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BULLETIN

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JANET'S CORNER

Who Am I?

GOSSIP

Historical accidents show just how long 'forever chemicals' last

refractor.io · 18 May 2026

Ian A. Wright , Amy-Marie Gilpin , & Katherine Warwick , Western Sydney University / The Conversation

The fresh air, picturesque vistas, and pristine bush of the Blue Mountains west of Sydney draw millions of visitors a year.

Unfortunately, the Blue Mountains are also the site of a controversial investigation into water contamination with "forever chemicals", also called PFAS.

Our recent study investigated long-term PFAS contamination from two incidents, both involving petrol tanker crashes and fires. Both accidents occurred in drinking water catchments, and our study found contamination was present but undetected for 24 and 33 years, respectively. We have searched the international literature and could not find similar examples.

PFAS (Perfluoroalkyl and polyfluoroalkyl substances) are a broad category of thousands of synthetic chemicals used in numerous consumer and industry products. Exposure to PFAS is associated with a greater risk of several illnesses.

Our research shows how vulnerable drinking water supplies are to long-term PFAS contamination. It also shows how contamination can remain hidden due to an absence of PFAS monitoring.

The 1992 petrol tanker accident in the Blue Mountains at Medlow Bath caused PFAS contamination of the local drinking water supply. And 32 years later , it forced the closure of two storage reservoirs.

Despite limited data, we identified the source of contamination as a type of foaming material used globally by firefighters to help extinguish burning fuel fires. This foaming substance was mixed with water using perfluorooctane sulfonate , a type of PFAS.

Firefighters used this substance to form a foam "blanket" and coat burning materials and extinguish liquid fires. The PFAS foams were used for decades before their harmful human health and environmental impacts were understood.

Nine years after the first petrol tanker accident, another fuel tanker crash and fire linked to PFAS contamination occurred in 2000, near Ourimbah on the NSW Central Coast. The fuel tanker was carrying 40,000 litres of fuel, and the crash and fire were triggered by a collision with a car. This resulted in the tragic death of two people.

Similar to the Medlow Bath accident, news footage showed water and foam were used to control the blaze. It also showed a foamy runoff draining from the accident.

PFAS, often called “forever chemicals”, are a broad category of thousands of synthetic chemicals . They are used in numerous products , such as non-stick cookware, stain-resistant fabrics, takeaway food packaging and even cosmetics.

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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 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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US officially moves to dismantle drinking water PFAS regulations

Chemistry World · 21 May 2026

Having announced its intentions in May last year, the US Environmental Protection Agency (EPA) has now formally proposed new rules limiting drinking water levels for six per- and polyfluoroalkyl substances (PFAS).

EPA leaders claim the Biden Administration made procedural mistakes in introducing the limits, and that they are correcting those errors

In 2024, president Joe Biden put in place the first ever national, legally enforceable drinking water standards to protect US communities from exposure to PFAS. They set limits at 4 parts per trillion (ppt) for the two most well-known substances, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), and 10ppt for four other PFAS chemicals – perfluorohexane sulfonate (PFHxS), perfluorononanoic acid (PFNA), PFBS, hexafluoropropylene oxide-dimer acid (HFPO-DA, or GenX), and mixtures of these three, plus perfluorobutane sulfonic acid (PFBS) – under the US Safe Drinking Water Act.

PFAS – also known as ‘forever chemicals’ – are a family of an estimated 15,000 synthetic chemicals that have been widely used in consumer products globally since the 1950s. They all share a characteristic carbon chain with multiple fluorine atoms attached. They do not degrade easily in the environment because the carbon-fluorine bond is among the strongest in existence. The unique properties of these substances confer characteristics like repellence to oil, grease and water, as well as temperature resistance and friction reduction. This helps to create products that are non-stick and stain-resistant, for example.

However, PFAS are also highly mobile in the environment and they bioaccumulate, as well as biomagnify, up the food chain. PFOA and PFOS – the best studied of these substances – have been linked to serious health conditions like reproductive and developmental disorders, reduced immune function and certain types of cancer.

In May 2025, EPA administrator Lee Zeldin announced that the agency intended to allow water companies two additional years (until 2031) to comply with the 4ppt limits on PFOS and PFOA, and completely repeal the limits on the remaining substances. At the time, experts told Chemistry World there was no scientific reason to reverse these limits, and that doing so would be a ‘tremendous setback to common sense water stewardship’.

In announcing the proposals on 18 May, Zeldin said the Biden administration had ‘cut corners’ and failed to follow the law when regulating PFAS in drinking water. ‘We are fixing that error with standards water systems can actually implement and that will hold up to scrutiny, while addressing PFOA...

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Canada’s Billion-Year-Old Rocks Could Hold the Future of Clean Energy

Sci Tech Daily · 21 May 2026

Researchers found that ancient rocks beneath Canada are naturally generating and releasing hydrogen gas over long periods of time. The discovery could open the door to a major new source of clean energy hidden within Earth’s crust.

Deep beneath Canada's ancient geological formations, scientists have identified naturally occurring hydrogen gas accumulating inside some of Earth's oldest rocks. The discovery provides the clearest evidence yet that these underground formations could become an important source of clean energy.

Researchers from the University of Toronto and the University of Ottawa directly measured hydrogen emerging from billion-year-old rocks in the Canadian Shield. Their work also tracked how the gas builds up over time and mapped where concentrations are highest. The findings may help determine whether natural, or "white," hydrogen can be commercially developed as a low-carbon energy source.

The study, published in the Proceedings of the National Academy of Sciences, introduces a new way to explore for hydrogen resources and could support efforts to lower greenhouse gas emissions while expanding clean energy production.

The research team collected data from an active mine near Timmins, Ontario. Measurements showed that individual boreholes drilled into the rock release an average of 0.008 tonnes of hydrogen annually, about 8 kilograms, roughly equal to the weight of a standard car battery. According to the researchers, these hydrogen releases can continue for at least 10 years.

Across the mine's nearly 15,000 boreholes, the estimated total hydrogen output exceeds 140 tonnes each year. The scientists calculate that this could provide roughly 4.7 million kilowatts of energy annually from a single site, enough to meet the yearly energy needs of more than 400 homes.

"The data from this study suggests there are critical untapped opportunities to access a domestic source of cost-effective energy produced from the rocks beneath our feet," says University Professor Barbara Sherwood Lollar in the Department of Earth Sciences in the Faculty of Arts & Science at University of Toronto, the lead author of the study. "What's more, this provides a 'made in Canada' resource that might be able to support local and regional industry hubs and reduce their dependence on importing hydrocarbon-based fuels."

Hydrogen already supports a global industry worth approximately \$135 billion. It plays a major role in fertilizer manufacturing, making it essential for agriculture and global food supplies. Hydrogen is also widely used in steel production and methanol manufacturing.

Most hydrogen currently used around the...

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Why promising CO₂-to-fuel catalysts keep falling short of copper

Phys Org · 21 May 2026

by The Korea Advanced Institute of Science and Technology (KAIST)

Technology that converts carbon dioxide (CO₂) into fuels and plastic feedstocks using electricity is gaining attention as a core technology in the era of carbon neutrality. In particular, ethylene and ethanol are high-value materials widely used in the production of plastics, fuels, and chemical products, but until now, the only metal that has effectively produced them has essentially been copper (Cu). Through this study, Korean researchers have revealed the limitations of existing catalyst theories that have explained this principle.

A research team led by Professor Jihun Oh from KAIST's Department of Materials Science and Engineering, through joint research with Professor Stefan Ringe's team from the Department of

Chemistry at Korea University, has identified a new operating principle of the electrochemical CO₂ reduction reaction (CO₂ reduction reaction, a reaction that uses electricity to convert carbon dioxide into other chemical substances). The study is published in the journal Nature Catalysis .

The research team fabricated alloy catalysts made by mixing gold (Au), silver (Ag), and palladium (Pd), and analyzed what substances these catalysts convert CO₂ into.

Existing catalyst theories have predicted that if the "d-band center" (an indicator of the electronic reactivity of a catalyst) and "work function" (the energy required for a metal to release electrons outward), which indicate the reactivity of electrons on the catalyst surface, are similar to those of copper, then the catalyst should be able to produce multi-carbon (C₂₊) compounds such as ethylene and ethanol like copper does.

Using a co-sputtering process (a technique that simultaneously deposits multiple metals as thin films to create a new alloy with a desired ratio), the research team precisely fabricated a ternary alloy (AuAgPd, an alloy made by mixing three metals: gold, silver, and palladium) with electronic properties very similar to those of copper.

However, the actual experimental results were different. This alloy produced simple products such as carbon monoxide (CO), but it did not produce complex multi-carbon compounds such as ethylene or ethanol at all. This means that complex CO₂ conversion reactions are difficult to explain using only the electronic properties of catalysts. In other words, the study confirmed that how atoms are arranged on the catalyst surface also has an important effect on reaction performance.

The research team expects that this study will provide important clues for developing next-generation high-efficiency catalysts that can replace copper in the...

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Electrifying MOF synthesis drastically reduces time it takes to make them

Chemistry World · 19 May 2026

MOF-5 was one of the metal-organic frameworks whose synthesis can be sped up by electric fields

By applying an alternating electric field to the outside of a reaction vessel, chemists have dramatically cut the time it takes to synthesise a range of metal-organic frameworks (MOFs). The researchers behind the work say that this simple method reduces reaction times to less than an hour, without the need for heat or additional catalysts.

Chemists typically make MOFs by reacting dissolved metal salts and organic linkers in a sealed container. However, such solvothermal methods can be energy-intensive, require reactions to be left overnight and lead to the buildup of potentially dangerous pressure in the reaction vessel.

Researchers in China have now taken a different approach by wrapping two ring electrodes around the outside of a glass test tube and applying a voltage. The generated electric field accelerates the formation of various well-known MOFs, such as UiO-66 and MOF-5. Reactions took between 15 and 60 minutes, depending on the metal and organic linker used, cutting the energy and time needed to make these highly porous materials.

Irradiating the reaction mixture of a known zirconium-based MOF with a laser allowed the team to determine the rate of MOF formation and subsequently the activation energy barrier. Analysis revealed that the presence of the electric field reduced the apparent energy barrier by around 20%,

compared with traditional synthesis methods. The researchers suggest this is due to the electric field making the reactants more reactive and lowering the energy required for the two reactants to mix.

The team also found that first activating the metal salt with the electric field before adding the organic linker led to the MOF forming instantly.

Although this method so far only works up to a gram scale, the researchers say that using flat-plate electrodes or multiple electrodes could help further scale up this technology.

C Shi et al , ACS Cent. Sci , 2026, DOI: 10.1021/acscentsci.6c00250

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Cooling copper plates could slash data center energy use by 90%

New Atlas · 20 May 2026

In 2025, data centers consumed 485 TWh of electricity . Thirty percent of that, more than the entire annual power consumption of Sweden, went to cooling. Scientists have developed a 3D-printed copper-plate cooling tech that can slash this figure by over 90%!

The technology combines a mathematical algorithm with 3D printing to create pure copper cooling plates that dramatically outperform conventional cold plates used in direct-to-chip cooling systems. According to the researchers from the University of Illinois Urbana-Champaign, applying the technology across an entire data center could reduce cooling-related electricity consumption from roughly 30% to just 1.1%.

The AI boom has driven data center electricity consumption to staggering levels, to the point that companies are considering building data centers in space to gain more direct access to solar energy! What makes AI's power demand more striking is that one-third of this power has absolutely nothing to do with computation. It all goes to cooling the hardware. A single NVIDIA GB200 chip runs at 1,200 watts, consuming 28.8 kW-hours of electricity daily. That's roughly equivalent to the average daily consumption of a US household , calculated from the total yearly consumption. One chip. But that's not even our pain point.

Due to a phenomenon known as Joule heating – an unavoidable consequence of how they operate at a fundamental level – chips dissipate almost exactly the amount of power they consume as heat. Therefore that GB200 chip also dissipates 1,200 watts of heat. Over an hour, that's enough energy to theoretically boil over 50 cups of water. Again, one chip.

Now imagine thousands to hundreds of thousands of these chips stacked in racks, as they are in large AI data centers. Without intervention, xAI's Colossus 1 data center with its 220,000 GPUs and 300 MW consumption would generate enough heat to raise the temperature of the 785,000-sq-ft space to 1200 °C (2192 °F) in one hour, hotter than molten lava. This is why cooling is a crucial, non-negotiable aspect of running data centers. Cooling systems require electricity.

"Cooling is the bottleneck in computer-chip design," says Behnood Bazmi, mechanical engineer and the paper's first author. "By bridging the gap between computational design and manufacturing capability, our approach provides a pathway for more energy-efficient liquid cooling of chips and other electronics."

Traditionally, data centers have relied on air cooling to prevent computer chips from overheating. In these systems, metal heat sinks are mounted...

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Scientists discover a mysterious silicone pollutant that may be everywhere

Science Daily · 23 Mar 2026

Scientists have identified surprisingly high levels of a little-known silicone pollutant in the atmosphere, raising new questions about possible risks to human health and the climate. The chemicals, known as methylsiloxanes, are commonly used in cosmetics, industrial products, transportation, and household items. Researchers found these compounds across a wide range of environments, from major cities to rural villages and forests.

The study was led by researchers from Utrecht University and the University of Groningen and published in the journal *Atmospheric Chemistry and Physics*.

Hidden Silicone Pollution Found Worldwide

Pollutants such as PFAS and microplastics are already known for their widespread presence in the environment. But methylsiloxanes, a class of water-repelling silicone compounds often used as lubricants, have received far less attention.

For years, scientists believed the methylsiloxanes detected in the atmosphere mainly came from evaporation from personal care products and industrial materials. More recently, however, researchers discovered that ships and motor vehicles release a different form of methylsiloxanes made up of much larger molecules that do not easily evaporate.

The new research shows these larger methylsiloxanes are not limited to traffic-heavy locations. Scientists detected them in urban, coastal, rural, and forest environments, suggesting the chemicals are widespread in the atmosphere.

"The findings also suggest that concentrations of methylsiloxane in the atmosphere are much higher than expected," says Rupert Holzinger, associate professor at Utrecht University who co-supervised the study.

According to the researchers, these large molecular methylsiloxanes account for between 2 and 4.3 percent of the total mass of organic aerosols in the atmosphere, making them among the most abundant synthetic compounds detected in airborne particles. By comparison, atmospheric concentrations of PFAS are typically more than a thousand times lower.

Methylsiloxanes added to lubricants are intended to assist with lubrication rather than combustion. However, during engine operation, moving parts such as pistons require constant lubrication, making it unavoidable that small amounts of engine oil enter the combustion chamber.

Because methylsiloxanes are highly heat resistant and do not fully break down during combustion, some survive the intense temperatures inside engines and are released into the atmosphere through exhaust gases.

The highest concentrations were measured in urban regions. Samples collected in the São Paulo metropolitan area in Brazil reached 98 nanograms per cubic meter. The lowest levels appeared in

forest locations, including Rugstelis, Lithuania, where concentrations measured 0.9 nanograms per cubic meter.

Researchers also collected air samples in Cabauw, a small rural...

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Complexity isn't subjective—the right amount results in new material properties

Phys Org · 21 May 2026

Complexity may seem subjective, but a quantitative measure of the complexity of nanomaterials was recently developed by a team of researchers from the University of Michigan Engineering, the University of Southern California Viterbi School of Engineering and the University of Illinois Urbana-Champaign. Their metric promises to take nanomaterials engineering from a process of discovery to one of design, enabling engineers to produce combinations of properties not seen in natural or existing man-made materials.

The findings also take nanomaterials beyond randomly distributed coatings of nanoparticles or tightly packed crystals, in which building blocks are arranged with a uniform pattern and spacing. Instead, a tunable combination of ordered crystals and randomness—considered the essence of complexity—provides a new knob for designing material properties.

"It's like a structure that has clusters and some bridges that connect these clusters throughout the system, and these interconnected communities of particles give you something new," said Nick Kotov, the Irving Langmuir Distinguished University Professor of Chemical Sciences and Engineering and co-corresponding author of the study recently published in *Science*. He is also the principal investigator of the Center for Complex Particle Systems, or COMPASS, which will harness nanoparticles to build materials with properties rarely, if ever, found in nature.

The team demonstrated the power of their network structures in several nanoparticle systems. In one example, they assembled gold nanoparticles into loose networks of crystal clusters that strongly reflect infrared light—something that suspensions of gold nanoparticles can't do and that gold nanoparticle crystals do poorly. The team also laid out how other researchers can harness complexity in the same way, providing a framework to quantify order and disorder and predict the resulting material properties.

"We show that graph-based measures strongly correlate with material properties and can serve as a new guiding principle for designing future materials for emerging technologies," said Xiaoming Mao, a U-M professor of physics and mechanical engineering in COMPASS and a co-corresponding author of the study. "It allows engineers to harness complexity as a powerful design parameter, opening pathways to capabilities that cannot be achieved with simple materials."

The idea that complexity is a metric related to a material's capabilities was first proposed by physics Nobel laureate Murray Gell-Mann. He defined complex structures as combinations of order and randomness, or disorder, while simple structures contain just one or the other.

Gell-Mann also described how complexity at small scales cascaded up through many larger scales....

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CURIOSITIES

US company claims it made an artificial egg in a plan to 'de-extinct' birds

refractor.io · 20 May 2026

Nic Rawlence , University of Otago / The Conversation

Today's announcement by Texas-based de-extinction company Colossal Biosciences about a successful hatching of chicks from an artificial egg would represent a major innovation, if the claims can be verified.

The company says its artificial egg supports the full development of bird embryos outside a biological eggshell, without the requirement for supplemental oxygen. The work is part of its plan to "de-extinct" birds, including the giant moa and dodo .

Colossal's artificial egg could be groundbreaking science and deliver a useful tool for conservation. But its announcement and slick video include no data or peer-reviewed scientific publications, making it difficult to independently assess the claim.

Artificial egg technology, which involves transferring and growing a developing chick embryo outside a natural eggshell, has been around since the 1980s . Live birds have been hatched from these systems before and grown to adulthood .

The technology is currently used for research purposes such as studying how embryos develop, how tumours grow, and creating genetically modified chickens. It also has applications for drug and vaccine development.

But several stumbling blocks to the widespread use of artificial eggs persist. To improve hatching efficiency, pure oxygen needs to be directly supplied to the developing embryo. This is a double-edged sword because it can also affect chick viability .

Colossal claims to have solved this problem by replacing the hard eggshell and membrane separating the yolk from the shell. Its version is based on the key innovations of an open, latticed half-shell and a transparent, silicone-based membrane that allows oxygen to freely diffuse from the air into the developing embryo.

The company's plan is to transfer a fertilised embryo and yolk from a real egg to their artificial egg, which would then be housed in incubators. Embryo development would be observed directly through the transparent membrane, as in other artificial systems.

Colossal is planning to genetically modify an emu genome to look more like that of a moa (as they did with grey wolves and dire wolves), create an embryo inside an emu egg, and then bring it to term using this new artificial egg.

The technology could also be used in Colossal's attempts to genetically engineer a Nicobar pigeon to look more like a dodo.

Key to Colossal's goal is that its artificial egg could be scaled in size.

However, this still requires a fertilised embryo...

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A common constipation drug shows surprising power to protect kidneys

Science Daily · 19 Feb 2026

Chronic kidney disease (CKD) affects hundreds of millions of people worldwide and is one of the leading causes of kidney failure. As the disease progresses, many patients eventually need dialysis to survive. While current treatments can help slow damage, there are still no approved medications that directly restore kidney function.

Researchers at Tohoku University Graduate School of Medicine uncovered an unexpected possibility involving a drug that has long been used to treat constipation. In a clinical trial, the medication lubiprostone appeared to slow the decline of kidney function in patients with moderate CKD, raising hopes for an entirely new approach to kidney disease treatment.

"We noticed that constipation is a symptom that often accompanies CKD, and decided to investigate this link further," explains Abe. "Essentially, constipation disrupts the intestinal microbiota, which worsens kidney function. Working backwards, we hypothesized that we could improve kidney function by treating constipation."

Doctors have increasingly focused on what researchers call the "gut kidney axis," the complex relationship between intestinal bacteria and kidney health. People with CKD often experience constipation and imbalances in gut microbes, which can contribute to inflammation and the buildup of harmful compounds in the body.

Earlier research had hinted that improving gut health might help protect the kidneys, but evidence in humans remained limited. To explore the idea further, researchers launched the multicenter Phase II clinical trial known as the LUBI-CKD TRIAL across nine medical institutions in Japan.

The study enrolled 150 patients with moderate chronic kidney disease. Participants received either lubiprostone or a placebo, allowing scientists to compare how the treatment affected kidney function over time.

The results surprised the researchers. Patients who received either 8 µg or 16 µg doses of lubiprostone showed a slower decline in kidney function compared with those in the placebo group. Kidney performance was measured using estimated glomerular filtration rate (eGFR), one of the most widely used indicators of kidney health.

Researchers reported that the protective effect appeared dose dependent, meaning higher doses were linked to greater benefits. The 16 µg group showed particularly promising preservation of kidney function signals during the 24 week trial period.

How a Constipation Drug May Protect the Kidneys

Scientists then investigated why the drug appeared to help the kidneys.

Their analysis pointed to changes in the gut microbiome. Lubiprostone increased the production of spermidine, a naturally occurring compound tied to healthier mitochondrial activity. Mitochondria are often described as the...

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Ancient lost ocean may have built Central Asia's dinosaur-era mountains

Science Daily · 27 Jan 2026

A new study from Adelaide University suggests that the ancient Tethys Ocean played a major role in shaping Central Asia's landscape during the Cretaceous period, long before the rise of the Himalayas.

The research team reached this conclusion through a large-scale data analysis that combined hundreds of thermal history models collected from more than 30 years of geological studies across Central Asia.

Scientists have often linked the region's landscape to a combination of tectonic activity, climate changes, and processes deep within Earth's mantle over the past 250 million years. However, the new findings point to a different dominant force.

"We found that climate change and mantle processes had only little influence on the Central Asian landscape, which persisted in an arid climate for much of the last 250 million years," said Dr. Sam Boone, who was a post-doctoral researcher at Adelaide University when the research was conducted.

"Instead, the dynamics of the distant Tethys Ocean can directly be correlated with short-lived periods of mountain building in Central Asia."

How a Lost Ocean Influenced Mountain Building

The Tethys Ocean once stretched across a vast area of the planet before gradually disappearing during the Meso-Cenozoic period, which covers the last 250 million years. Today, the Mediterranean Sea is considered the final remnant of that ancient ocean.

"The present-day relief of Central Asia was largely built by the India-Eurasia collision and ongoing convergence," said co-author Associate Professor Stijn Glorie, from Adelaide University's School of Physics, Chemistry and Earth Sciences.

"However, during the Cretaceous periods, dinosaurs would have seen a mountainous landscape as well, similar to the present-day Basin-and-Range Province in the western USA.

"It is thought that the extension in the Tethys, due to roll-back of subducting slabs of ocean crust, reactivated old suture zones into a series of roughly parallel ridges in Central Asia, up to thousands of kilometers away from the Himalaya collision zone."

According to the researchers, geological activity connected to the ancient ocean may have triggered mountain formation far from the actual plate boundaries.

Thermal History Models Reveal Earth's Past

The study relied on thermal history models, which help scientists trace how rocks cooled as they moved closer to Earth's surface during periods of mountain uplift and erosion.

"These models were constructed using thermochronology methods and reveal how rocks cooled down when they are brought towards the surface during mountain uplift and subsequent erosion," Associate Professor Glorie said.

"We...

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Childhood junk food may rewire the brain for life

Science Daily · 8 Feb 2026

Children who regularly eat high-fat, high-sugar foods may experience lasting changes in the brain that continue long after their diets improve, according to a new study from University College Cork (UCC). Researchers also found that beneficial gut bacteria and prebiotic fibers could help reduce some of these long-term effects and support healthier eating behaviors later in life.

Scientists at APC Microbiome, a leading research center based at UCC, discovered that unhealthy diets during early life can alter how the brain controls appetite and feeding. These changes persisted even after the unhealthy diet ended and body weight returned to normal.

Today's children are surrounded by highly processed foods that are heavily marketed and easy to access. Sugary and fatty foods have become common at birthday parties, school events, sports activities, and even as rewards for good behavior. Researchers say this constant exposure may shape food preferences from an early age and encourage eating habits that continue into adulthood.

Childhood Diets and Long-Term Brain Changes

The study, published in *Nature Communications*, found that early exposure to calorie-dense, nutrient-poor foods can leave lasting effects on feeding behavior. Researchers used a preclinical mouse model and found that animals exposed to a high-fat, high-sugar diet early in life showed persistent changes in eating behavior as adults.

The team linked these behavioral effects to disruptions in the hypothalamus, a brain region responsible for regulating appetite and energy balance.

The research also explored whether targeting the gut microbiome could help counter these effects. Scientists tested a beneficial bacterial strain (*Bifidobacterium longum* APC1472) along with prebiotic fibers (fructo-oligosaccharides (FOS) and galacto-oligosaccharides (GOS), naturally present in foods such as onions, garlic, leeks, asparagus and bananas, and widely available in fortified foods and prebiotic supplements).

According to the findings, both approaches showed potential benefits when given throughout life.

Gut Bacteria May Help Restore Healthy Eating Patterns

"Our findings show that what we eat early in life really matters," said Dr. Cristina Cuesta-Martí, first author of the study. "Early dietary exposure may leave hidden, long-term effects on feeding behavior that are not immediately visible through weight alone."

Researchers found that unhealthy diets early in life disrupted brain pathways linked to feeding behavior, with effects continuing into adulthood. The findings suggest this could raise the risk of obesity later in life.

Importantly, scientists found that modifying the gut microbiota helped reduce these long-term effects. The probiotic strain *Bifidobacterium longum* APC1472...

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Scientists Discover Surprising Way Cranberry Juice Could Fight Antibiotic Resistance

Sci Tech Daily · 21 May 2026

Laboratory tests show cranberry juice may strengthen a common UTI antibiotic and reduce bacterial resistance.

Urinary tract infections affect more than 400 million people worldwide each year, and some epidemiological studies suggest that over half of all women will experience at least one during their lifetime. Most UTIs are caused by harmful strains of *Escherichia coli* bacteria, and fosfomycin is commonly used as a first-line antibiotic treatment. But growing antibiotic resistance is pushing researchers to explore new treatment strategies.

A new study suggests cranberry juice could help antibiotics work better, at least in laboratory-grown bacterial strains. Writing in *Applied and Environmental Microbiology*, researchers reported that cranberry juice improved fosfomycin's antibiotic activity in 72% of the uropathogenic *E. coli* strains tested. It also reduced the appearance of mutations linked to antibiotic resistance. Lead author Eric Déziel, Ph.D., a microbiologist at the Institut National de la Recherche Scientifique in Montreal, Canada, said the results are encouraging but still early.

The research does not show whether drinking cranberry juice would produce the same effects in people. "We don't know if the metabolites will reach the infection," he said. If they do, he explained, cranberry juice could potentially improve the effectiveness of antibiotic treatment. Additional studies will be needed to determine how much juice, if any, might provide a benefit.

Cranberry juice has long been used as a folk remedy for urinary tract infections. Researchers once believed its acidity was responsible for the effect, but more recent studies point to compounds that may prevent bacteria from sticking to the cells lining the urethra. Until now, scientists had not closely studied how cranberry juice interacts with antibiotics.

The researchers found that cranberry juice appears to influence how bacteria absorb fosfomycin. The antibiotic enters bacterial cells through the same transport channels bacteria use to take in certain sugars. According to Déziel, scientists still do not know which compounds in cranberry juice are responsible, but something in the juice seems to increase sugar uptake through one of these channels. As a result, the bacteria also absorb more fosfomycin. Antibiotic resistance often develops through mutations affecting other nutrient transport channels.

Déziel's laboratory studies how bacteria communicate and searches for natural compounds that could interfere with those signals to help treat dangerous infections. Earlier lab work from his team showed that cranberry extracts could strengthen the effects of antibiotics against resistant bacterial strains.

Those earlier findings drew interest...

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'A new form of engineered artificial matter': Atomic manipulation enters the mesoscale as 40,000 atoms repositioned in single crystal

Chemistry World · 15 May 2026

Autonomous atomic engineering at scale by moving the electron beam between target locations. At each target location, the beam is positioned with picometre precision with chromium atoms then repositioned

By creating 40,000 user-defined defects in a single crystal lattice, researchers have shown that atomic manipulation can be achieved on the mesoscopic scale – between the single-atom and bulk-material ranges. The work potentially offers a way to engineer materials with desired properties by fine-tuning the positions of individual atoms within their structures.

Scientists have known for decades that microscopy techniques can be used to manipulate the positions of individual atoms. In 1990, two IBM researchers carried out an iconic demonstration, dragging 35 xenon atoms across a nickel surface to spell out the company's name .

Now, a team from the US and Europe has scaled up the concept to a whole new level. Using the electron beam in a specially programmed scanning transmission electron microscope, the researchers introduced 40,000 defects into a chromium sulfur bromide lattice. The CrSBr semiconductor was selected as a model sample and, with their automated process, the researchers could subtly reposition individual chromium atoms in a predictable manner. They describe the resulting material as 'a new form of engineered artificial matter', and note that it remains stable at room temperature outside of the microscope.

The defects were introduced within minutes across an area measuring 150nm × 100nm with a depth of 13nm. However, the team believes that the method is generalisable and could be scaled up to the macroscopic level. The researchers write that the technique offers a new way to produce programmable matter in which 'functionality is engineered from the atom up'.

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Elusive electronic effect could explain the origins of chirality for all life on Earth

Chemistry World · 20 May 2026

Magnetic surfaces can sway spin selectivity, resulting in different reaction rates for enantiomers. 1 The discovery of this interaction between mirror molecules and magnetic fields could explain the origins of homochirality on Earth and early life, in particular in prebiotic peptides and RNA.

Why do life's molecules favour one mirror image form over another?

Most biomolecules exhibit a single handedness – normally natural amino acids have L symmetry, whereas sugars are predominantly D enantiomers. The origins of this phenomenon have puzzled researchers for decades, until an electronic effect emerged as a plausible explanation. This effect, known as chirality-induced spin selectivity (CISS), demonstrates the selection of a specific spin state in electrons travelling through chiral and magnetic materials.

Chiral: A molecule is said to be chiral if that molecule and its mirror image are non-superimposable – one molecule is akin to your left hand and the other the right.

Stereochemistry: The study of the three-dimensional structure of molecules.

Enantiomer: Chiral molecules that are mirror images of one another are called enantiomers. All other stereoisomers are diastereoisomers.

Diastereoisomers: Stereoisomers are either enantiomers or diastereoisomers. Chiral molecules that have the relationship of mirror images are called enantiomers. All other stereoisomers are diastereoisomers including E/Z -isomers.

Epimer: Diastereoisomers that differ in only one configuration of two or more chiral elements.

Regioselective: A regioselective reaction is one in which one direction of bond making or breaking occurs preferentially over all other possible directions.

Stereocentre: Any atom in a molecule such that the interchange of two of its substituent groups leads to the formation of a different stereoisomer.

Stereoisomers: Compounds that exhibit the same constitution (the same molecular formula and connectivity of atoms) but different spatial arrangements. Stereoisomers can be further classified as enantiomers and diastereoisomers.

In this case, combining magnetite, a naturally-occurring magnetic mineral, and ribose aminooxazoline, with a well-known prebiotic precursor of RNA, resulted in surprisingly different CISS interactions for the two enantiomers. The magnetic measurements in mirror molecules differ 'by a factor of three', according to this study, which affected spin selectivity and reactivity. This study 'supports that, if and once homochirality was selected for a pivotal RNA precursor, it could then propagate ... to nucleotides, RNA and, potentially, peptides', explains Claudia Bonfio, who studies the origins of life at the University of Cambridge, UK, and wasn't involved in this work.

In this work, the rate of reaction for the RNA precursor...

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Plants can 'eat' the dust that falls onto their leaves

refractor.io · 21 May 2026

Every year, billions of tons of dust are lifted into the air and dispersed by winds across continents and oceans. This dust deposition has long been recognized as an important process that contributes to soil formation and delivers essential macro and micronutrients to soils.

Since dust particles are rich in minerals such as phosphorus, iron, and potassium, scientists have wondered whether dust serves as an important source of nutrition for plants.

A new study, published in *New Phytologist* in April, shows that some plants can enrich themselves by absorbing the essential minerals from dust through their leaves. While this mechanism of nutrient absorption (known as foliar uptake) is well-known, the study highlights an underexplored terrestrial nourishment pathway that plays a major role in plant nutrition in nutrient-poor and dust-affected ecosystems.

"Nature continues to surprise us by revealing new mechanisms, even in systems we think we already understand well," Marcelo Sternberg, a plant biologist at Tel Aviv University in Israel, tells Refractor, in an email. The study shows that "plants are not limited to taking up nutrients through their roots – they can also absorb nutrients directly from dust through their leaves."

To explore this terrestrial uptake pathway, Anton Lokshin at Tel Aviv University and his colleagues conducted a field experiment in a Mediterranean shrubland in Israel's Judean Hills, a region known for its high annual deposits of mineral dust from the Arabian and Sahara deserts.

Here, the team applied volcanic dust directly to the foliage of three common shrub species: *Cistus creticus*, *Salvia fruticosa*, and *Teucrium capitatum*. The volcanic dust contains a signature of rare earth elements that's unlike the local soil, allowing researchers to show that nutrients were being absorbed through the leaves and not the roots.

They found increased concentrations of micronutrients such as iron, manganese, nickel, and copper in the shoots of the plants dusted with volcanic ash. Meanwhile, the concentrations in their roots remained largely unchanged.

By integrating field observations with dust deposition and nutrient estimates from different regions, the team found that foliar dust uptake could supply up to 17% of the iron that plants in the Western United States receive from soil annually, and up to 12% of the phosphorus in the Eastern Amazon.

"The aspect that surprised me most personally was the realization that dust storms in eastern Mediterranean ecosystems are not only a geological or atmospheric phenomenon, but also...

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Scientists discover tiny gut particles that may drive aging and chronic disease

Science Daily · 9 Apr 2026

Researchers at the Marshall University Joan C. Edwards School of Medicine have uncovered new evidence that tiny particles created in the gut may contribute to inflammation and chronic diseases linked to aging. The findings provide fresh insight into the connection between gut health, metabolism, immune function, and even sleep-related biological stress.

The study, published in *Aging Cell*, focused on gut luminal exosomes, microscopic particles that cells use to communicate by carrying proteins and genetic material throughout the body. Scientists discovered that exosomes taken from older animals contained molecular signals tied to insulin resistance, inflammation, and damage to the gut barrier. When those exosomes were transferred into young animals, the younger animals developed similar metabolic and inflammatory changes.

Researchers also observed the opposite effect. Exosomes collected from young animals and transferred into older animals reduced several aging-related metabolic problems. The results suggest that the gut environment itself may play an important role in the development of diseases associated with aging.

Gut Barrier Damage and Chronic Inflammation

The study indicates that gut exosomes could directly influence disease development. A weakened gut barrier can allow inflammatory substances to leak into the bloodstream, potentially triggering long-term inflammation and raising the risk of heart disease and metabolic disorders.

"This study helps clarify how the physiological stressors associated with biological aging may accelerate biological processes linked to aging and disease," said Abdelnaby Khalyfa, M.Sc., Ph.D., professor of biomedical sciences at the Joan C. Edwards School of Medicine and lead author on the study. "Understanding these mechanisms is essential to identifying new targets for intervention and improving long-term outcomes for patients."

The findings also reinforce the idea that aging affects multiple systems in the body at the same time, including metabolism, immune responses, and cellular communication pathways. Researchers identified specific molecules inside the exosomes that may eventually help scientists detect, better understand, and possibly treat age-related diseases.

The researchers noted that the findings may also apply to chronic conditions involving long-term physiological stress, particularly diseases that share biological pathways with aging.

The research team included Khalyfa, Trupti Joshi, Ph.D., and David Gozal, M.D., M.B.A., Ph.D. (Hon) from Marshall University, along with Lyu Zhen from the University of Missouri.

Funding for the study included unrestricted start-up support awarded to Khalyfa by the Joan C. Edwards School of Medicine through the Marshall University Research Corporation (MURC), Huntington, West Virginia, USA. Gozal also received partial support from NIH grants...

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Ancient seas get a new T. rex as massive mosasaur emerges from Texas fossils

Phys Org · 21 May 2026

There's a new T. rex in the fossil record, only this one terrorized the ancient seas. New research led by scientists at the American Museum of Natural History, the Perot Museum of Nature and Science in Dallas, and Southern Methodist University uncovers a new, massive species of mosasaur, a marine reptile that lived during the age of the dinosaurs. One of the largest mosasaurs known to date—stretching up to 43 feet long—this top predator was described from 80-million-year-old fossils that were found primarily in northern Texas decades ago. It was named *Tylosaurus rex*, or T. rex for short, meaning "king of the tylosaurs."

"Everything is bigger in Texas and that includes the mosasaurs, apparently," said Amelia Zietlow, lead author of the new study, which was published today by the *Bulletin of the American Museum of Natural History*.

Zietlow, a research associate at the American Museum of Natural History who is now at the History Museum at the Castle in Wisconsin, began this work as a comparative biology Ph.D. student in the Museum's Richard Gilder Graduate School, when she came across a mosasaur fossil in the research collection that appeared to be misidentified as *Tylosaurus proriger*.

After comparison with *T. proriger*'s holotype fossil—the name-bearing specimen—which was described more than 150 years ago and is in the collections at the Harvard Museum of Comparative Zoology, Zietlow and colleagues suspected that the American Museum of Natural History specimen, as well more than a dozen similar fossils held at other institutions, were a different animal. Larger in stature than *T. proriger*, these fossils also have finely serrated teeth—a trait that's uncommon among mosasaurs. And while the majority of *T. proriger* specimens are found in what is now Kansas and are estimated to be about 84 million years old, these other fossils are predominantly from Texas and are 4 million years younger.

The researchers gave the name *T. rex* to this group, an homage to paleontologist John Thurmond, who, in the late 1960s, first recognized that tylosaurs from northeast Texas stood out for their size and might belong to a new species. He informally referred to them as "*Tylosaurus thalassotyrannus*," or "sea tyrant," along with a note acknowledging the cliché.

The holotype for the newly described *T. rex* is a giant specimen displayed at the Perot Museum that was first discovered in 1979 along an artificial reservoir near Dallas. Beyond *T. rex*'s impressive size,...

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REACH UPDATE

ECHA to play key role in protecting Europe's waters from chemical pollution

ECHA · 11 May 2026

ECHA/NR/26/19

The European Chemicals Agency (ECHA) will take on new scientific tasks under the EU's updated water protection legislation, which will strengthen the protection of Europe's water resources from harmful effects of chemicals.

Helsinki, 11 May 2026 – The updated EU water protection framework strengthens the protection of Europe's waters – including rivers, lakes, estuaries, coastal waters and groundwater – by amending the Water Framework Directive, the Environmental Quality Standards Directive and the Groundwater Directive. It also introduces new scientific tasks for ECHA.

ECHA will provide the technical and scientific basis to support the European Commission in decision-making on water pollutants. The Agency will prepare scientific reports for:

identifying priority substances for surface water and groundwater pollutant lists, including the development and updating of related (environmental) quality standards;

identifying substances to be included on watchlists for surface water and groundwater; and where necessary, proposing harmonised environmental quality standards for river basin specific pollutants and harmonised threshold values for regional groundwater pollutants.

It will report to the European Commission (Commission) on potential updates to the main pollutant lists and associated water quality standards every six years, in line with the EU water management cycle. The Agency will also report on watchlist substances every three years, drawing on monitoring data collected by Member States.

The Commission will use ECHA's scientific reports as the technical and scientific basis for preparing legislative proposals to update priority substance lists and watchlists under EU water legislation. Through these tasks, ECHA will work closely with the Commission and Member States to help reduce surface water and groundwater pollution and support the achievement of good chemical status across EU waters.

Close cooperation between ECHA and the European Environment Agency (EEA) will be essential for the effective implementation of the updated framework, building on existing collaboration and supporting transparent communication with stakeholders.

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REGULATORY UPDATE

ASIA PACIFIC

Correction of chemical names on the Inventory – 13 May 2026

AICIS · 13 May 2026

We have updated the names of the following chemicals in the Australian Inventory of Industrial Chemicals (Inventory) to the Chemical Abstracts Service (CAS) name. These corrections do not change the identity of the chemical substances themselves.

For details of their Inventory listings, search the Inventory

We've made these amendments under section 85 of the Industrial Chemicals Act 2019.

A list of chemicals that have had their names updated on the Inventory

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AMERICA

Call for California Crackdown on PFAS-Laden Pesticide

PEER · 13 May 2026

Herbicide May Pose Undisclosed Threat to Health and the Environment

California needs to re-evaluate the safety of a widely used herbicide, Indaziflam, according to a legal petition filed today by Public Employees for Environmental Responsibility (PEER) and Salinas City Councilmember Andrew Sandoval with California's Department of Pesticide Regulation (DPR). The petition requests that DPR re-evaluate Indaziflam because of newly found health and environmental risks posed by this pesticide. Indaziflam contains significant amounts of toxic per- and polyfluoroalkyl substances (PFAS), known as "forever chemicals" that do not break down in the environment.

Indaziflam is an herbicide used to prevent seed germination and control invasive annual grasses such as cheatgrass. The California DPR approved Indaziflam (sold under the tradename of Rejuvra) in 2024 for direct soil application.

Despite being marketed as a low toxicity herbicide, there is evidence that Indaziflam has substantial health risks to people. Moreover, because Indaziflam is a non-selective herbicide, it inadvertently kills native plants, disrupts soil chemistry, and poisons aquatic life.

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Vermont passes first-in-the-nation bill to ban toxic herbicide linked to Parkinson's disease

EWG · 13 May 2026

In a historic show of bipartisan leadership, Vermont lawmakers today approved a bill to ban the highly toxic herbicide paraquat. It's the first time a state legislature has passed legislation to phaseout paraquat, a chemical linked to Parkinson's disease.

House Bill 739 would, if enacted, end Vermonters' exposure to one of the most dangerous pesticides still in use.

The Environmental Working Group is urging Gov. Phil Scott to sign the legislation and set a first-in-the-nation precedent for banning paraquat. The vote also comes as 12 other states have introduced bills to ban or restrict the chemical and California's Department of Pesticide Regulation is re-reviewing paraquat.

Paraquat has been linked not only to Parkinson's disease but also to other serious health harms, including cancer. More than 70 countries have banned paraquat due to these health concerns, yet it remains used in the U.S.

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Hundreds of volunteers kick off a month of action to address plastic pellet pollution

Beyond Plastic · 5 May 2026

The second-annual International Plastic Pellet Count kicked off on Saturday, with over 500 volunteers from Oregon to Texas to Maine and beyond combing waterways for plastic pellets. By collecting and counting the pellets, organizers hope to raise awareness of this pervasive form of pollution and spur action to tackle the problem.

Plastic pellets, or "nurdles," are the building blocks of plastics manufacturing and are a big part of the plastic pollution problem. These tiny pellets are shipped to plastic facilities, where they are melted down and used to form many of the common plastic products you see everyday.

At these plastic factories, nurdles that spill onto the floor, or get contaminated by dirt or other materials, are sometimes washed down drains. From there it's just a quick trip through the drains and pipes before reaching local waterways and aquatic ecosystems. Because they're small, lightweight and shipped all over, nurdles can also spill during transport. An estimated 10 trillion plastic pellets enter the oceans every year.

[Read More →](#)

EUROPE

Publication of GB MCL technical reports

UK HSE · 14 May 2026

The next batch of Great Britain Mandatory Classification and Labelling (GB MCL) technical reports is now available for download.

A GB MCL technical report is an independent scientific evaluation of the information submitted under the standalone GB MCL process or as part of the EU harmonised classification and labelling process.

It sets out whether there is adequate scientific evidence to support a new or revised GB MCL of a substance and what that GB MCL should be.

Download the next batch of technical reports from the GB MCL publication table.

These GB MCL technical reports relate to substances for which the Committee for Risk Assessment (RAC) published a RAC Opinion under Article 37(4) of EU CLP during 2025, based on information submitted under the EU CLP Regulation. The scientific information supporting the RAC Opinion is evaluated under the GB MCL system.

At the time of publication, the classification and labelling proposed in these technical reports have not been agreed and/or adopted in GB.

For information on the next steps in the process, please see our webpage on the GB MCL system.

[Read More →](#)

160+ environmental and health groups respond to last-minute attempt by Coca-Cola, McDonald's and others to reopen EU packaging law

EEB · 13 May 2026

Leaked CEO letter prompts opposition from broad alliance of environmental and health advocates defending landmark EU Packaging and Packaging Waste Regulation.

A leaked letter signed by more than 100 food and beverage company CEOs, including Coca-Cola, Heineken, McDonald's, Kraft Heinz and Mondelez, is calling on European Union institutions to delay and reopen key provisions of the Packaging and Packaging Waste Regulation (PPWR), just months before implementation is set to begin in August 2026.

On 29 April, CEOs requested EU institutions to delay key implementation timelines and revise provisions. If acted upon, requests could weaken restrictions on harmful PFAS chemicals in food packaging, and expand exemptions to keep large volumes of single-use packaging on the market, undermining the EU's objective to reduce packaging waste at a time when waste levels remain high. Notably, a number of signatories and active sponsors of this initiative are headquartered outside the EU, raising questions about the extent to which corporate interests beyond Europe are seeking to undermine democratically agreed EU law.

A broad alliance of over 160 Break Free From Plastic members and allies, communities impacted by plastic and PFAS pollution, universities, consumer rights organisations and businesses committed to

reuse, have sent a letter in response urging EU leaders to reject this lobbying push and uphold the Regulation as agreed by the European Parliament, Council and Commission.

[Read More →](#)

Childcare articles – restriction on substances classified as carcinogenic, mutagenic or toxic for reproduction (CMR)

European Commission · 13 May 2026

About this initiative

Summary

This initiative aims to protect children from substances that are carcinogenic, mutagenic or toxic for reproduction (CMR) and may be present in childcare articles (such as products intended to facilitate sleep, relaxation, hygiene, the feeding of children or sucking on the part of children).

Topic

Business and industry, Single market

Type of act

Regulation

Committee

C34200

Draft act

Feedback: Open

Feedback period

08 May 2026 - 05 June 2026 (midnight Brussels time)

The Commission would like to hear your views.

This draft act is open for feedback for 4 weeks. Feedback will be taken into account for finalising this initiative. Feedback received will be published on this site and therefore must adhere to the feedback rules.

[Read More →](#)

Labour must fulfil promise to introduce clean air act, charities urge

The Guardian · 13 May 2026

Ministers should bring forward a new clean air act that would ban wood burning, clear diesel vehicles from the roads and force councils to cut pollution, a group of more than 60 charities have urged before the king's speech on Wednesday.

Labour held out the prospect of a clean air act while in opposition in 2023, but this was dropped from the final election manifesto, and the government has made no move to reinstate it.

Jemima Hartshorn, founder and director of the Mums for Lungs charity, one of the groups behind the letter, said: "Dirty air is the biggest environmental health risk in this country. Air pollution is costing us about £27bn a year and is linked to asthma, wheezing, cancer and dementia. The dirty air is harming us all, and it's damaging the economy too. Yet, we know how to solve this problem."

The call, by organisations with more than 230,000 members, came as one of the country's leading experts on pollution and health urged ministers to ban wood burning in urban areas. Stephen Holgate, who is the special adviser to the Royal College of Physicians on air quality, told the British Medical Journal (BMJ) it was a "disgrace" that so few complaints about wood burning resulted in any enforcement action. In the year from August 2024 to August 2025, at least 15,195 complaints were made against wood burning in England, but only 24 fines were issued.

[Read More →](#)

Germany is preparing to ban disposable e-cigarettes

GST · 14 May 2026

Federal Environment Minister Carsten Schneider is preparing a ban on the sale of disposable e-cigarettes in Germany with the support of the Bundesrat (Federal Council) and the Bundestag (Federal Parliament). He will present a draft law to this effect sometime in 2026, the SPD MP announced after a meeting with the state environment ministers in Leipzig.[1]. Rechargeable and reusable devices would not be affected by this ban.

Health, environmental and safety concerns

While e-cigarettes produce an inhaled vapor containing fewer harmful substances than traditional cigarette smoke, doctors remind us that these products are not harmless and can lead to nicotine addiction. Furthermore, their bright colors, sweet or fruity flavors, and easy accessibility encourage young people to discover and use these products, which can be addictive and pose risks specific to their age group. Marketing strategies targeting young people to promote these products have led to a sharp increase in their use among this age group. According to a study by the Federal Center for Health Education (BZgA), 6.7% of young people aged 12 to 17 had used disposable e-cigarettes in 2023 during the 30 days preceding the survey..

In addition to these public health risks, the government has environmental and safety concerns related to the batteries integrated into devices, particularly disposable ones. These disposable devices allow for between a few hundred and a few thousand puffs, after which they are empty and must be discarded. The small reservoir containing the liquid cannot be refilled, and the integrated battery is not rechargeable. In Germany, more than 60 million of these single-use products end up in the environment each year, releasing lead, cadmium, and mercury that contaminate soil and waterways. When thrown in household waste or recycling bins, their lithium batteries can cause fires in treatment and recycling centers, release toxic gases, and endanger employees. Authorities also highlight the difficulties associated with their collection and recycling.

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Portugal launches its Deposit Return System ahead of the new EU packaging rules

Zero Waste Europe · 7 May 2026

Portugal has officially launched its national Deposit Return System (DRS) for beverage containers. The system, known as "Volta", provides a clear example of how Member States can take concrete action to tackle packaging waste in line with upcoming EU legislation.

From 10 April 2026, consumers can return plastic and metal beverage containers of up to 3 litres and receive a €0.10 deposit refund through return-to-retail systems. During a transition phase running until 9 August 2026, containers bearing either the Volta logo or the Green Dot logo coexist on the market. After 9 August 2026, the transition period ends and only containers with the Volta logo will be permitted, meaning the Green Dot system will no longer apply to beverage containers.

With this launch, Portugal joins 19 other European countries where DRS is already in place – marking an important step forward for Southern Europe, where progress has historically been slower.

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HAZARD ALERT

Chromium

22 May 2026

Chromium is a chemical element with the symbol Cr and atomic number 24. It is a steely-grey, lustrous, hard and brittle metal, which takes a high polish, resists tarnishing, and has a high melting point. [1] Chromium is a naturally occurring element found in rocks, animals, plants, and soil. It can exist in several different forms. Depending on the form it takes, it can be a liquid, solid, or gas. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odour is associated with chromium compounds. [2]

Uses [2,3]

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, wood preserving and water treatment.

In the Environment [4]

- Chromium is released into the atmosphere via industrial, commercial, and residential fuel combustion of natural gas, oil, and coal and from emissions from metal industries such as chrome plating and steel production.
- Approximately 1/3 of atmospheric releases are believed to be in the form of chromium(VI).
- Electroplating, leather tanning, and textile industries release large amounts of chromium to surface water.
- Chromium is primarily removed from the atmosphere by fallout and precipitation, the residence time is expected to be <10 days.
- Most of the chromium released in water will be deposited in the sediments.
- Chromium is not believed to biomagnify in the food chain.

Sources & Routes of Exposure

Sources of Emission [3]

- Industry sources: Emissions to air and water from chemical manufacturing industry e.g. dyes for paints, rubber and plastic products, metal finishing industry e.g. chrome plating, manufacturers of pharmaceuticals, wood, stone, clay and glass products, electrical and aircraft manufacturers, steam and air conditioning supply services, cement producing plants as cement contains chromium, incineration of council refuse and sewage sludge and combustion of oil and coal.
- Diffuse sources: Facilities below the reporting threshold.

- Natural sources: Chromium (VI) compounds are not found in nature. Chromium is usually found as the Cr(III) form, as the mineral Chromite and in many soils.
- Transport sources: Emission to air from the wearing down of brake linings containing chromium. Motor vehicle exhaust (crude oil contains traces of chromium (III) compounds, these may oxidise to the chromium (VI) state during fuel combustion in vehicle engines).
- Consumer products: Some inks, paints and paper. Some rubber and composite floor coverings. Some treated (preserved) timber products. Some toner powders used in copying machines.

Routes of Exposure [2,4]

- Exposure to chromium may occur by eating food containing chromium(III).
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Drinking contaminated well water.
- Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

The major routes of exposure are as follows:

- Inhalation – Predominant route of exposure for occupational populations.
- Oral – Predominant route of exposure for the general population.
- Dermal – Minor route of exposure for the general population.

Health Effects [5]

Acute Effects

Chromium VI

- Chromium (VI) is much more toxic than chromium (III), for both acute and chronic exposures. The respiratory tract is the major target organ for chromium (VI) following inhalation exposure in humans. Shortness of breath, coughing, and wheezing were reported in cases where an individual inhaled very high concentrations of chromium trioxide.
- Other effects noted from acute inhalation exposure to very high concentrations of chromium (VI) include gastrointestinal and neurological effects, while dermal exposure causes skin burns in humans.
- Ingestion of high amounts of chromium (VI) causes gastrointestinal effects in humans and animals, including abdominal pain, vomiting, and haemorrhage.
- Acute animal tests have shown chromium (VI) to have extreme toxicity from inhalation and oral exposure.

Chromium III

- Chromium (III) is an essential element in humans, with a daily intake of 50 to 200 µg/d recommended for adults.
- Acute animal tests have shown chromium (III) to have moderate toxicity from oral exposure.

Chronic Effects

Chromium VI

- Chronic inhalation exposure to chromium (VI) in humans results in effects on the respiratory tract, with perforations and ulcerations of the septum, bronchitis, decreased pulmonary function, pneumonia, asthma, and nasal itching and soreness reported.
- Chronic human exposure to high levels of chromium (VI) by inhalation or oral exposure may produce effects on the liver, kidney, gastrointestinal and immune systems, and possibly the blood.
- Rat studies have shown that, following inhalation exposure, the lung and kidney have the highest tissue levels of chromium.
- Dermal exposure to chromium (VI) may cause contact dermatitis, sensitivity, and ulceration of the skin.
- The Reference Concentration (RfC) for chromium (VI) (particulates) is 0.0001 mg/m³ based on respiratory effects in rats.
- The Reference Concentration (RfC) for chromium (VI) (chromic acid mists and dissolved Cr (VI) aerosols) is 0.000008 mg/m³ based on respiratory effects in humans.
- The Reference Dose (RfD) for chromium (VI) is 0.003 mg/kg/d based on the exposure at which no effects were noted in rats exposed to chromium in the drinking water.

Chromium III

- Although data from animal studies have identified the respiratory tract as the major target organ for chronic chromium exposure, these data do not demonstrate that the effects observed following inhalation of chromium (VI) particulates are relevant to inhalation of chromium (III).
- EPA has not established an RfC for chromium (III).
- The RfD for chromium (III) is 1.5 mg/kg/d based on the exposure level at which no effects were observed in rats exposed to chromium (III) in the diet.

Reproductive/Developmental Effects

Chromium VI

- Limited information on the reproductive effects of chromium (VI) in humans exposed by inhalation suggest that exposure to chromium (VI) may result in complications during pregnancy and childbirth.
- Animal studies have not reported reproductive or developmental effects from inhalation exposure to chromium (VI).
- Oral studies have reported severe developmental effects in mice such as gross abnormalities and reproductive effects including decreased litter size, reduced sperm count, and degeneration of the outer cellular layer of the seminiferous tubules.

Chromium III

- No information is available on the reproductive or developmental effects of chromium (III) in humans.
- A study of mice fed high levels of chromium (III) in their drinking water has suggested a potential for reproductive effects, although various study characteristics preclude a definitive finding.

- No developmental effects were reported in the offspring of rats fed chromium (III) during their developmental period.

Cancer Risk

Chromium VI

- Epidemiological studies of workers have clearly established that inhaled chromium is a human carcinogen, resulting in an increased risk of lung cancer. Although chromium-exposed workers were exposed to both chromium (III) and chromium (VI) compounds, only chromium (VI) has been found to be carcinogenic in animal studies, so EPA has concluded that only chromium (VI) should be classified as a human carcinogen.
- Animal studies have shown chromium (VI) to cause lung tumours via inhalation exposure.
- EPA has classified chromium (VI) as a Group A, known human carcinogen by the inhalation route of exposure.
- EPA used a mathematical model, based on data from an occupational study of chromate production workers, to estimate the probability of a person developing cancer from continuously breathing air containing a specified concentration of chromium. EPA calculated an inhalation unit risk estimate of $1.2 \times 10^{-2} (\mu\text{g}/\text{m}^3)^{-1}$.

Chromium III

- No data are available on the carcinogenic potential of chromium (III) compounds alone.
- EPA has classified chromium (III) as a Group D, not classifiable as to carcinogenicity in humans.
- EPA has stated that "the classification of chromium (VI) as a known human carcinogen raises a concern for the carcinogenic potential of chromium (III)".

Safety [6]

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.
- Skin Contact: In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.
- Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.
- 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. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Fire & Explosion Information

- Chromium is a moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reactions occur with nitrogen oxide or sulfur dioxide.

- Powdered Chromium metal + fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

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 chromium:

- Splash goggles;
- Lab coat;
- Dust respirator (be sure to use an approved/certified respirator or equivalent);
- Gloves.

Personal protective equipment 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.

Regulations [3,7,8]

United States

Australia

Safe Work Australia has established the following exposure limits for Chromium:

Australian Drinking Water Quality Guidelines (NHMRC and ARMCANZ, 1996) specify a limit of 0.05 mg/L (i.e. 0.00005 g/L).

References

- <http://en.wikipedia.org/wiki/Chromium>
- <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=61&tid=17>
- <http://www.npi.gov.au/resource/chromium-vi-compounds>
- <http://www.atsdr.cdc.gov/toxguides/toxguide-7.pdf>
- <http://www.epa.gov/ttn/atw/hlthef/chromium.html>
- <http://www.sciencelab.com/msds.php?msdsId=9927136>
- <http://www.atsdr.cdc.gov/csem/csem.asp?csem=10&po=8>

- <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/772/Workplace-exposure-standards-airborne-contaminants.pdf>

JANET'S CORNER

Who Am I?

22 May 2026

I am born from ancient Roman ingenuity, yet my modern recipe has barely changed since volcanic ash met limestone millennia ago.

My crystalline transformation happens slowly over years, binding sand and stone into an unyielding monolith through a chemical dance with water.

I am the second-most-consumed material on Earth by mass, beaten only by water, and I am found in nearly every structure you pass.

My gray powder form is Portland cement—when mixed with aggregate and water, I harden into the foundation of civilization itself.