CHEMWATCH

BULLETIN

Week of 5 June 2026

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GOSSIP

Polyphenol structures reveal why tea, cocoa and fruit compounds taste so different

Phys Org · 4 Jun 2026

A pilot study has developed a new sensory evaluation method that links the chemical structures of polyphenols with their distinct taste properties. Using trained human panelists, researchers showed that different polyphenols produce unique sensory effects, including bitterness, acidity, and astringency. The findings may help improve functional food design and food processing technologies while advancing understanding of how taste-related sensory pathways contribute to digestion, metabolism, and health-related responses.

Polyphenols are naturally occurring plant compounds widely found in tea, cocoa, fruits, vegetables, and other foods. They are well known for their potential health benefits, including reducing the risk of cardiovascular disease, diabetes, and age-related disorders. However, despite decades of research on their physiological effects, scientists still understand relatively little about how the specific chemical structures of polyphenols influence their taste sensations, such as bitterness and astringency. These sensory properties strongly affect food preferences and may also influence biological responses in the digestive system.

To address this challenge, a research team led by Professor Naomi Osakabe from the Department of Functional Control Systems, Graduate School of Engineering and Science, Shibaura Institute of Technology, Japan, along with Hitomi Nakamura and Moeka Ogata from the same institute, developed a structured sensory evaluation system using trained human panelists to quantitatively analyze the taste characteristics of polyphenols and connect them with their chemical structures. Their findings were published in the journal Foods on April 17, 2026.

The study focused on four representative polyphenols with different chemical structures: gallic acid, quercetin hydrate, epigallocatechin gallate (EGCG), and a procyanidin-rich fraction derived from cocoa. Before testing, seven carefully selected panelists underwent four months of intensive sensory training designed to improve their ability to distinguish acidity, bitterness, and astringency. The researchers combined multiple sensory evaluation approaches, including flavor profile analysis, quantitative descriptive analysis, and three-alternative forced-choice testing, to ensure reliable results.

The experiments revealed clear sensory differences between the compounds. Gallic acid produced strong acidity similar to citric acid, while EGCG, a major compound in green tea, generated pronounced bitterness and mild astringency. The procyanidin-rich fraction showed intense astringency, likely due to its polymerized structure interacting with salivary proteins. In contrast, quercetin hydrate displayed little detectable taste, mainly because of its low water solubility.

Prof. Osakabe explained, "While polyphenols are known to produce bitter and astringent sensations, very few studies have objectively evaluated these properties using trained human panels. We wanted to establish a reliable system that could scientifically connect sensory...

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This new aluminum could replace rare metals and cut costs dramatically

Science Daily · 16 Mar 2026

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

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

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

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

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

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

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

Expanding the Possibilities of Aluminum Chemistry

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

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

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Scientists turn CO2 into fuel using breakthrough single-atom catalyst

Science Daily · 17 Apr 2026

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

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

Breakthrough Catalyst Turns CO 2 Into Methanol

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

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

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

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

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

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

Single Atom Catalysts Maximize Efficiency

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

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

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

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Repurposed anticancer agent becomes sound-activated antibacterial drug candidate

Chemistry World · 4 Jun 2026

The ruthenium-agent can penetrate deep into bacteria and produce deadly reactive oxygen species when exposed to ultrasound

A sound-activated antibacterial offers a promising alternative to conventional antibiotics for deep-tissue bacterial infections. Upon exposure to ultrasound, the sono-sensitive ruthenium complex generates reactive oxygen species that can damage bacterial DNA and biofilms without triggering the evolution of resistance. The team behind the work believes that this blend of general mechanism and localised effect provides a powerful framework for treatments that could beat antibiotic-resistant microorganisms.

Antimicrobial resistance is a significant global health problem, with deaths from drug-resistant infections expected to exceed cancer by 2050 . Consequently, there is an urgent need to develop treatments that are less vulnerable to these evolved defensive pathways and, in recent years, stimuli-responsive therapies have emerged as a promising option. ‘We administer a compound, which itself is non-toxic, and then use an external trigger such as light or ultrasound to generate reactive oxygen species that then damage the bacteria,’ explains Johannes Karges , a medicinal inorganic chemist at Ruhr University Bochum who wasn’t involved in the new work. ‘It’s only where the two come together that you have an effect, and this can be very strongly controlled by a doctor.’

Photodynamic therapy using light is already well-established for treating skin infections and cancers but the limited penetration of safe light wavelengths restricts this approach. Conversely, ultrasound can penetrate much deeper into tissues, but localising sufficient sensitiser around infection sites has proven challenging and these agents are therefore comparatively underdeveloped.

However, using a DNA-targeting scaffold previously developed as an anticancer photodynamic therapy drug, the Chinese and Korean team were able to direct a ruthenium-based sono-sensitiser exclusively towards infected lung tissue. Unlike animal cells, where genetic information is enclosed within a membrane-bound nucleus, bacterial DNA is free-floating within the cytoplasm, making it an accessible target for small molecule drugs. The ruthenium complex TLD1433 therefore rapidly concentrates around the site of infection, meaning subsequent activation with ultrasound focuses oxidative damage on bacteria rather than healthy cells. This switch in activation mechanism to more penetrating ultrasound also provides access to deeper tissues, previously unreachable with light, expanding the potential of this treatment approach, the team says.

In a direct in vitro comparison, TLD1433 outperformed both a conventional antibiotic (ciprofloxacin) and a standard sono-sensitiser against pneumonia pathogens, reducing bacterial survival to just 14% and even relieving the hypoxic environment created by the bacterial...

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Fully reusable bricks could allow old buildings to be taken apart and rebuilt

New Atlas · 4 Jun 2026

Demolition of old structures at the end of their service life results in large amounts of waste and carbon emissions, not to mention the labor involved and the cost of producing new materials.

According to official statistics, construction and demolition waste accounts for more than one third of all waste generated in Europe.

A team from Austria's Graz University of Technology (TU Graz) questioned if there might be a better, more sustainable approach to dealing with old brick buildings. What if instead of being demolished, they could be carefully deconstructed, so that the bricks could be reused in future construction projects?

This concept is similar to taking apart a Lego structure and rebuilding it elsewhere with the same parts. Obviously, using conventional mortar is not going to work in such a case. Instead of binding bricks together permanently, the researchers developed prefabricated brick wall elements connected through so-called reversible joints.

As of now, there is unfortunately not much information disclosed about the design or any technical details of the reversible joints. We've reached out to the researchers, but are still waiting to hear back.

The bricks used in the project are 44 cm (17.3 in) thick and contain insulating wool for improved thermal performance. These wall elements are pre-plastered at the factory, which reduces the amount of work required on the construction site.

One of the main goals behind the project was to reduce emissions from construction materials, and, according to project manager Hans Hafellner from the Institute of Building Physics, Services and Construction at TU Graz, the results look very promising.

“The results of our research to date show that a significant proportion of total emissions can be avoided during the second phase of use through reuse by developing an innovative jointing solution," he says. "Considering three life cycles, CO_2 emissions can be reduced by around 60% compared to conventional construction methods.”

Permanent mortar is what typically provides structural stability to a whole building, and since it could not be used, the engineers at TU Graz had to develop alternative methods to ensure the same safety standards.

This became one of the main challenges for the research team, and they came up with two solutions: stability can be achieved either through a roof that is heavy enough to stabilize the entire structure, or through vertically pre-stressed threaded rods that run through the bricks. Both methods reportedly provide the necessary...

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Scientists Finally Uncover How a “Forever Chemical” Causes Birth Defects

Sci Tech Daily · 4 Jun 2026

PFDA, a PFAS “forever chemical,” can cause craniofacial birth defects by disrupting retinoic acid regulation during fetal development, revealing the first clear molecular mechanism behind the link.

Researchers have long linked perfluoroalkyl and polyfluoroalkyl substances (PFAS), often called “forever chemicals,” to serious birth defects.

However, scientists have struggled to explain exactly how these pollutants affect fetal development. A new study now offers the first detailed molecular explanation, revealing how a PFAS compound known as perfluorodecanoic acid (PFDA) can cause craniofacial abnormalities before birth.

The findings were published in ACS Chemical Research in Toxicology .

“Most people are exposed to small amounts of PFAS in everyday life, but higher exposure can occur through contaminated water, living near manufacturing sites, or certain jobs like firefighting and ski waxing, which is why it’s so important to understand the chemicals better,” said the paper’s senior author, Jed Lampe, PhD, associate professor at University of Colorado Anschutz Skaggs School of Pharmacy and Pharmaceutical Sciences.

“We wanted to understand which PFAS compounds are truly harmful during fetal development, especially for people with higher exposure, and how they cause damage.”

Around 15,000 PFAS compounds are used in consumer and industrial products, but growing evidence suggests only a portion of them present major health concerns. To identify the most harmful compounds, Lampe and colleagues Michaela Hvizdak and Sylvie Kandel examined 13 commonly detected PFAS. Their results showed that PFDA was the most toxic to craniofacial development in a fetus.

The researchers found evidence linking PFDA to significant facial abnormalities seen in both people and laboratory animals. Some estimates suggest the compound may increase the risk of these defects by about 10%, even at very low exposure levels.

“This finding moves us beyond association by providing a clear explanation for how PFDA can interfere with fetal development. It’s a critical step toward understanding a vast and complex class of environmental chemicals,” said Lampe.

The team discovered that PFDA interferes with retinoic acid, a molecule that plays a vital role in forming the face and head during early pregnancy. Retinoic acid controls the activity of hundreds of genes, and maintaining the correct amount is essential. Because a fetus cannot produce or safely remove excess retinoic acid, it depends entirely on the mother to keep levels balanced.

Researchers found that PFDA blocks CYP26A1, an enzyme responsible for breaking down excess retinoic acid. When the enzyme is inhibited, retinoic acid can accumulate...

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Australia sues 3M over firefighting foam PFAS contamination

Chemistry World · 1 Jun 2026

The Australian government is suing 3M for A$2 billion (£1.1 billion) in damages to recover costs from per- and poly-fluoroalkyl substances (PFAS) contamination at 28 defence bases across the country.

The suit covers contamination from firefighting foam used at defence bases. Civil airport contamination is being dealt with separately

The government alleges 3M withheld a range of information and misrepresented the effects of the company’s aqueous film-forming foams (AFFF). This includes what it knew about the products’ environmental risks. 3M disputes these claims.

The lawsuit says 3M gave assurances about disposal and environmental safety that were inconsistent with what the company knew at the time.

This is the largest ever claim brought by Australia, which the government says reflects the 'past and future environmental, economic and cultural costs of the contamination'.

Speaking to the press , attorney general Michelle Rowland said 3M withheld a range of information, including: '3M's own environmental laboratory testing which showed there was significant adverse environmental effects associated with the use of 3M firefighting foam'.

In response, 3M said it has never manufactured PFAS in Australia and ceased sales of the AFFF products in Australia in 2005 . 'Despite this, the Department of Defence continued to use PFAS-containing firefighting foams for nearly two decades longer.' The company will contest the claims through the legal process.

Historical use of these foams has led to widespread PFAS contamination – particularly at defence bases and airports through extensive use for training as well as emergency response. In Australia's civil airports, foams containing two of the most hazardous PFAS, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), were phased out in 2003 , and fluorine free foam has been used since 2010.

3M also faces litigation in the US over PFAS in firefighting foam. In 2024, Texas attorney general Ken Paxton sued 3M alongside DuPont and related firms , claiming the companies had scientific proof of the dangers of these chemicals, but continued marketing products containing them as safe for consumer use in Texas for over 50 years.

Several cases have been brought against DuPont and its spin-off Chemours, which took on most of DuPont's PFAS business. In 2024 an interim decision by the Dutch courts ruled that Chemours was liable for environmental damage caused by releases of PFAS from its Dordrecht plant between 1984 and 'at least' 1998. In 2025, the US state of New Jersey agreed on a...

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Rare Ebola strain is spreading beyond Africa. Here's what you should know.

refractor.io · 3 Jun 2026

Abrar Ahmad Chughtai , Holly Seale , & Md Saiful Islam , UNSW Sydney / The Conversation

The latest Ebola outbreak is showing no signs of slowing.

On April 24, the first suspected case of the rare Bundibugyo strain of Ebola was detected in the Democratic Republic of the Congo (DRC). On May 17, the World Health Organisation declared the outbreak a "Public Health Emergency of International Concern".

The current Ebola outbreak is the third-largest in world history, with 906 suspected cases and 223 deaths in the DRC alone as of 27 May.

And it may have spread to other continents. Health authorities are now investigating a suspected case in Italy, and two possible cases in Brazil. All three are believed to be travellers returning from either the DRC or Uganda. One American man who tested positive for Ebola is currently being treated in Germany.

As concerns grow, the Coalition for Epidemic Preparedness Innovations has committed more than A$86 million in funding to fast-track the development of three potential vaccines, targeting the Bundibugyo strain.

But in the meantime, could this outbreak spread further? And how concerned should we be?

Ebola is a rare but potentially fatal virus that mainly spreads through direct contact with the bodily fluids – such as blood, faeces and vomit – of an infected person.

Early symptoms of Ebola include sore throat, headaches, fever, fatigue and body pain. Severe Ebola cases can cause skin rashes, shortness of breath, vomiting, diarrhoea, abdominal pain and seizures.

Ebola was first identified in humans in 1976. Since then, there have been more than 40 outbreaks around the world, with the majority occurring in African countries.

The current outbreak is the third ever to be caused by the rare Bundibugyo strain . The majority of past outbreaks were driven by the more deadly Zaire strain, which kills up to 90% of people compared to up to 34% for Bundibugyo.

The factors driving this latest outbreak also contributed to the devastating West African outbreak of 2014-16, where more than 11,000 people died .

In both outbreaks, the virus had been circulating for months before an outbreak was declared, and initial cases had non-specific symptoms .

Both outbreaks also rapidly spread in urban areas . Transmission in health-care settings is another common factor.

Political instability and social unrest also contributed to both outbreaks. Most recently in the DRC, crowds have set fire to...

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Scientists Crack Major Ammonia Problem With a Platinum Catalyst Breakthrough

Sci Tech Daily · 3 Jun 2026

A newly engineered catalyst overcomes key obstacles that have long limited ammonia as a clean fuel for heavy industry.

A newly developed single-atom platinum catalyst can ignite ammonia at about 200°C (392°F) and sustain stable combustion at 1,100°C (2,012°F) while producing very little NOx. The breakthrough could provide carbon-free, high-grade heat for industries such as steel, cement, and chemical manufacturing.

Ammonia has long been considered a promising clean fuel for energy-intensive industries. It can be produced using air, water, and renewable electricity, stored in liquid form, and transported through existing industrial infrastructure.

The challenge is that ammonia is difficult to ignite, burns slowly, and can release large amounts of nitrogen oxides (NOx) at high temperatures. Those limitations have made it difficult for heavy industries, which depend on reliable high-temperature heat, to move away from fossil fuels.

Researchers from the College of Design and Engineering (CDE) have now demonstrated that atomic-scale engineering may solve these problems. In a study published in Joule , a team led by Professor

Yan Ning from the Department of Chemical and Biomolecular Engineering and Assistant Professor He Qian from the Department of Materials Science and Engineering created a catalyst that starts ammonia combustion just above 200°C (392°F) and maintains clean burning at 1,100°C (2,012°F).

The process converts ammonia completely into nitrogen and water while generating only trace levels of NOx. The findings suggest ammonia could eventually provide industrial heat without carbon dioxide emissions or harmful exhaust gases.

Industrial furnaces and reactors require powerful, controllable heat that can be produced on demand. Ammonia could theoretically provide this without carbon emissions, but practical use has been difficult. Ammonia burns cleanly only within a narrow range of fuel and air mixtures. Its “light-off” temperature, the point where combustion begins easily, is also relatively high, and the flame can become unstable. Raising the temperature to stabilize combustion often increases NOx emissions.

“Heavy industry needs high-quality heat, not just a clean exhaust,” says Asst Prof He. “We set out to kill two birds with one stone: make ammonia easier to ignite and keep NOx low when you run it hot.”

The researchers used a method called high-temperature catalytic ammonia combustion, which relies on a surface catalyst to help ammonia react more efficiently with oxygen. The main difficulty was identifying a material capable of initiating combustion at lower temperatures while also surviving the extreme heat required for industrial applications.

The team developed...

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New solar desalination breakthrough makes fresh water without toxic brine

Science Daily · 28 Feb 2026

According to the United Nations, 2.2 billion people still do not have access to safely managed drinking water. To help meet growing demand, many regions, from California to parts of the Middle East, rely on desalination plants that convert seawater into fresh water.

Traditional desalination methods such as reverse osmosis and thermal distillation can be expensive and energy intensive. They often require chemical treatments before and after processing the water and generate large volumes of concentrated saltwater known as brine. When discharged back into the ocean, brine can damage marine ecosystems by increasing salinity and reducing oxygen levels.

Researchers at the University of Rochester have developed a new approach that could address several of these challenges. Their solar powered desalination system produces fresh water efficiently, operates without chemical pretreatment, and avoids creating brine waste. The research was led by Chunlei Guo, a professor of optics and physics and a senior scientist at the University's Laboratory for Laser Energetics. The team described the technology in the journal Light: Science & Applications .

Laser-Treated Solar Panels Drive the Process

The system relies on specially engineered solar panels made from black metal that has been textured with femtosecond lasers. This treatment gives the surface two important properties. It absorbs nearly all incoming sunlight and strongly attracts water, a characteristic known as superwicking.

A laser patterned active region draws a thin layer of seawater across the panel. As sunlight is absorbed, the water evaporates and is distilled into fresh water. At the same time, dissolved salts and minerals are guided away from the active area and deposited onto untreated sections of the panel called passive regions.

By moving the salts away from the evaporation zone, the design prevents buildup that could otherwise interfere with continuous operation.

Using the Coffee Ring Effect to Prevent Clogging

Guo notes that several solar thermal desalination technologies have shown promising results in laboratory studies using simplified seawater composed only of water and sodium chloride.

In those experiments, sodium chloride crystals form in a loose, porous structure as water evaporates. Water can continue flowing through these crystals, dissolving them and making the systems relatively easy to clean.

In addition to sodium chloride, oceans contain many other dissolved minerals. Materials containing magnesium and calcium often form hard, dense crusts when they crystallize. These deposits can block water flow and eventually shut down the desalination process.

The problem is similar to mineral...

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CURIOSITIES

The secret to pigeons' incredible navigation was hiding in their liver

Science Daily · 19 Jun 2026

How pigeons can travel hundreds of miles and still find their way home has puzzled scientists for decades. New research suggests the answer may lie in an unexpected place: the liver.

According to a study published in Science , pigeons may use specialized immune cells in their livers to detect Earth's magnetic field, providing them with an internal navigation system.

Researchers found that these cells, called macrophages, accumulate iron while breaking down old red blood cells. The iron gives the cells unique magnetic properties that could allow them to respond to the planet's magnetic field. When the cells were removed, pigeons struggled to find their way home, pointing to a previously unknown role in navigation.

"We didn't expect immune cells to act like sensors for magnetic fields at all. Our results reveal a previously unknown mechanism for magnetic perception in animals," says Prof. Christian Kurts, Director at the Institute of Molecular Medicine and Experimental Immunology at the University Hospital Bonn, and one of the study's co-senior authors.

"What looks like a 'gut feeling' in bird navigation may actually have a physical basis," adds Prof. Martin Wikelski, Director at the Max Planck Institute of Animal Behavior and the other co-senior author of the study.

The Long Search for Birds' Magnetic Sense

Scientists have long known that homing pigeons and migratory birds use Earth's magnetic field as one of several tools for navigation. However, exactly how animals detect that field has remained one of biology's biggest mysteries.

Over the years, researchers proposed several possibilities. Some theories suggested birds could detect magnetic fields through light-sensitive molecules in their eyes. Others pointed to tiny magnetic particles in their beaks. Despite years of investigation, neither idea has received strong experimental confirmation.

The new study offers a different explanation, combining expertise from immunology, physics, and animal behavior. The research team included scientists from the University of Bonn, the University Hospital Bonn, the University of Duisburg-Essen, and the Max Planck Institute of Animal Behavior (MPI-AB).

Iron-Rich Liver Cells Show Strong Magnetic Properties

To determine where magnetic sensing might occur, the researchers examined multiple organs that have previously been linked to magnetoreception, including the eyes, beak, and brain. They also

analyzed the liver and spleen using techniques known as "vibrating sample magnetometry" and "magnetic cell separation."

"We had some clues that the liver and spleen have magnetic properties, because they break down red blood cells and so store...

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Intermittent fasting triggers surprising changes in the brain

Science Daily · 18 Feb 2026

More than one billion people worldwide now live with obesity, a condition that raises the risk of cardiovascular disease, diabetes, and several types of cancer. Yet losing weight and keeping it off can be extremely difficult. The body does not simply respond to fewer calories in a straightforward way. Signals from the gut, hormones, metabolism, and the brain can all influence hunger, cravings, and weight regain.

One approach that has drawn growing interest is intermittent energy restriction (IER), a form of dieting in which periods of reduced calorie intake are followed by periods of more typical eating. Research published in 2023 suggests that this strategy may do more than reduce body weight. It may also shift the relationship between gut bacteria and brain activity in ways that are closely tied to appetite and food behavior.

"Here we show that an IER diet changes the human brain-gut-microbiome axis. The observed changes in the gut microbiome and in the activity in addition-related brain regions during and after weight loss are highly dynamic and coupled over time," said last author Dr. Qiang Zeng, a researcher at the Health Management Institute of the PLA General Hospital in Beijing.

To explore what happens inside the body during weight loss, the researchers studied 25 adults with obesity in China. The volunteers, who were about 27 years old on average, had a BMI between 28 and 45.

The team used several tools to track changes over time. Stool samples were analyzed with metagenomics to measure the composition of the gut microbiome. Blood tests were used to monitor metabolic and physiological changes. The researchers also used functional magnetic resonance imaging (fMRI) to examine activity in brain regions involved in appetite, emotion, attention, learning, inhibition, and reward.

"A healthy, balanced gut microbiome is critical for energy homeostasis and maintaining normal weight. In contrast, an abnormal gut microbiome can change our eating behavior by affecting certain brain area involved in addiction," explained coauthor Dr. Yongli Li from the Department of Health Management of Henan Provincial People's Hospital in Henan, China.

A carefully controlled weight loss program

The study began with a 32 day high controlled fasting phase. During this period, participants received meals designed by a dietitian. Their calorie intake was gradually reduced in steps until it reached about one quarter of their basic energy needs.

This was followed by a 30 day low controlled fasting phase. During this stage,...

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Scientists discover gut bacteria that may help protect against autism and ADHD

Science Daily · 5 Jan 2026

Scientists have uncovered a surprising connection between a baby's earliest biological programming, the gut microbiome, and later brain development. The findings, published in Cell Press Blue , suggest that epigenetic changes present at birth can influence how gut bacteria develop during infancy. The study also found links between specific epigenetic patterns, certain gut microbes, and signs of autism spectrum disorder (ASD) and Attention-Deficit/Hyperactivity Disorder (ADHD) by age three.

"Certain bacteria seem to offer protection, which is exciting because it suggests there could be ways to support a child's development through diet or probiotics in the future," says senior author and gastroenterologist Francis Ka Leung Chan of The Chinese University of Hong Kong.

The first few years of life are a critical period for both brain development and the maturation of the immune system. Previous research has shown that epigenetics and the gut microbiome can each influence long-term health, but scientists have had limited understanding of how these two systems interact during early life.

"We wanted to see how the epigenome and microbiome interact in early life and if their interaction could influence a child's risk of developing neurodevelopmental conditions like ASD and ADHD," says co-senior author and public health researcher Hein Min Tun of The Chinese University of Hong Kong. "We discovered a kind of conversation happening: a baby's epigenetic setting at birth can influence their risk for neurodevelopmental disorders, but the presence of certain 'good' bacteria in their gut can step in and modify the risk."

To investigate, the research team analyzed DNA methylation patterns, a common form of epigenetic modification, in umbilical cord blood from 571 infants. They combined those data with gut microbiome samples collected from 969 infants at 2, 6, and 12 months of age, along with microbiome samples from the infants' parents during the third trimester of pregnancy.

When the children reached 36 months of age, researchers assessed their neurodevelopment using a behavioral questionnaire and looked for connections between developmental outcomes, gut microbes, and epigenetic patterns.

Factors That Influence the Infant Microbiome

The researchers found that several factors were associated with epigenetic patterns at birth, including delivery method, length of pregnancy, having older siblings, and maternal allergies. Interestingly, parental gut microbiomes did not appear to influence these birth-related epigenetic changes.

The development of the infant microbiome was linked to a different set of factors. Delivery method, antibiotic exposure, older siblings, and breastfeeding all played a...

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Boron equivalent of buckminsterfullerene finally observed after decades of research

Chemistry World · 3 Jun 2026

After 20 years of painstaking search, scientists finally have spectroscopic evidence that they have isolated an 80-atom boron analogue of buckminsterfullerene, the football-shaped C 60 carbon cage. Their B 80 - spectrum is surprisingly simple and indicates a high symmetry complex with a considerable energy gap. 1

Carbon forms a range of nanostructures , including nanorods and Nobel prize-winning fullerene and graphene. These structures come with unique characteristics that have been explored for a multitude of applications. Yet despite significant interest and exploration, few have managed to create fullerene replicas with another element.

Lai-Sheng Wang at Brown University, US, began investigating boron's potential at the turn of the millennium. He believed it could be the most promising system to mimic carbon nanostructures because of the strength of the boron–boron bond.

Several studies since have revealed promising structures. Wang describes a moment in 2013 when his team finally made some headway. 'We realised boron-36 had a particularly beautiful structure. It's hexagonal with a hexagonal vacancy in the middle, and that was very exciting ... Immediately we realised that if we extended that structure, we could make two-dimensional boron nanostructures with hexagonal vacancies.'

With this knowledge, the team obtained experimental evidence for a 40-atom boron fullerene . Electronic structure calculations showed that the most stable possible structure of B 40 existed as a distorted fullerene with a hexagonal hole at the top and bottom and heptagonal holes on each of the four sides. This marked the first observation of a boron fullerene.

At this point – halfway to a B 80 fullerene – Wang didn't believe an 80-atom boron structure could be stable, despite a 2007 computational study proposing such a structure. This work by Boris Yakobson and others at Rice University, US, suggested boron could create an analogue of C 60 by inserting an extra boron atom into the centre of each hexagon. 2

Now, over 10 years later, experimental evidence has emerged that goes some way to supporting Yakobson's proposal of an 80-atom boron fullerene. However, the structure reported by Wang and his team is even closer to the geodesic shape of C 60 and B 40 . Instead of hexagons with a boron centre, Wang's boron buckyball has a symmetrical cage of triangles interjected by several pentagons.

To synthesise it, the team first formed clusters via laser vaporisation using helium as a carrier gas, but found the clusters were...

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In a first, this animal hijacks the power of bioluminescence from its victims

refractor.io · 1 Jun 2026

The rules of biology have been torn up by a small fish in the Pacific that steals light-producing molecules from its food in the only known example of kleptoproteinism.

Researchers from Tohoku University in Japan have uncovered how the golden sweeper fish (Parapriacanthus ransonneti) glows despite missing a gene for luciferase, the enzyme critical for bioluminescence.

Using advanced whole-genome sequencing, the researchers uncovered how these crafty 7-cm (2.8-in) fish "steal" light-producing molecules from their prey – a tiny ostracod, a crustacean known as a " sea firefly " – in an incredibly rare example of molecular thievery.

In previous research, the scientists found that sea fireflies (Cypridina noctiluca) appeared to be critical to the glow-up seen in P. ransonneti fish. But it wasn't clear whether the bioluminescence was triggered within the fish or if it was an external acquisition.

Not only was the luciferase gene absent, but the team found no evidence that the fish had acquired it through horizontal gene transfer – the process by which DNA can occasionally jump between unrelated species.

"These results provide compelling and conclusive evidence that this fish does not possess the genetic blueprint for bioluminescence," says Manabu Bessho-Uehara, an associate professor at Tohoku University. "Instead, it relies entirely on proteins obtained from its prey, representing a truly unique form of biological adaptation."

Essentially, the fish has no way of making the enzyme it needs to glow, and it hasn't borrowed the instructions to make it.

"Taken together, we conclude that the ostracod luciferase gene is absent in the genome of P. ransonneti , supporting the hypothesis that P. ransonneti cannot produce luciferase by itself but instead sequesters and uses the luciferase from ostracod prey for its bioluminescence," the researchers note.

Instead, it targets a luminous prey species, extracting its fully formed luciferase protein, and then transports it to its own light organs. This method means it's not an infinite glow, but the light is topped up with each feed.

While it may not seem like a big deal, this sort of phenomenon shows how resourceful nature can be. Conserving a gene that can produce bioluminescence can be energy-intensive – so the fish have basically outsourced the job.

But then there's more to this story. The bioluminescence isn't used for attracting a mate or luring prey, but camouflage – which sounds counterintuitive.

In dim, moonlit waters, predators beneath a school...

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How Pigeons Find Their Way Home May Finally Be Solved

Sci Tech Daily · 2 Jun 2026

A study suggests pigeons navigate using iron-rich immune cells in their livers that can respond to Earth’s magnetic field. The findings may solve a decades-old mystery about bird navigation and reveal a surprising new sensory role for the immune system.

Pigeons are famous for their ability to travel long distances and still find their way home. For decades, scientists have tried to understand how they do it. A new study suggests that part of the answer may be found in an unexpected place: the liver.

Research published in Science indicates that specialized immune cells in pigeons' livers may help them detect Earth's magnetic field, providing an internal compass that assists with navigation.

The cells, called macrophages, normally help break down aging red blood cells. As they perform this task, they accumulate iron. According to the researchers, that iron may give the cells unique quantum properties that allow them to respond to magnetic fields. When these cells were removed, the birds struggled to find their way home.

"We didn't expect immune cells to act like sensors for magnetic fields at all. Our results reveal a previously unknown mechanism for magnetic perception in animals," says Prof. Christian Kurts, Director at the Institute of Molecular Medicine and Experimental Immunology at the University Hospital Bonn, and one of the study's co-senior authors.

"What looks like a 'gut feeling' in bird navigation may actually have a physical basis," adds Prof. Martin Wikelski, Director at the Max Planck Institute of Animal Behavior and the other co-senior author of the study.

Tracks of homing pigeons that were trained to navigate over 20km back to their aviaries in Southern Germany. Some pigeons were treated with clodronate to deplete macrophages. Untreated pigeons (white) navigated successfully home on sunny and overcast days. Clodronate-treated pigeons also navigated successfully home on sunny days (orange), but could not navigate home on overcast days (blue). Credit: Max Planck Institute of Animal Behavior

Scientists have long known that migratory birds and homing pigeons use Earth's magnetic field as one of several tools for navigation. Exactly how they detect that field, however, has remained unclear.

Previous ideas suggested that birds might perceive magnetic fields through light-sensitive molecules in their eyes or through tiny magnetic particles in their beaks. Despite years of investigation, convincing evidence for either explanation has been difficult to obtain.

The new study offers a different possibility. The international research team brought together immunologists...

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Researchers Solve the Mystery Behind a Billion-Dollar Dental Implant Disease

Sci Tech Daily · 4 Jun 2026

Researchers have uncovered why a common and costly dental implant infection often resists antibiotics.

Dental implants have helped tens of millions of people regain a full set of stable, functional teeth, something traditional dentures cannot provide. However, between 10% and 20% of implant recipients eventually develop peri-implantitis, a serious infection that damages the jawbone around the implant.

For years, researchers have known that antibiotics often fail to stop this infection, but the reason remained unclear.

Researchers at the Rutgers School of Dental Medicine have now identified a possible explanation in a study published in PNAS Nexus . Their findings show that bacteria can corrode dental implants, causing them to release microscopic titanium particles into nearby tissue. These particles interfere with immune cells that are supposed to fight infection, trapping them in a prolonged inflammatory state that ultimately destroys the surrounding jawbone.

Using human tissue samples, cultured immune cells, and genetically engineered mice, the researchers identified a specific calcium channel in macrophages, the immune cells responsible for engulfing bacteria, that is activated by the titanium particles. When that channel was disabled in mice, the disease did not develop. The discovery points to the first promising drug target for a condition that affects up to one in five implant patients and costs more than $1 billion annually worldwide.

“For the first time, we show why all the antibiotic treatments that work around teeth do not work around implants,” said Georgios Kotsakis, the study’s senior author and the assistant dean for clinical research at the dental school. “Now that we know the cause, we can start developing therapeutics.”

Peri-implantitis has puzzled researchers because it closely resembles periodontitis, a common gum disease affecting natural teeth that is caused by many of the same oral bacteria. In natural teeth, antibiotics and routine cleaning usually resolve the infection. Around implants, however, those same treatments succeed less than half the time, while bone loss often continues.

Most studies over the past two decades have focused primarily on bacteria. Kotsakis and his colleagues instead examined the implants themselves. They found that bacteria living on implant surfaces create acidic biofilms that gradually corrode titanium, releasing billions of particles smaller than a red blood cell. Similar particle shedding can also occur during routine cleanings, particularly when dentists use metal instruments designed for natural teeth.

Once inside the gum tissue, the particles become coated with lipopolysaccharide, a toxin produced by bacteria....

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The ocean's health may depend on a tiny microbe inside fish

Science Daily · 8 Feb 2026

Scientists have uncovered evidence that tiny microbes living inside fish may be helping drive important processes that affect the world's oceans.

The research, led by former University of Miami graduate student Anthony Bonacolta, suggests that gut bacteria and marine fish work together to produce calcium carbonate, a mineral that plays a significant role in ocean chemistry and the marine carbon cycle. The findings point to a previously overlooked partnership that could influence how oceans store carbon and maintain overall health.

Researchers have long believed that this mineral production was controlled mainly by the fish themselves. The new study indicates that microbes living in the fish intestine may also be essential participants in the process.

Bony fish, known as teleosts, constantly drink seawater to maintain proper hydration. As they process that seawater, excess calcium and carbonate ions are removed from the body and released as solid calcium carbonate pellets called ichthyocarbonates.

"This work suggests that the gut microbiome may play a broader role in both fish biology and global marine nutrient cycles," said one of the study's senior authors, Martin Grosell, Maytag Professor of Ichthyology and chair of the Department of Marine Biology and Ecology. "What was previously thought to be a process driven solely by the fish may actually reflect a close symbiosis between the fish and its gut microbial community."

Testing Fish in Different Salinity Conditions

To investigate the process, researchers conducted laboratory experiments using Gulf toadfish exposed to water with different salt concentrations. The fish were kept in brackish water (9 ppt), normal seawater (35 ppt), and hypersaline water (60 ppt).

Scientists wanted to determine how salinity affects ichthyocarbonate production, which is known to increase as fish adjust to saltier conditions through normal osmoregulation.

The results showed clear differences. Fish living in low-salinity water did not produce ichthyocarbonates. Fish kept in seawater did produce them, and production increased even further in the hypersaline environment.

The research team collected samples from multiple areas of the fish intestine, from the ichthyocarbonates themselves, and from the surrounding water.

DNA and RNA analyses allowed scientists to examine both the microbial communities living in the fish and patterns of gene activity in the fish and associated microbes. Genetic sequencing was used to identify the microorganisms present, while gene expression studies helped reveal potential biological functions connected to calcium carbonate formation.

The researchers found that vibrios, especially Photobacterium damselae subsp. damselae , were highly...

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Pigeons navigate with ‘gut feeling’ powered by paramagnetic liver cells, study suggests

Chemistry World · 4 Jun 2026

Iron-rich cells in the liver could be the mechanism that enables pigeons’ to detect magnetic fields

Scientists in Germany have shown that liver macrophages – the white blood cells that destroy pathogens and help clear cellular waste – could play a role in giving pigeons a ‘gut feeling’ to find their way home. The work could help explain how some animals are able to navigate by sensing magnetic fields.

Many animals are thought to use the Earth’s magnetic field as an internal compass, particularly in low-light conditions or at night when they can’t rely on visual cues and the sun to orient themselves. However, this magnetoreception ability is not well understood and studies in birds have proposed different mechanisms to explain how animals are able to detect magnetic fields, such as light

sensitive proteins in the eye, iron ions in birds' beaks or cellular ion channels that change in response to magnetic fields.

Clivia Lisowski and her team at the Institute for Molecular Medicine and Experimental Immunology have now proposed a new mechanism for magnetoreception, based on iron nanoparticles that are found in macrophages in the liver.

Macrophages accumulate iron as they process spent red blood cells, which they store in a protein complex called ferritin that can contain clusters of up to 4500 iron ions. The team's previous work showed that these macrophages are superparamagnetic because 'they harbour a huge amount of these nanoparticles,' says Lisowski. The unpaired electrons within the clusters can interact with one another through dipole–dipole coupling, and this collective interaction gives a population of such cells a sensitivity to magnetism that could potentially be involved in magnetoreception.

To test their theory, the team administered the drug clodronate, which depletes macrophages, to a group of pigeons prior to releasing them 19km from their roosts on a cloudy day. The birds in that group took much longer to find their way home than those in a control group, and followed highly erratic flight paths. When the test was repeated on a sunny day, however, the birds without macrohages were able to find their way home as normal. 'Imagine being dropped in a forest with fog above, no sun anywhere – but you know you are west of your cabin. It's hazy, white-out conditions. If you have a magnetic compass, you can walk east and find your cabin. If you don't have a magnetic compass, you will try...

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Mystery solved: Ocean's 'golden orb' is something nobody guessed

refractor.io · 2 Jun 2026

A deep-sea mystery that has stumped researchers for the past two-and-a-half years has a solution, with marine scientists from NOAA Fisheries and the Smithsonian National Museum of Natural History in the US finally determining the identity of a bizarre "golden orb" recovered from the Pacific in 2023.

If you had money on sponge, monstrous eyeball, or microbial biofilm, we're sorry to say that you're not walking away with any winnings today.

If you guessed it was the egg sac of some large, tentacled creature, you're also wrong.

Ok, you might deserve a consolation prize – the lump of tissue plucked from rocks roughly 2 miles (3.2 kilometers) beneath the surface by a National Oceanic and Atmospheric Administration (NOAA) expedition was, in fact, left by a big animal with a lot of tentacles.

While their findings are yet to be peer-reviewed, preliminary results reveal that the material is, in fact, once anchored an individual Relicanthus daphneae sea anemone to the ocean floor.

These pinkish organisms can reach several feet (about a meter) across, and stretch the same in length, so they're not tiny. While not exactly new to biology, the species was first described in 2006 . And even then, its exact taxonomy was debated until phylogenetic studies confirmed its connection to its closest relatives.

Given its obscurity and the fact that the species is most at home far beneath the waves near hydrothermal vents, we may be forgiven for not immediately recognising the bronze-colored ‘cuticle’ for what it is.

When researchers on the NOAA Ship Okeanos Explorer brought the papery material to the surface during a survey in the Gulf of Alaska in the summer of 2023, they were baffled. The size of a fist with a hole in the top, it may have been an egg sac. Or a dead sponge. Or something completely novel to science.

“We work on hundreds of different samples, and I suspected that our routine processes would clarify the mystery,” says zoologist Allen Collins, director of NOAA Fisheries’ National Systematics Laboratory.

“But this turned into a special case that required focused efforts and expertise of several different individuals. This was a complex mystery that required morphological, genetic, deep-sea, and bioinformatics expertise to solve.”

The integrative approach combined a study of the organic structure and a genetic analysis. A close look at the surface revealed numerous cnidocytes – "stinging cells" common to jellyfish, coral polyps...

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REACH UPDATE

Call for evidence: 1,4-dioxane in the PET lifecycle

29 Apr 2026

Germany has launched a further call for evidence to assess the necessity of a REACH restriction proposal on different processes suspected to cause emissions of 1,4-dioxane into the environment. This call for evidence covers emissions of 1,4-dioxane from the poly(ethylene terephthalate) (PET) lifecycle. Submit your information on emissions from the production, processing, and recycling of PET, available measures for emission reduction and economic impacts of a potential restriction on the PET lifecycle in English or German.

Have your say by 27 July 2026.

For any clarifications, contact: chemg(at)baua.bund.de

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REGULATORY UPDATE

ASIA PACIFIC

Indians protest over ‘forever chemicals’ after relocation of scandal-hit Italian factory

The Guardian · 26 May 2026

Protests over the production of cancer-linked Pfas chemicals have spread across India, after an investigation revealed that an Italian factory shut down due to an environmental scandal was bought by an Indian company and partly rebuilt.

At the end of last year, the Guardian revealed that the former Miteni plant in Vicenza had been acquired by the Indian company Laxmi Organic Industries. The factory produced Pfas and was shut down in 2018 after being linked to one of Italy’s worst environmental contamination scandals.

In June 2025, former Miteni executives were convicted over contamination linked to the plant, in a first-instance ruling widely seen as a landmark for environmental justice in Europe.

The factory left behind the contamination of one of Europe’s largest aquifers, affecting more than 350,000 people across the provinces of Vicenza, Verona and Padua through the drinking water. Miteni’s workers were worst affected, with one former employee showing one of the highest concentrations of Pfas ever recorded in human blood.

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DMPE releases response paper and public submissions for injection and storage greenhouse gas regulations

Government of Western Australia · 28 May 2026

The Department of Mines, Petroleum and Exploration (DMPE) has finalised its responses to public submissions to consultation drafts for the two sets of greenhouse gas (GHG) regulations.

Public comments were open from 15 July 2025 to 5 September 2025 for the consultation drafts of the Petroleum, Geothermal Energy and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2026 and the Petroleum and Greenhouse Gas Storage (Submerged Lands) (Greenhouse Gas Injection and Storage) Regulations 2026 (GHG Regulations).

The regulations follow the assent of the Petroleum Legislation Amendment Act 2024 (PLAA24) which, among other things, amended the existing Petroleum and Geothermal Energy Resources Act 1967 (PGERA67), Petroleum Pipelines Act 1969 and the Petroleum (Submerged Lands) Act 1982

(PSLA82) to provide a legislative framework for pipeline transport and permanent underground storage of greenhouse gas substances.

While Part 1 of the PLAA24 commenced on 14 May 2024 (sections 1 and 2), a secondary stage of regulation amendments is required to give effect to allow for commencement of the remainder of the PLAA24.

The GHG Regulations were developed to facilitate and regulate GHG injection and storage operations under the amended PGERA67 and the amended PSLA82.

As part of the consultation, DMPE committed to provide a response to submissions document and all submissions have now collectively published verbatim.

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Statistics Digest reveals Western Australia's strong resources sector amid market challenges

Government of Western Australia · 11 May 2026

The Department of Mines, Petroleum and Exploration has released its 2024-25 Mineral and Petroleum Statistics Digest, revealing impressive production, sales and market resilience despite global market uncertainties and price volatility in key commodities.

Mineral and petroleum sales reached $220 billion, reinforcing WA's status as the nation's resources powerhouse.

Iron ore, the backbone of the industry, achieved exceptional results, generating $122 billion in sales on the back of high prices and near-record output of 864 million tonnes.

Gold reached new heights, with a record $29 billion in sales driven by strong prices and slightly higher output of 6.7 million ounces (209 tonnes). A robust pipeline of new projects, restarts and expansions continues to build momentum for the industry.

The sector also remains a major employer, supporting 138,257 full-time equivalent (FTE) on-site positions in mining and mineral exploration, while the petroleum sector employed 9,428 on-site people.

Liquefied natural gas (LNG) sales totalled $36 billion, among the highest on record, while alumina delivered its second-highest result at $8.2 billion as higher prices offset lower production.

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P1067 - Health Star Rating System

Food Standards Australia New Zealand · 21 Apr 2026

Food Standards Australia New Zealand (FSANZ) is calling for submissions on Proposal P1067 – Health Star Rating System.

This proposal considers whether the Australia New Zealand Food Standards Code (the Code) should be amended to require packaged foods sold in Australia and New Zealand to display a Health Star Rating (HSR) symbol.

Based on current evidence, amending the Code to mandate the HSR system appears warranted.

A mandatory HSR system is expected to:

improve the consistency, comparability and accessibility of nutrition information

address limitations of the voluntary approach

strengthen consumer trust

provide greater regulatory certainty for industry and enforcement agencies.

This 1st call for submissions outlines FSANZ's assessment and proposed regulatory approaches and seeks stakeholder views to inform whether FSANZ should proceed to preparing a draft variation to amend the Code.

What's being proposed?

The 1st call for submissions outlines proposed regulatory approaches, including:

requiring the HSR symbol to be displayed on most packaged foods for retail sale where a nutrition information panel is required

standardising the design and location of the HSR symbol

requiring use of a prescribed Health Star Rating algorithm.

FSANZ also recognises the importance of consumer education to support understanding and effective use of a mandatory HSR system.

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AMERICA

Mercury and Air Toxics Standards

Harvard Law School · 18 May 2026

On Feb. 20, 2026, EPA finalized its repeal of the Biden administration standards regulating HAPs from coal- and oil- fired power plants. The final rule reinstates the 2012 standards. A coalition of nonprofits and a coalition of states separately petitioned for review of the final rule in D.C. Circuit.

Why It Matters

Mercury and Air Toxics Standards (MATS) limit the amount of mercury and other toxic emissions from power plants. Mercury is a powerful neurotoxin that ends up in the water and soil, and concentrates up the food chain, especially in fish. It is particularly dangerous for pregnant women and young children. In response to the Supreme Court's decision, Michigan v. EPA, EPA had to determine whether it was "appropriate and necessary" to regulate toxic pollution from power plants. The Biden administration confirmed in a final rule that it was appropriate and necessary to regulate mercury emissions from power plants, and that determination was not challenged in court.

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FDA's new post-market food chemical safety program a step forward, but gaps leave Americans at risk

Environmental Defense Fund · 15 May 2026

FDA action: The FDA finalized a new post-market food chemical safety program that could improve oversight of chemicals already in the food supply.

Missing pieces: The program still lacks some key details, including clear timelines for prioritizing, assessing and mitigating chemical risks and an adequate review process for understudied chemicals.

Health risks persist: By failing to address risks from cancer-causing substances, cumulative health effects and more, the program leaves Americans at risk.

"All Americans deserve to know their food is safe. This new program is an important step forward, incorporating changes that we at Environmental Defense Fund have been urging for years," said Maria Doa, Senior Director, Chemicals Policy. "At the same time, the program leaves several questions unanswered that are critical to delivering safer food. It fails to fully ban carcinogens and address cumulative effects, leaving pathways open for harmful substances to still end up in Americans' food."

Real improvements made, but too many risks remain

The FDA recently finalized its food chemical safety post-market assessment program, a step forward toward reducing health harms from chemicals in food that Americans have been exposed to for years, if not decades. However, the program leaves vital questions unanswered and fails to adequately address cancer-causing chemicals and other major risks.

The new program includes important features recommended by Environmental Defense Fund and partners to streamline and enhance the prioritization and review process, strengthen the toxicity criteria for prioritizing chemicals of high concern, increase stakeholder engagement and incorporate peer review of its scientific assessments.

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EUROPE

New EU water quality protection rules enter into force

The Water Diplomat · 22 May 2026

New EU water protection rules entered into force on 11 May 2026, targeting a broader range of pollutants including PFAS, microplastics, and various pharmaceuticals. These regulations update the Water Framework Directive by establishing stricter limits on chemical mixtures and improving monitoring standards across all Member States. Although the legislation is now active, countries have until 2039 to achieve full compliance with the newly established environmental quality standards. Environmental groups have commented on this long implementation period, arguing that the timeline is too lenient, allowing industrial polluters to continue discharging hazardous substances for another decade and a half. Consequently, they argue, while the rules provide a legal roadmap for cleaner water, the actual ecological benefits may not be fully realised for several years.

Together with the new EU water protection rules, the European Chemicals Agency (ECHA) will assume a centralised role in assessing chemical risks to water, streamlining the process of setting safety limits for pollutants such as PFAS and pharmaceuticals. This structural shift aims to ensure that water quality standards are based upon the latest scientific data whilst accelerating the identification of hazardous substances across the European Union. The intention behind this change is to move the EU away from a fragmented, multi-agency approach and towards a more centralised "one substance, one assessment" model.

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Asbestos control limit review published

HSE.gov.uk · 18 May 2026

The Health and Safety Executive (HSE) has reviewed the latest international scientific, technical and workplace evidence on Great Britain's asbestos control limit.

The review followed HSE's published workplace exposure level setting process and concluded that the Great Britain (GB) asbestos control limit (CL), will remain at 0.1 fibres per millilitre (f/ml), measured as a 4-hour time-weighted average (TWA).

Undertaken in response to the European Union's (EU) decision to reduce its occupational exposure limit (OEL) for asbestos, and the 2022 Work and Pensions Committee report on 'HSE's approach to asbestos management', the review concluded that, currently, there is no clear evidence that lowering the GB CL in law would reduce current or future exposures and improve health outcomes.

HSE's Chief Scientific Advisor Professor Andrew Curran said: "Our decision is based on rigorous scientific evidence and reflects our commitment to protecting workers through the most effective means possible. The current regulatory framework, which requires exposures to be reduced as low as reasonably practicable, already provides robust protection for workers handling asbestos.

"We have thoroughly examined the available science and consulted extensively with experts across the sector, and our conclusion is that the current framework provides the most effective protection for workers.

"In addition, we found that lowering the Great Britain control limit would in practice bring most asbestos-related work into the scope of licensable activity, imposing significant costs on businesses without a corresponding reduction in exposure risk."

The review noted that there are practical difficulties of measurement at lower levels of exposure, which would provide a barrier to accurately implementing a lower limit, and could introduce risk.

The review found that most asbestos work is already designed to minimise exposure to well below the control limit through effective control measures, when requirements are followed. The review's findings stated training, competence, site discipline, and regulatory enforcement have greater influence on reducing asbestos exposure risks than changing numerical limits.

HSE will continue to monitor emerging evidence and international developments, including the EU's planned review in 2029. HSE remains committed to ensuring standards are met in practice, recognising that worker behaviour and competence are key factors in minimising asbestos exposure risks.

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“Universal PFAS”: European Space Sector comments on socio-economic assessment sent to ECHA, urging EU policy makers to move away from universal ban model

ASD Eurospace · 27 May 2026

ASD-Eurospace is pleased to announce that we have submitted the European Space Sector response to the European Chemicals Agency’s (ECHA) consultation on the SEAC (Socio-Economic Analysis Committee) Draft Opinion concerning the proposed universal PFAS restriction on 22 May 2026.

Key points delivered with the response:

According to the response, the current “ban-with-derogations” approach could seriously undermine Europe’s space capabilities.

New uses identified

PFAS substances remain indispensable across a wide range of European space applications, including satellites, launchers, propulsion systems, thermal insulation, photonic sensors, cable systems, hydraulic systems, semiconductor equipment and defence-related space infrastructure. Further to the input provided by ASD-Eurospace for the 1st ECHA public consultation in 2023, many additional PFAS-dependent applications have been identified, and viable substitutes are still unavailable for mission-critical uses.

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INTERNATIONAL

Climate Finance Provided and Mobilised by Developed Countries in 2013-2024

OECD · 21 May 2026

Since 2015, at the request of donor countries, the OECD has produced regular analyses1 of progress towards the goal set under the United Nations Framework Convention on Climate Change (UNFCCC) for developed countries to mobilise USD 100 billion annually for climate action in developing countries, in the context of meaningful mitigation action and transparency on implementation. This goal was initially set to be reached by 2020 and was then extended through to 2025.

Analyses by the OECD Secretariat are based on best-available data and a robust accounting framework, consistent with the outcome of the first meeting of the Parties to the Paris Agreement (CMA1) regarding funding sources and financial instruments related to reporting of information on financial resources provided and mobilised through public interventions. Figures produced by the OECD to track progress towards the USD 100 billion goal focus on climate finance provided and mobilised by developed countries and, as such, do not capture all finance for climate action in developing countries. The present report includes a dedicated chapter that details the scope, data sources and methods.

The preceding OECD report, published in May 2024, showed that the goal was reached in 2022, exceeding USD 100 billion for the first time (OECD, 2024[1]), reaching a level that had not been expected until 2025 according to earlier OECD forward-looking scenarios (OECD, 2021[2]). While the goal expired at the end of 2025, tracking its annual fulfilment through to 2025 is important for transparency and accountability, as well as to identify lessons learned to contribute to informing the next stages in mobilising and scaling up climate finance. The present report adds figures for 2023 and 2024 to the previously published time series and, in doing so, confirms that the goal was met during those two years. Data needed to track and produce figures for 2025 will not be available before 2027 at the earliest.

Moving beyond the USD 100 billion goal, in November 2024 at COP29, Parties to the UNFCCC adopted a New Collective Quantified Goal (NCQG) on climate finance, for the period 2026-2035. The decision includes a call on all actors to work together to enable the scaling up of financing to developing countries for climate action from all sources to at least USD 1.3 trillion annually by 2035, and a goal, with developed country Parties taking the lead, of at least USD 300 billion per year by 2035. The UNFCCC's Standing Committee on Finance has a mandate to prepare biennial reports on collective progress towards all elements of the NCQG decision, starting in 2028. Work conducted in 2025 under the OECD-IEA Climate Change Expert Group highlights the importance of co-ordinated efforts over the next two years to foster a robust tracking framework, improve the availability and comparability of data, and establish transparency arrangements (Falduto and Jachnik, 2025[3]). Building on its long-standing experience in tracking and analysing climate finance, and in providing platforms for dialogue and knowledge exchange, the OECD stands ready to contribute to this process.

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HAZARD ALERT

Methyl Methacrylate

5 Jun 2026

Methyl methacrylate is an organic compound with the formula CH2=C(CH3)COOCH3. It is the methyl ester of methacrylic acid (MAA) and is a monomer produced on a large scale for the production of poly(methyl methacrylate) (PMMA). [1] Methyl methacrylate is a colourless liquid with an acrid fruity odour. It is a flammable liquid and is slightly soluble in water and is soluble in some organic solvents. [2]

Uses [3]

Methyl methacrylate is used in the manufacture of methacrylate resins and plastics e.g., Plexiglas. The principal uses of methyl methacrylate are: cast sheet and other grades (advertising signs and displays, lighting fixtures, glazing and skylights, building panels and sidings, and plumbing and bathroom fixtures), moulding/extrusion powder, and coatings (latex paints, lacquer, and enamel resins). It is also used in the impregnation of concrete to make it water-repellent, and also has uses in the fields of medicine and dentistry to make prosthetic devices and as a ceramic filler or cement.

In the Environment [4]

Methyl methacrylate evaporates when exposed to air. It dissolves when mixed with water. Most releases of methyl methacrylate to the environment are to air. Methyl methacrylate can also evaporate from water or soil exposed to air. Once in air, it breaks down to other chemicals. Microorganisms that live in water and in soil can also break down methyl methacrylate. Because it is a liquid that does not bind well to soil, methyl methacrylate that makes its way into the ground can move through the ground and enter groundwater. Plants and animals are not likely to store methyl methacrylate.

Sources & Routes of Exposure [3,4]

Sources of Exposure

Potential for exposure exists for employees of manufacturers of methyl methacrylate and its polymers, as well as doctors, nurses, dentists, and dental technicians. Individuals may also be exposed to methyl methacrylate via consumption of contaminated water. Exposure to methyl methacrylate can occur in the workplace or in the environment following releases to air, water, land, or groundwater. In addition, exposure can occur when people use certain exterior latex house paints, adhesives, inks, and floor polishes.

Routes of exposure

Exposure to methyl methacrylate is primarily occupational, through dermal and inhalation routes. Methyl methacrylate enters the body when people breathe air or consume water or food contaminated with methyl methacrylate. It can also be absorbed through skin contact. Methyl methacrylate does not remain in the body due to its breakdown and removal.

Health Effects [3]

Acute Effects

Methyl methacrylate is irritating to the skin, eyes, and mucous membranes in humans. An allergic response to dermal exposure may develop. Respiratory symptoms reported in humans include chest tightness, dyspnea, coughing, wheezing, and reduced peak flow. Neurological symptoms, including headache, lethargy, lightheadedness, and sensation of heaviness in arms and legs, have occurred in humans following acute exposure to methyl methacrylate. In mice and rats acutely exposed to high concentrations of methyl methacrylate by inhalation, degenerative olfactory changes in the nasal passages and lung damage have been observed. High doses of methyl methacrylate may cause pulmonary oedema. Acute oral exposure of animals to methyl methacrylate has caused damage to the liver. Tests involving acute exposure of rats, mice, rabbits, and guinea pigs have demonstrated methyl methacrylate to have low to moderate acute toxicity by inhalation or oral exposure.

Chronic Effects

Respiratory and nasal symptoms and reduced lung function have been reported in chronically exposed workers. In one study, occupational exposure to high doses of methyl methacrylate was associated with cardiovascular disorders in humans. Chronic inhalation of methyl methacrylate by rats has resulted in respiratory effects (e.g., inflammation of the nasal cavity, degeneration/loss of olfactory epithelium in nasal turbinates, and lung congestion). Chronic inhalation of high levels of methyl methacrylate has resulted in degenerative and necrotic changes in the liver, kidney, brain, spleen, and bone marrow, decreased body weight gain, listlessness, prostration, and ocular and nasal discharge in animals. EPA has calculated a Reference Concentration (RfC) for methyl methacrylate of 0.7 milligrams per cubic metre (mg/m3) based on respiratory effects in rats. EPA has calculated a Reference Dose (RfD) of 1.4 milligrams per kilogram body weight per day (mg/kg/d) based on no adverse effects in rats.

Reproductive/Developmental Effects

No adequate reproductive or developmental studies in humans are available. Inhalation exposure of rats to maternally toxic levels of methyl methacrylate resulted in foetal abnormalities (haematomas and skeletal anomalies) and decreased foetal weight and crown-rump length.

Cancer Risk

From a retrospective epidemiology study, a causal relationship between occupational exposure and increased incidences of colon and rectal cancers has been suggested; however, the causal relationship could not be established when relative accumulated total exposures and latency were considered. No carcinogenic effects were observed in several inhalation and oral animal studies. EPA considers methyl methacrylate not likely to be carcinogenic to humans.

Safety [5]

First Aid Measures

- Eye Contact: Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.
- Skin Contact: After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.
- Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.
- Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.
- Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.
- Ingestion: Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Fire & Explosion Data

- Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks.
- Explosive in presence of heat.
- Fire Fighting Media and Instructions: Flammable liquid, soluble or dispersed in water. For small fires use dry chemical powder. For large fires use alcohol foam, water spray or fog.

Engineering Controls & Personal Protection

Engineering Controls

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapours below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the workstation location.

Personal Protective Equipment

The following personal protective equipment is recommended when handling methyl methacrylate:

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

Personal Protection in Case of a Large Spill:

- Splash goggles;
- Full suit;
- Vapour respirator;
- Boots;

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

Regulation [2,3]

Exposure Limits

United States

- American Conference of Governmental and Industrial Hygienists' threshold limit value is 410mg/m3.
- National Institute of Occupational Safety and Health's recommended exposure limit is 410mg/m3.
- NIOSH's immediately dangerous to life or health concentration is 4100mg/m3
- Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average is 410mg/m3.

Australia

- Safe Work Australia has set a limit for methyl methacrylate, of 100 parts per million over an eight hour workshift.

References

- http://en.wikipedia.org/wiki/Methyl_methacrylate
- http://www.npi.gov.au/substances/methyl-methacrylate/index.html
- http://www.epa.gov/ttn/atw/hlthef/methylme.html
- http://www.epa.gov/chemfact/methy-fs.txt
- http://www.sciencelab.com/msds.php?msdsId=9927360

JANET'S CORNER

Who Am I?

5 Jun 2026

I am born from ancient Roman ingenuity, yet I became the defining material of the modern world.

My strength comes from a chemical marriage between a powder and water, a reaction that actually grows harder with time.

I am poured as liquid, set as solid, and I now cover more of Earth's surface than any other human-made substance.

My primary ingredient is Portland cement mixed with sand, gravel, and water—together we build the skyscrapers, bridges, and roads beneath your feet.