Key Misconceptions About Food and Sustainability

The study found that people tend to judge food impact using two main factors: whether the food comes from animals or plants, and how processed it is. In general, participants assumed that meat and dairy products, as well as highly processed foods, are worse for the environment.

However, these assumptions do not always match reality. Many participants overestimated the environmental impact of processed foods while underestimating the impact of water-intensive products (e.g. nuts). They were also surprised to learn how much higher the environmental impact of beef is compared to other meats like chicken.

Labels Could Help People Make Better Choices

Daniel Fletcher, Postdoctoral researcher from the School of Psychology is lead author on the study, he said: "We designed an..."

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Bioluminescent bacterial partner proves essential for squid development

Phys Org · 26 Mar 2026

by Marcie Grabowski, University of Hawaii at Manoa

The Hawaiian bobtail squid, a small, multi-colored native of coastal waters in Hawai'i, uses bioluminescence to camouflage itself and evade predators. However, the costume change is only possible through an exclusive symbiotic relationship with a bacterial partner, *Vibrio fischeri*, which the squid recruits from the ocean environment. A new study , published in Proceedings of the National Academy of Sciences , led by researchers at the University of Hawai'i (UH) at Mānoa

revealed that the benefit of the partnership extends far beyond light-production: the bacteria were found to play a vital role in the healthy development of the squid.

"Our recent work revealed that in order to develop properly, the squid host requires a protein provided by its bacterial symbiont," said Jill (Kuwabara) Smith, lead author of the study, who was a postdoctoral researcher at the Pacific Biosciences Research Center (PBRC) in the UH Mānoa School of Ocean and Earth Science and Technology at the time of this research. "This was very surprising, but given that the work we do with this symbiosis model is always pioneering, just about every new finding is a surprise."

Many bacteria secrete tiny packets, called outer membrane vesicles, from the surface of their cells. These vesicles can contain proteins, enzymes, genetic material, or infectious agents if the bacteria are pathogenic. Previous research found that *Vibrio fischeri* includes in these packets a protein referred to as SypC, which is important for initiating the host-microbe connection.

"Once the bacteria and its vesicles are inside the squid host, the new research found that the SypC assumes a new function—it prompts development of the light-organ itself," Smith shared.

While SypC is a microbial protein and its necessity for squid development seemed unlikely, the research team made a striking discovery: the absence of SypC in bacterial vesicles led to significant developmental disruptions in the squid host. The scientists then chemically attached a fluorescent tag to SypC and used fluorescence confocal microscopy to track how the protein moved throughout the squid. They also monitored gene expression in squid with and without SypC.

Their observations revealed that hemocytes, specialized immune cells that are responsible for removing pathogenic microbes, interact with the bacterial vesicles and transport the bacteria to a distant site where they are essential for induction of light organ development. Further, they found that within squid, the expression of 138 genes...

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Scientists discover hormone that may stop chronic back pain at its source

Science Daily · 24 Jan 2026

Low back pain (LBP) is one of the most widespread health issues globally, affecting people across all age groups and putting significant strain on healthcare systems. For many, the pain becomes long-lasting, disrupting work, sleep, and everyday life. In most cases, however, doctors cannot pinpoint a clear structural cause, which makes effective long-term treatment challenging.

A new study published in Volume 14 of the journal *Bone Research* suggests that a hormone-based treatment could help ease chronic back pain by reducing abnormal nerve growth within damaged spinal tissue. The research was led by Dr. Janet L. Crane from the Center for Musculoskeletal Research, Department of Orthopedic Surgery, Johns Hopkins University School of Medicine, United States. The findings offer new insight into how bone cells may influence pain signaling in degenerating spines.

"During spinal degeneration, pain-sensing nerves grow into regions where they normally do not exist. Our findings show that parathyroid hormone can reverse this process by activating natural signals that push these nerves away," says Dr. Crane.

Understanding Parathyroid Hormone and Its Effects

Parathyroid hormone (PTH) is naturally produced by the parathyroid glands and plays a key role in regulating calcium levels and bone remodeling. Synthetic versions of PTH are already used to treat osteoporosis. Earlier research hinted that these treatments might also reduce bone-related pain, but the underlying biological mechanism was not well understood.

To explore this further, the research team used three mouse models that replicate common causes of spinal degeneration: natural aging, surgically induced mechanical instability, and genetic susceptibility. These models allowed scientists to study how degeneration affects both bone structure and nerve growth. The mice received daily injections of PTH for periods ranging from two weeks to two months, while control animals were given inactive solutions. Researchers then examined spinal tissue using high-resolution imaging and measured responses to pressure, heat, and movement.

Improved Spine Structure and Reduced Pain Sensitivity

After one to two months of treatment, mice treated with PTH showed clear improvements in their vertebral endplates, the thin layers that separate spinal discs from vertebrae. These structures became denser and more stable. At the same time, treated mice showed reduced sensitivity to pain, tolerated pressure better, responded more slowly to heat, and displayed increased activity compared to untreated animals.

How PTH Reduces Pain-Causing Nerve Growth

The researchers also examined nerve fibers within the spine. In damaged tissue, pain-sensing nerves often extend into areas where they do...

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Scientists “Bottle the Sun” With Revolutionary Liquid Battery

Sci Tech Daily · 26 Mar 2026

A newly engineered molecule acts like a “rechargeable” solar heat battery, storing sunlight and releasing it on demand.

Solar energy has one persistent weakness: it disappears at sunset. Finding a reliable way to store that energy for later use remains one of the biggest obstacles to expanding renewable power.

A research team at UC Santa Barbara may have found an unexpected workaround. Instead of relying on conventional batteries, they created a small organic molecule that captures sunlight, locks that energy into its structure, and releases it later as heat. The work, published in *Science*, introduces a new version of Molecular Solar Thermal (MOST) storage using a compound called pyrimidone.

“The concept is reusable and recyclable,” said lead author Han Nguyen, a doctoral student in the Han Group.

To understand the idea, Nguyen points to a familiar example. “Think of photochromic sunglasses. When you’re inside, they’re just clear lenses. You walk out into the sun, and they darken on their own. Come back inside, and the lenses become clear again,” Nguyen said. “That kind of reversible change is what we’re interested in. Only instead of changing color, we want to use the same idea to store energy, release it when we need it, and then reuse the material over and over.”

To build this molecule, the researchers turned to DNA for inspiration. The pyrimidone structure resembles a DNA component that can reversibly change its form when exposed to UV light.

By creating a synthetic version, the team designed a molecule capable of repeatedly storing and releasing energy. They worked with Ken Houk, a distinguished research professor at UCLA, using computational modeling to understand how the molecule can hold energy while remaining stable for years.

"We prioritized a lightweight, compact molecule design," Nguyen said. "For this project, we cut everything we didn't need. Anything that was unnecessary, we removed to make the molecule as compact as possible."

Unlike solar panels that generate electricity, this system stores solar energy in chemical form. The molecule behaves like a coiled spring. When exposed to sunlight, it shifts into a strained, high energy configuration. It remains in that state until triggered by heat or a catalyst, which allows it to return to its original form and release the stored energy as heat.

"We typically describe it as a rechargeable solar battery," Nguyen said. "It stores sunlight, and it can be recharged."

The material shows...

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Women over 50 lost 35% more weight with this surprising combo

Science Daily · 15 Jul 2026

A Mayo Clinic-led study reports that postmenopausal women using menopausal hormone therapy experienced significantly greater weight loss when taking tirzepatide, a Food and Drug Administration-approved medication for overweight and obesity. On average, these women lost about 35% more weight compared to those using tirzepatide alone. The results, published in *The Lancet Obstetrics, Gynaecology, & Women's Health*, point to new possibilities for treating obesity and related health conditions in women after menopause.

Menopause is often associated with increased weight gain and a higher risk of developing overweight and obesity. These changes can raise the likelihood of serious health problems, including cardiovascular disease and type 2 diabetes. In addition to weight gain, declining estrogen levels during menopause can trigger other changes in the body that may further increase cardiovascular risk. "This study provides important insights for developing more effective and personalized strategies for managing cardiometabolic risk in postmenopausal women," says Regina Castaneda, M.D., postdoctoral research fellow at Mayo Clinic and first author of the study.

Exploring the Role of Hormone Therapy in Weight Loss

Hormone therapy remains the most effective first-line option for relieving common menopausal symptoms such as hot flashes and night sweats, which affect up to 75% of postmenopausal women. However, its potential role in enhancing weight-loss medications has not been well understood. Earlier studies have suggested that women using hormone therapy may lose more weight when treated with GLP-1-based drugs like semaglutide, but data on tirzepatide had been lacking.

To address this gap, researchers analyzed data from 120 adults with overweight or obesity who were treated with tirzepatide for at least 12 months. They compared outcomes between those who

also used hormone therapy and those who did not, ensuring both groups had similar baseline characteristics.

The analysis showed that women receiving both treatments lost significantly more weight. "In this observational study, women who used menopausal hormone therapy lost about 35% more weight than women taking tirzepatide alone. Because this was not a randomized trial, we cannot say hormone therapy caused additional weight loss," says Maria Daniela Hurtado Andrade, M.D., Ph.D., endocrinologist at Mayo Clinic and senior author of the study.

"It is possible that women using hormone therapy were already engaged in healthier behaviors, or that menopause symptom relief improved sleep and quality of life, making it easier to stay engaged with dietary and physical activity changes."

Potential Synergy Between Estrogen and GLP-1 Medications

Although more controlled studies...

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REACH UPDATE

ECHA CHEM tutorial: how to request confidentiality for notifier names under CLP

18 Mar 2026

This short step-by-step video explains how to request confidentiality for notifier names in our chemical database, ECHA CHEM.

The tutorial shows where to set the confidentiality flag in IUCLID, how to provide a valid justification, and how to ensure your dossier is complete before submission.

We will start publishing names of companies that have submitted information to the Classification and Labelling Inventory following the change in the Classification, Labelling and Packaging (CLP) Regulation.

If you wish to keep your company name confidential, you need to make a request before 30 June 2026.

[Source URL not provided — add manually]

REGULATORY UPDATE

ASIA PACIFIC

Australia's pesticide regulator sets new rules banning some rat baits from public sale

ABC News · 11 Mar 2025

The Australian Pesticides and Veterinary Medicines Authority has declared second-generation anticoagulant rodenticides a restricted chemical product.

The ruling means popular, commercially available rat baits could only be sold to licensed operators, such as pest controllers.

The AVPMA will work with state and territory governments to enact the ban in coming months.

Over-the-counter rat baits could soon be taken off shelves after a federal regulator announced it would be declaring significant restrictions on popular commercially available poisons.

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Safe Work Australia has published a summary of feedback received during public consultation for the Best Practice Review of the model Work Health and Safety (WHS) laws

Safe Work Australia · 17 Mar 2026

Safe Work Australia received 1055 written responses, of which 118 were written submissions and the rest were survey responses, visited each capital city and 2 regional centres (Bunbury in Western Australia and Geelong in Victoria), and held over 100 meetings – gathering insights from employers, industry associations, unions, regulators, government agencies, academics, WHS professionals, community organisations, individuals, and families affected by workplace fatalities and serious injuries.

The consultation summary published today outlines key themes and issues raised through submissions, surveys and meetings.

Key messages:

Strong ongoing support for the model WHS laws and the goal of national harmonisation – but growing concern about jurisdictional variations

Differences in compliance and enforcement are undermining harmonisation and creating complexity

Unions want to improve worker consultation, representation and participation rights

Businesses want WHS laws that are simple to understand and industry based

There needs to be a greater focus on emerging risks, including digital work, artificial intelligence and climate-related hazards.

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AMERICA

FDA Takes New Approach To “No Artificial Colors” Claims

Bergeson & Campbell, P.C., 17-02-26 · 17 Feb 2026

On February 5, 2026, FDA announced that companies will now have the flexibility to claim that products contain “no artificial colors” when the products do not contain petroleum-based colors. FDA released a public letter addressed to the food industry stating “FDA does not intend to take enforcement action as to section 403(a)(1) of the FD&C Act against a firm that makes certain voluntary labeling claims on foods intended for human consumption that do not contain any FD&C Act certified colors.” FDA states that the current definition of artificial color, which does not differentiate between colors derived from natural sources and other color (e.g., from petroleum sources), “may create challenges to transitioning away from FD&C Act certified colors.”

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Perchlorate/Safe Drinking Water Act: Institute of Hazardous Materials Management Comments on U.S. EPA's Proposed Primary Drinking Water Regulation

JD Supra · 17 Mar 2026

The Institute of Hazardous Materials Management (“IHMM”) submitted March 2nd comments to the United States Environmental Protection Agency (“EPA”) regarding EPA's proposed Safe Drinking Water Act National Primary Drinking Water Regulation (“NPDWR”) for perchlorate.

EPA published in the January 6th Federal Register the proposed NPDWR for perchlorate. See 91 Fed. Reg. 398.

Perchlorate is often utilized in signal flares, munitions, fireworks, airbag initiators for vehicles, and solid rocket propellants. However, it can occur naturally in arid regions such as the Southwestern United States. It has been a focus of EPA review for many years.

EPA noted in proposing the NPDWR that it was required to do so by the District of Columbia Circuit Court of Appeals in *NRDC v. Regan* in 2023. The D.C. Circuit had vacated and remanded EPA's July 2020 withdrawal of its determination to issue a drinking water regulation for perchlorate.

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Framework for the risk assessment of manufactured nanomaterials

Government of Canada · 5 Mar 2026

Nanotechnology, which can be described as the manipulation of matter at the nanoscale (about 1 to 100 nanometres), is a technology with enormous innovation potential. Manufactured nanomaterials (NMs) developed using this technology enter the Canadian market across a wide range of applications and industries. Substances, including nanomaterials, are regulated under the Canadian Environmental Protection Act, 1999 (CEPA), which provides the authority to collect information and to assess and manage risks of substances to the environment and human health.

In 2013, the Organisation for Economic Co-operation and Development (OECD) recommended its Member Countries apply existing international and national chemical regulatory frameworks to manage the risks associated with manufactured NMs:

“to manage the risks of manufactured nanomaterials, [country members should] apply the existing international and national regulatory frameworks or other management systems, adapted to take into account the specific properties of manufactured nanomaterials” (OECD 2013).

As such, the principles used for the assessment of substances in Canada are appropriate for the assessment of NMs with necessary modifications to address the specificities of NMs. This framework provides guidance on adapting the existing practices for risk assessment to account for the novel properties exhibited by substances at the nanoscale in accordance with the OECD recommendation.

The framework is divided into three sections. Section 1 introduces the context, the scope, and the purpose of the document. It also contains a summary of the policies that support the risk assessment of NMs under CEPA. Section 2 provides an overview of substance risk assessment under CEPA. Although section 2 is not specific to NMs, it provides context on practices and processes generally used under CEPA to assess substances, considering that many of the principles used for the assessment of substances are appropriate for the assessment of NMs. Section 3 presents modifications to those general practices and processes for risk assessment to address the specificities of NMs. Notably, the nanomaterial-specific considerations for risk assessment include discussions on the physical and chemical properties specific for NM identification and characterization, their behaviour, and their potential effects on human health and the environment. Furthermore, section 3 explains how the overall risk characterization of NMs is conducted under CEPA and how uncertainties are weighted into risk characterization.

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Nominations for Substances To Be Evaluated for Toxicological Profile Development

US Agency for Toxic Substances and Disease Registry · 17 Mar 2026

The Agency for Toxic Substances and Disease Registry (ATSDR), within the Department of Health and Human Services (HHS), announces that it is soliciting nominations of substances to be evaluated for an upcoming set of toxicological profiles. ATSDR is opening a docket for the public to submit nominations and provide comments on which toxicological profiles are developed next. Members of the public, government agencies, or private organizations may comment on which substances they are concerned about so that ATSDR may take this information into consideration when developing future toxicological profiles.

DATES:

Written comments must be received on or before May 18, 2026.

ADDRESSES:

You may submit comments, identified by Docket No. ATSDR-2026-0001 by either of the methods listed below. Do not submit comments by email. ATSDR does not accept comments by email.

Federal eRulemaking Portal: <http://www.regulations.gov>. Follow the instructions for submitting comments.

Mail: Agency for Toxic Substances and Disease Registry, Office of Innovation and Analytics, 4770 Buford Highway, Mail Stop S106-5, Atlanta, GA, 30341-3717. Attn: Docket No. ATSDR-2026-0001.

Instructions: All submissions received must include the agency name and Docket Number. All relevant comments received will be posted without change to <http://www.regulations.gov>, including any personal information provided. For access to the docket to read background documents or comments received, go to <http://www.regulations.gov>.

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EUROPE

Upcoming EU active substance renewal submission deadlines

UK HSE · 18 Mar 2026

Apply for active substance renewal by the relevant deadlines to keep products on the NI market.

Under the EU Biocidal Products Regulation (EU BPR), active substance approvals will expire unless a renewal application is submitted to ECHA at least 550 days before their expiry date.

The 550-day deadlines are coming up for the following active substance/product type combinations under EU BPR. This affects NI:

29 June 2026

2-bromo-2-(bromomethyl)pentanedinitrile (DBDCB) (CAS 35691-65-7 EC 252-681-0) in product type 6

2-octyl-2H-isothiazol-3-one (OIT) (CAS 26530-20-1 EC 247-761-7) in product type 8

amines, N-C10-16-alkyltrimethylenedi-, reaction products with chloroacetic acid (ampholyt 20) (CAS 139734-65-9 EC 701-317-3) in product types 2, 3 and 4

Bacillus amyloliquefaciens strain ISB06 (CAS N/A EC N/A) in product type 3

biphenyl-2-ol (CAS 90-43-7 EC 201-993-5) in product type 3

N-cyclopropyl-1,3,5-triazine-2,4,6-triamine (cyromazine) (CAS 66215-27-8 EC 266-257-8) in product type 18

reaction mass of N,N-didecyl-N-(2-hydroxyethyl)-N-methylammonium propionate and N,N-didecyl-N-(2-(2-hydroxyethoxy)ethyl)-N-methylammonium propionate and N,N-didecyl-N-(2-(2-(2-hydroxyethoxy)ethoxy)ethyl)-N-methylammonium propionate (CAS N/A EC N/A) in product type 8

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'No ordinary clean-up operation': EU deploys drones and robots to remove litter from the sea floor

Euro news · 10 Mar 2026

The EU-funded initiative is helping tidy up the litter-filled sea floor, and could even be used to detect hidden mines.

Futuristic tech, including heavy-lifting robots, is being deployed to help clean up Europe's litter-riddled waters as part of an EU-funded trial.

Scientists and companies behind SeaClear2.0 and its predecessor SeaClear have developed a fleet of drones that can independently identify rubbish lying on the seabed. Robots, which are powered by AI but supervised by humans, can also spot everyday items such as bottles, tyres and other debris and can distinguish litter from rocks, plants and marine life.

The initiative is part of the bloc's Mission Restore our Ocean and Waters – which aims to cut marine litter by around half by 2030. Tests have already been conducted in a marina in Marseille, France as well as in Germany.

Further tests are planned in Venice, Dubrovnik and Tarragona, but experts warn the technology still needs refining.

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Safe and sustainable by design

European Commission · 6 Mar 2026

The Commission Recommendation in a nutshell

The Commission Recommendation on the European assessment framework for 'safe and sustainable by design' (SSbD), revised in March 2026, aims at promoting a voluntary decision-making approach to guide innovation towards chemicals and materials that are safer and more sustainable over the whole life cycles.

It offers support for:

enhancing competitiveness by efficiently steering innovation processes and advancing knowledge and science towards safer and more sustainable alternatives, thereby also supporting the transition towards cleaner and more sustainable industries

substituting or minimising the production and use of substances of concern, aligning but also including actions going beyond minimum legal compliance

minimising health, climate, and environmental impacts during the sourcing, production, use, and end-of-life stages of chemicals, materials, and products

This Recommendation does not create nor interfere with Union legal obligations for chemicals and materials but will serve as a guide for anticipatory actions and decisions within the innovation process.

To whom is it addressed?

This Recommendation is addressed to Member States, industry (including small- and medium-sized businesses (SMEs), startups, scaleups and spin-offs), higher education institutions, organisations managing research and technology infrastructures, and research and technology organisations that contribute to or work on the design, development, production and uptake of chemicals and materials.

It invites them to:

use the SSbD Framework in projects and activities related to chemicals or materials, with the objective to apply safety and sustainability considerations systematically

refer to the SSbD Framework in relevant documents, including strategic research and innovation agendas.

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Guidance Testing for asbestos in sand

Gov.uk · 2 Mar 2026

A technical advisory note for businesses and industry on testing for asbestos in consumer products containing sand such as toys, hobby and decorative products.

Technical advisory note

Asbestos is a naturally occurring group of fibrous minerals that occurs in different mineral forms and fibre types. These fibres can vary significantly in their physical characteristics, including length, thickness, and shape. Some asbestos fibres are relatively coarse and more easily detected, while others are extremely thin making them more difficult to identify. All asbestos fibre types, regardless of size, have the potential to pose a health risk if fibres become airborne and are inhaled.

UK regulations prohibit the placing on the market of products containing asbestos fibres due to their classification as carcinogens. This document sets out OPSS' position on the most appropriate testing methodologies for detecting asbestos in consumer products containing sand such as toys, hobby and decorative products.

Polarized Light Microscopy (PLM)

Polarized Light Microscopy (PLM) is an optical microscopy technique that uses polarised light to identify and characterise materials based on their optical properties. PLM can be suitable for materials with relatively high asbestos levels and larger fibres, such as bulk construction materials. However, it is generally not reliable when asbestos is present at low levels, less than ~0.1%, and may miss very fine or thin fibres.

SEM (Scanning Electron Microscopy) and TEM (Transmission Electron Microscopy)

Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) are electron-based laboratory techniques used to detect very small fibres that cannot be reliably identified using standard based optical methods. By using electrons rather than light, these techniques provide a much higher sensitivity and are able to detect asbestos at levels below 0.1% and very fine or thin asbestos fibres.

Recommendation

SEM and TEM are therefore the recommended techniques for detecting asbestos in consumer products containing sand such as toys, hobby and decorative products because they can more reliably identify low asbestos concentrations, below 0.1%, and fine or thin asbestos fibres likely to be present in contaminated products.

Published 2 March 2026

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HAZARD ALERT

Lead

27 Mar 2026

Lead is a chemical element in the carbon group with symbol Pb and atomic number 82. Lead is a soft and malleable metal, which is regarded as a heavy metal. Metallic lead has a bluish-white colour after being freshly cut, but it soon tarnishes to a dull greyish colour when exposed to air. Lead has a shiny chrome-silver lustre when it is melted into a liquid. [1]

Uses [2]

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

Sources of Emission & Exposure

Sources of Emission [3]

- Industry sources: Mining and metal manufacturing are the largest sources of lead emissions in Australia. Water supply, sewerage and draining surfaces, oil and gas extraction and electricity supply can also emit lead. Lead is also emitted as a result of coal mining, cement, lime, plaster and concrete product manufacture, ceramic product manufacturing, transport equipment manufacturing, iron and steel manufacturing, petroleum and coal product manufacturing. Other manufacturing industries where lead may be used include: beverages and malt, paper and paper products, glass and glass products, fabricated and structural metal products, motor vehicles and parts, wood products, ceramic products, food and beverage products, textile, yarn and woven fabrics.
- Diffuse sources: Paved roads, windblown dust, burning fuels or wildfires, solid and liquid fuel combustion, lawn mowing and barbeques (from burning fuel) are all capable of causing emissions of lead.
- Natural sources: Lead and compounds occurs naturally in the earth's crust in rocks and soil.
- Transport sources: Lead emissions may be present from the vehicle exhaust of cars, aeroplanes, railway operations and from recreational and commercial shipping or boating.
- Consumer products: Lead and compounds are used in a range of applications. Lead is used in the production of batteries, ammunition, metal products (solder and pipes) and devices to shield X-rays. Lead was present in petroleum, paints and ceramic products, caulking and pipe solder, however due to health concerns, it is now prohibited to include lead in these products.

Sources of Exposure [4]

- Eating food or drinking water that contains lead;
- Water pipes in some older homes may contain lead solder;
- Lead can leach out into the water;
- Spending time in areas where lead-based paints have been used and are deteriorating;
- Deteriorating lead paint can contribute to lead dust;
- Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass;
- Using health-care products or folk remedies that contain lead

Routes of Exposure [5]

- Ingestion: Lead exposure in the general population occurs primarily through ingestion.
- Inhalation may be the major contributor for workers in lead-related occupations. Almost all inhaled lead is absorbed into the body, whereas from 20% to 70% of ingested lead is absorbed. Since leaded gasoline additives were phased out beginning in the 1970s, and control measures were implemented in industries, which have reduced air emissions, inhalation is no longer the major exposure pathway for the general population.
- Dermal: Dermal exposure plays a role for exposure to organic lead among workers, but is not considered a significant pathway for the general population. Organic lead may be absorbed directly through the skin. Dermal exposure is most likely among people who work with lead.
- Endogenous Exposure: Endogenous exposure to lead may contribute significantly to an individual's current blood lead level, and of particular risk to the developing foetus. Once absorbed into the body, lead may be stored for long periods in mineralising tissue (i.e., teeth and bones). The stored lead may be released again into the bloodstream, especially in times of calcium stress (e.g., pregnancy, lactation, osteoporosis), or calcium deficiency.

Health Effects [6]

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anaemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

Effects in Children

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anaemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth. Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies,

decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

Carcinogenicity

There is no conclusive proof that lead causes cancer in humans. Kidney tumours have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services (DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

Safety [7]

First Aid Measures

- Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.
- Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.
- Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
- Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Exposure Controls & Personal Protection

Engineering Controls

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protective equipment

The following personal protective equipment is recommended when handling lead:

- Safety glasses;
- Lab coat;
- Dust respirator (be sure to use an approved/certified respirator or equivalent);
- Gloves

Personal Protection in Case of a Large Spill:

- Splash goggles;
- Full suit;
- Dust respirator;
- Boots;
- Gloves;

- A self-contained breathing apparatus should be used to avoid inhalation of the product.
- Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Regulation [7,8,9]

Exposure Limits

United States

- OSHA: The Occupational Safety & Health Administration has established a permissible exposure limit (PEL) of 50 micrograms of lead per cubic meter of air, as averaged over an 8-hour period.
- NIOSH: The National Institute of Occupational Safety & Health has set a recommended exposure limit (REL) for lead of 50 micrograms per cubic metre of air ($\mu\text{g}/\text{m}^3$) over 8-hours.
- ACGIH: The American Conference of Governmental Industrial Hygienists has set a threshold limit value (TLV) for lead of 0.05 mg/m^3
- EPA: The Environmental Protection Agency has established a drinking water limit for lead of 0.015 mg/L

Australia

- Safe Work Australia: Safe Work Australia has established a time weighted average concentration of 0.15 mg/m^3 for lead
- The Australia Drinking Water Guidelines specifies a concentration limit for lead of 0.01 mg/L

References

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JANET'S CORNER

Who Am I?

27 Mar 2026

I am the pungent ghost that escaped from your high school chemistry lab, unmistakable and sharp enough to make your eyes water from across the room.

My nitrogen-rich essence makes me indispensable to feeding the world's billions, synthesized on an industrial scale that dwarfs almost every other chemical process.

I am composed of one nitrogen atom bound to three hydrogen atoms, and my production consumes roughly 2% of all the energy humanity generates annually.

My aqueous solution is called ammonia water, I'm widely used as a cleaning agent and refrigerant, and I'm the key ingredient in the Haber-Bosch process that revolutionized agriculture.