

Bulletin Board

Contents

AUG. 13, 2021

(click on page numbers for links)

REGULATORY UPDATE

ASIA PACIFIC

FSSAI issues food safety and standards (Ayurveda Aahar) regulations 2021	4
Glyphosate call for information closes next month.....	5
Study finds microplastics induce reproductive toxicity in male mice.....	6

AMERICA

Canada proposes to update nutritional – table of daily values.....	7
Toxic ‘forever chemicals’ are found everywhere. What you need to know about PFAS	8
Elevated lead levels found in 93 Hawaii public school water fixtures.....	9
Washington state county is the first in US to ban new fossil fuel infrastructure	10

EUROPE

Certain HFCs and HFOs are in PFAS group that five EU countries intend to restrict	11
EC committee’s preliminary opinion on HAA299 (Nano) as a UV filter open for public comment	12
Ban all pesticides in UK gardens to save bees and insects, says expert	13
France seeks more protective European definition of nanomaterials	14

REACH UPDATE

EUO publishes nanopinion on ECHA nanomaterials expert group	16
ECHA calls for tenders to perform study on impact of graphene, graphene oxide, and other 2D materials	17

JANET’S CORNER

Standup Chemist.....	18
----------------------	----

HAZARD ALERT

Vanadium	19
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*** While Chemwatch has taken all efforts to ensure the accuracy of information in this publication, it is not intended to be comprehensive or to render advice. Websites rendered are subject to change.**

Bulletin Board

Contents

AUG. 13, 2021

GOSSIP

Snake-eating spiders are surprisingly common	25
Reef-harming sunscreens are now banned from all national marine parks	26
This hurricane season will be even more active than previously predicted, NOAA says	27
Study finds link between glyphosate exposure and pregnancy length	29
'Doubly charming' tetraquark is the longest-lived exotic-matter particle ever found	31
Air pollution linked to higher risk of dementia	33
A horseshoe crab's blood is vital in testing drugs. Critics say using it endangers the ancient creature.....	35
Melting sea ice could wipe out 98% of emperor penguins by the end of the century	40
Contaminated pet food investigation traces toxic horse meat back to NT property	43
Frozen mummy of extinct cave lion is 'best-preserved ice age animal ever found,' researchers say.....	45

CURIOSITIES

US astronaut moon landing 'not feasible,' by 2024, NASA's inspector general finds	47
New poo, new you? Fecal transplants reverse signs of brain aging in mice.....	49
Human influence on global warming is 'unequivocal,' IPCC report says	51
There's a 46% chance that fish you bought is mislabelled.....	54
Squirrels use parkour tricks when leaping from branch to branch.....	56
This meat-eating plant is only a part-time killer	58
Which COVID-19 vaccine has the lowest rate of breakthrough infections?.....	61
Concerns over pollution and hot weather add another challenge to marathon swimming.....	63
Arizona man went a month without knowing he had the plague.....	66
Bayer heads into next U.S. cancer trial, opening statements set for Thursday	68

Bulletin Board

Contents

AUG. 13, 2021

TECHNICAL NOTES

(Note: Open your Web Browser and click on Heading to link to section) ...	71
CHEMICAL EFFECTS	71
ENVIRONMENTAL RESEARCH	71
OCCUPATIONAL.....	71
PHARMACEUTICAL/TOXICOLOGY	71

Bulletin Board

Regulatory Update

AUG. 13, 2021

ASIA PACIFIC

FSSAI issues food safety and standards (Ayurveda Aahar) regulations 2021

2021-07-05

On July 01, 2021, the Food Safety Standards Authority of India proposed a draft regulation on "[Food Safety and Standards \(Ayurveda Aahar\) Regulations 2021](#)" in accordance with Food Safety and Standards Act, 2006. The manufacture of Ayurveda Aahar shall be established by Food Business Operators in accordance with Schedule 4 of Food Safety and Standards (Licensing and Registration of Food Businesses) Regulation, 2011.

The scientific document highlights the main focal points:

- Not intended for use in infants up to the age of 24 months.
- The food business operators may alter the recipes listed in schedule IV of Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, Functional Food and Novel Food) Regulations, 2016.
- The addition of vitamins, minerals and amino acids shall not be permitted.
- The presence of natural vitamins and minerals may be declared on the label.
- Products covered under these regulations shall contain only natural food additives as specified under schedule C of these regulations.
- Products shall conform to the safety requirements specified in Schedule D of these regulations.
- Packaging of Ayurveda Aahar shall conform to the Food Safety and Standards (Packaging) Regulation, 2018.
- The labelling of Ayurveda Aahar shall be in accordance with the Food Safety and Standards (Labelling and Display) Regulations, 2020, and the specific labelling requirements provided in these regulations.

[Read More](#)

Selerant, 5 July 2021

<https://resources.selerant.com/food-regulatory-news/fssai-issues-food-safety-and-standards-ayurveda-aahar-regulations-2021>

Bulletin Board

Regulatory Update

AUG. 13, 2021

Glyphosate call for information closes next month

2021-07-21

Just over two months into the call for information on the herbicide glyphosate, we have received more than 80 responses.

This weed killer has been used by home gardeners, farmers, and councils in New Zealand since the 1970s. Although it is commonly known as the active ingredient in Roundup, there are 89 mixtures containing glyphosate that are approved for use in this country.

We are seeking information from New Zealanders – including industry and the general public – about the manufacture, importation, and patterns of use of glyphosate in this country, as well as information on the availability of alternatives, and any impacts on Māori.

General Manager of Hazardous Substances and New Organisms, Dr Chris Hill, says the majority of responses to the call for information have come from the general public.

"So far, nearly 80% of responses to the call for information have come from individual members of the public. The remainder have been submitted by professional users, organisations, and those involved in the supply of glyphosate.

"With just over five weeks to go, we would particularly like to hear from professional users or those involved in the manufacture or supply of products containing glyphosate."

We monitor international developments and continually review global research on hazardous substances, including glyphosate, and we have no evidence that risks associated with using glyphosate, or its hazardous nature, have changed. However, we feel the time is right for us to take another look at this substance.

The European Chemicals Agency and the European Food Safety Authority are in the process of reviewing the classification and approval of glyphosate, with their conclusions set to be released in mid-2022.

Issuing a call for information now will enable us to have a greater understanding of how glyphosate-containing products are being used in New Zealand by the time the European findings are published, and ensure we're better prepared to assess those findings.

The call for information closes at 5.00pm Friday 27 August.

Although it is commonly known as the active ingredient in Roundup, there are 89 mixtures containing glyphosate that are approved for use in this country.

Bulletin Board

Regulatory Update

AUG. 13, 2021

[Find out more and respond to the call for information](#)

[Read more about glyphosate](#)

EPA NZ, 21 July 2021

<https://www.epa.govt.nz/news-and-alerts/latest-news/glyphosate-call-for-information-closes-next-month/>

Study finds microplastics induce reproductive toxicity in male mice

2021-07-29

Study investigates reproductive toxicity of environmental concentrations of polystyrene (PS) microplastics to male mice; further examines underlying molecular mechanism; study is first to find long-term PS microplastic exposure affects sperm quality and testosterone levels in mice.

In a [preprint](#) under consideration at the peer-reviewed journal *Particle and Fibre Toxicology*, published on July 19, 2021, Haibo Jin and co-authors from *Nanjing University*, China, studied the effects of polystyrene (PS) microplastics on the male reproductive system of mammals. The scientists exposed mice to fluorescent PS microplastics of three sizes (0.5, 4.0, and 10 μm) for 180 days and exposed primary Leydig cells to particles of 0.5 μm for 24 hours. Leydig cells are testis cells that synthesize and secrete testosterone. According to the authors, environmentally relevant particle concentrations were used (100 and 1000 $\mu\text{g/L}$ for mice exposure) which complies with requirements previous reviews emphasized as necessary to better understand potential health implications of microplastics (FPF reported).

After the exposure period, Jin and colleagues observed damage to testicular tissue structure as well as decreased sperm quality and testosterone levels, showing that chronic exposure to PS microplastics induces male reproductive toxicity in mice. They also analyzed the underlying mechanism for reduced testosterone levels and found the inhibition of the luteinizing hormone (LH)-mediated LHR/cAMP/PKA/StAR pathway to be responsible. Moreover, the researchers reported that the plastic particles attached to the Leydig cells and were subsequently internalized. The authors believe that their "findings may provide a novel insight for preventing the reproductive toxicity of MPs [microplastics]." Providing novel insights into micro- and nanoplastic impacts on human

Bulletin Board

Regulatory Update

AUG. 13, 2021

health is also the objective of five recently launched Horizon 2020 research projects (FPF reported).

[Read More](#)

Food Packaging Forum, 29 July 2021

<https://www.foodpackagingforum.org/news/study-finds-microplastics-induce-reproductive-toxicity-in-male-mice>

AMERICA

Canada proposes to update nutritional – table of daily values

2021-06-30

On June 24, 2021, the [Health Canada Food Directorate](#) proposed an amendment to the potassium and sodium values for specific age groups in the Table of Daily Values. The table sets out the recommended amounts of nutrients (the daily value) for specific age groups for nutrition labelling purposes.

The scope of the scientific document is herein summarized:

- Canada's current DVs for potassium and sodium are based on the 2005 DRIs thus proposes to update DV to reflect the new DRIs for specific age groups
- Infants 6 - 12 months: increase the DV for potassium from 700 mg to 860 mg
- Children 1 - 4 years: decrease the DV for sodium from 1500 mg to 1200 mg and decrease the DV for potassium from 3000 mg to 2000 mg
- All other age groups: decrease the DV for potassium from 4700 mg to 3400 mg

The draft is open for public comments until September 07, 2021.

[Read More](#)

Selerant, 30 June 2021

<https://resources.selerant.com/food-regulatory-news/canada-proposes-to-update-nutritional-labelling-table-of-daily-values>

The table sets out the recommended amounts of nutrients (the daily value) for specific age groups for nutrition labelling purposes.

Bulletin Board

Regulatory Update

AUG. 13, 2021

Toxic 'forever chemicals' are found everywhere. What you need to know about PFAS

2021-07-29

From nonstick pans to food packaging to make-up, hundreds of everyday products are made with PFAS chemicals that have been linked to adverse health effects, including cancer, weakened immunity and low birth weight.

They are also a persistent pollutant in the environment, with high levels found in many public water systems.

PFAS are described as "forever chemicals" because they don't degrade in the environment or the human body. And, according to the Centers for Disease Control and Prevention, most people in the U.S. have PFAS in their bloodstream.

So, what exactly are PFAS chemicals and should you be concerned? Here's what you need to know:

What are PFAS?

PFAS is shorthand for a class of chemicals known as perfluoroalkyl and polyfluoroalkyl substances. PFAS chemicals have been manufactured since the 1940s and highly utilized in various industries because of their ability to resist heat and repel grease, water and oil.

PFAS chemicals keep food from sticking to cookware, make clothes and carpets resistant to stains, and create firefighting foam that is more effective.

PFOA and PFOS are among the oldest chemicals in this class and have been largely phased out in the United States. However, these man-made pharmaceuticals, microplastics and synthetic chemicals take hundreds of years to break down, and according to the Environmental Protection Agency, are still present in the environment. The EPA has established a nonbinding "advisory level" of 70 parts per trillion for PFOA and PFOS in drinking water, which the federal Agency for Toxic Substances and Disease Registry has described as too weak. Some states have imposed tougher limits.

They are also a persistent pollutant in the environment, with high levels found in many public water systems.

Bulletin Board

Regulatory Update

AUG. 13, 2021

Read More

NBC Los Angeles, 29 July 2021

<https://www.nbclosangeles.com/news/national-international/toxic-forever-chemicals-are-found-everywhere-what-you-need-to-know-about-pfas/2653672/>

Elevated lead levels found in 93 Hawaii public school water fixtures

2021-07-22

Elevated concentrations of lead were found in about 4% of the water samples collected from faucets and drinking fountains at selected Hawaii public schools and child care centers over the last several months.

Water from nearly 100 fixtures is no longer being used, according to state officials, while monitoring and testing continue under a national effort to test drinking water sources for lead at public schools and child care facilities that started here in February.

Testing of 58 schools and 70 child care facilities in Hawaii, Maui and Kauai counties has been completed so far, officials said.

To date, 93 of the 2,232 sampled taps at schools show elevated concentrations of lead above the project action level of 15 parts per billion (ppb), while four of the 100 sampled taps at child care centers had results above the action level.

Michael Miyahira, acting branch chief of the Department of Health's Safe Drinking Water Branch, said the schools and child care facilities were notified immediately after test results were known.

"We would like to assure the community that taps that had elevated levels of lead will not be used for drinking or food preparation until the problem is fixed," Miyahara said in a release.

Lead is a heavy metal that is naturally present in the environment and has been used in the manufacture of such things as pipes. When lead gets into human bodies, it can harm the brain and nervous system. Long-term effects of childhood lead exposure include problems with learning, school performance, attention and behavior as well as anemia and other health problems.

Testing of 58 schools and 70 child care facilities in Hawaii, Maui and Kauai counties has been completed so far, officials said.

Bulletin Board

Regulatory Update

AUG. 13, 2021

While 4% of sampled taps indicated results above the action level so far, comparable projects on the mainland have had rates of about 5% to 6%, officials said.

Testing on Oahu began in mid-July and results will be available on a rolling basis.

Schools and centers with lead concentrations below 15 ppb have been provided strategies to minimize lead exposure, such as daily flushing of the water, using certified lead-free filters or turning the tap into a hand wash-only station.

[Read More](#)

Star Advertiser, 22 July 2021

<https://www.staradvertiser.com/2021/07/22/breaking-news/elevated-lead-levels-found-in-93-hawaii-public-school-water-fixtures>

Washington state county is the first in US to ban new fossil fuel infrastructure

2021-07-29

A county in Washington state has become the first such jurisdiction in the US to ban new fossil fuel infrastructure, following a lengthy battle over the impact of oil refineries on the local community.

In a vote on Tuesday night, Whatcom county's council unanimously passed a measure that bans the construction of new refineries, coal-fired power plants and other fossil fuel-related infrastructure. The ordinance also places new restrictions on existing fossil fuel facilities, such as a requirement that any extra planet-heating gases emitted from any expansion be offset.

Whatcom county is located in the far north-west corner of Washington state, next to the Canadian border and abutting the Salish sea. The county hosts two of the state's five oil refineries, with BP and Phillips 66 overseeing facilities at the Cherry Point complex that refines much of the oil from Canada and Alaska that is then distributed along the US west coast.

"There will be no new refineries, they won't be able to get permits to export their product and while we will still have these dinosaur facilities already here it will be more challenging for them to expand," said Todd

Bulletin Board

Regulatory Update

AUG. 13, 2021

Donovan, who is serving his second term on the council and was a major proponent of the new rule. "The future is clearly in renewable energy."

The ban is the culmination of a years-long fight to curb fossil fuel activity in the county to help address the climate crisis and reduce air pollution. A huge coal export facility, which would have moved 50m tons of coal a year, was proposed for Cherry Point but was eventually blocked in 2016 following fears raised by the local Lummi Nation that it would have destroyed fisheries.

Donovan said that people in the county had become increasingly alarmed about the environmental fallout of fossil fuel activity, including impacts upon fisheries and local orca whales.

[Read More](#)

The Guardian, 29 July 2021

<https://www.theguardian.com/us-news/2021/jul/28/washington-state-whatcom-county-ban-fossil-fuel-infrastructure>

EUROPE

Certain HFCs and HFOs are in PFAS group that five EU countries intend to restrict

2021-07-29

In a move with major implications for the European HVAC&R industry, five EU countries announced on July 15 their intention to submit a joint proposal to restrict per- and polyfluorinated alkyl substances (PFAS), including some HFC and HFO refrigerants, to the European Chemicals Agency (ECHA) under the REACH regulation by July 2022.

The five countries – Germany, the Netherlands, Norway, Sweden and Denmark – are seeking stakeholder feedback on their proposal.

Following submission next year, the restriction proposal would then be subject to "adoption of the final opinions" by ECHA's Committee for Risk Assessment (RAC) and Committee for Socio-economic Analysis (SEAC), before it would be adopted by the European Commission (EC).

PFAS, which represent a group of over 4,700 "forever chemicals," are used to produce many consumer products, but exposure to PFAS can be harmful to human health. PFAS include perfluorooctane sulfonic acid

The ordinance also places new restrictions on existing fossil fuel facilities, such as a requirement that any extra planet-heating gases emitted from any expansion be offset.

The five countries – Germany, the Netherlands, Norway, Sweden and Denmark – are seeking stakeholder feedback on their proposal.

Bulletin Board

Regulatory Update

AUG. 13, 2021

(PFOS) and perfluorooctanoic acid (PFOA), which have already been limited and banned, respectively, in the EU.

As defined by the five countries, PFAS cover a number of f-gases, including certain HFCs and HFOs that are used in HVAC&R applications. In addition, trifluoroacetic acid (TFA), which is a PFAS, is an atmospheric degradation product of HFO-1234yf and HFC-134a.

The REACH regulation governs the registration, evaluation, authorization and restriction of chemical substances in the EU. HFCs are separately regulated by the EU F-Gas Regulation, though HFOs are not. In the U.S. the Environmental Protection Agency also recently increased its oversight of PFAS, and is in the process of separately regulating HFCs. On July 15, the U.S. state of Maine became the first government in the world to ban the sale of products containing PFAS as of January 1, 2030, with exceptions for health and safety needs for which alternatives are not available.

Along with their announcement of intent, the five EU countries released a survey in which “the affected industrial associations and companies, but also companies that produce alternatives to PFAS,” can add or correct information published by the countries on PFAS, said the German Environment Agency (UBA) in a statement.

[Read More](#)

HC21, 29 July 2021

http://hydrocarbons21.com/articles/10121/certain_hfcs_and_hfos_are_in_pfas_group_that_five_eu_countries_intend_to_restrict

EC committee’s preliminary opinion on HAA299 (Nano) as a UV filter open for public comment

2021-07-27

The European Commission’s (EC) Scientific Committee on Consumer Safety (SCCS) has begun a public comment period on its preliminary opinion on HAA299 (nano). The EC asked SCCS whether it considered HAA299 (nano) safe when used as an ultraviolet (UV) filter in cosmetic products up to a maximum concentration of ten percent. According to the preliminary opinion, SCCS considers that HAA299 (nano) as covered within the provided characteristics is safe when used as a UV filter in dermally applied cosmetic products up to a maximum concentration of ten percent. The preliminary opinion states that based on the inflammatory effects on the lung after acute inhalation exposure, SCCS has concerns regarding the

Bulletin Board

Regulatory Update

AUG. 13, 2021

repeated use of products containing HAA299 (nano) in applications that could lead to inhalation exposure. Therefore, SCCS does not recommend the use of HAA299 (nano) in applications that could lead to inhalation exposure. The EC asked whether in view of SCCS’s previous opinion (SCCS/1533/14) it considers HAA299 non-nano and nano form safe when used as a UV filter in cosmetic products up to a maximum concentration of ten percent. According to SCCS, the data considered in its preliminary opinion have not provided any new or additional concern, and it considers HAA299, either as non-nano or nano form, safe when used as a UV filter in dermally applied cosmetic products up to a maximum concentration of ten percent. The EC asked whether SCCS has any further scientific concerns on human health with regard to the use of HAA299 (nano) in cosmetic products. The preliminary opinion is based on the currently available scientific evidence, showing an overall very low level or lack of dermal absorption of HAA299 (nano) in human skin. SCCS notes that if any new evidence emerges in the future to show that HAA299 (nano) used as a UV filter in cosmetic products can penetrate human skin (healthy, compromised, sunburned, or damaged skin) to reach viable cells, in higher levels than demonstrated in this submission, then it may consider revising its assessment. Comments are due **September 27, 2021**.

[Read More](#)

Nano and Other Emerging Chemical Technologies Blog, 27 July 2021

<https://nanotech.lawbc.com/2021/07/ec-committees-preliminary-opinion-on-haa299-nano-as-a-uv-filter-open-for-public-comment>

Ban all pesticides in UK gardens to save bees and insects, says expert

2021-08-05

A leading insect expert has called for a UK-wide ban on the use of pesticides in gardens and urban areas to protect bees, wildlife and human health.

Dave Goulson, a professor of biology at the University of Sussex, said outlawing chemical spraying in the country’s 22m private gardens, along with road verges, parks and other green spaces, could slow insect decline by creating a network of nature-friendly habitats where insects can recover.

In a petition launched on Thursday, Goulson urged the government to follow the example of France, which banned all use of synthetic pesticides

The campaign has been backed by the RSPB, Parkinson’s UK, the Soil Association and other environmental groups.

Bulletin Board

Regulatory Update

AUG. 13, 2021

in public spaces in 2017, and banned garden use from 2019. The campaign has been backed by the RSPB, Parkinson's UK, the Soil Association and other environmental groups.

"The use of pesticides in farming is the subject of big debate. You can make a pretty strong argument that we probably do need pesticides if we're going to feed everybody. But we don't need them in our gardens. There's no economic case for that at all," Goulson said. "If we link up private gardens with flower-filled road verges and roundabouts, city parks, cemeteries and so on, that's potentially a network of insect-friendly habitats. It would be a huge step in the right direction."

[Read More](#)

The Guardian, 5 August 2021

<https://www.theguardian.com/environment/2021/aug/05/campaign-calls-for-uk-ban-pesticides-gardens-urban-areas-aoe>

France seeks more protective European definition of nanomaterials

2021-07-29

As reported in our May 7, 2021, [blog item](#), the European Commission (EC) recently held a targeted stakeholder consultation to update, test, and verify the preliminary findings of its review of the 2011 [Recommendation on the definition of a nanomaterial](#). According to a July 23, 2021, [news item](#) posted by the French Agency for Food, Environmental and Occupational Health and Safety (ANSES), in its response to the consultation, ANSES maintained that the changes proposed by the EC "tend to restrict the number and type of objects that will ultimately be considered as nanomaterials. For example, nanoplastics, as well as certain emulsions and lipid nanoparticles, might not be considered to fall under this definition." ANSES states that the EC's definition "needs to be as comprehensive as possible and define nanomaterials in a unique way based on physico-chemical criteria." Sectoral regulations, such as for cosmetics, biocides, and food, could then clarify which nanomaterials should be subject to specific measures, including product labeling, specific assessment, and authorization, before the nanomaterials are placed on the market. ANSES "also finds it unfortunate that the size thresholds (1-100 nm) used in the current definition were not open to discussion as part of this consultation, as they have no scientific basis." According to the news item, ANSES will publish an opinion by **2022**, "with the support of

Bulletin Board

Regulatory Update

AUG. 13, 2021

a multidisciplinary group of experts," that provides more information and perspective on its response to the EC.

[Read More](#)

Nano and Other Emerging Chemical Technologies Blog, 29 July 2021

<https://nanotech.lawbc.com/2021/07/france-seeks-more-protective-european-definition-of-nanomaterials/>

... ANSES maintained that the changes proposed by the EC "tend to restrict the number and type of objects that will ultimately be considered as nanomaterials.

Bulletin Board

REACH Update

AUG. 13, 2021

EUO publishes nanopinion on ECHA nanomaterials expert group

2021-08-02

On July 15, 2021, the European Union (EU) Observatory for Nanomaterials (EUON) published a Nanopinion entitled “[The ECHA Nanomaterials Expert Group \(NMEG\)](#)” by Frank Le Curieux, Scientific Area Leader for Genotoxicity at the European Chemicals Agency (ECHA). Le Curieux provides a brief summary of the creation of NMEG and its history. NMEG’s current mandate is to provide informal and non-binding scientific and technical advice on questions related to nanomaterials or nanoforms of substances in the frame of the implementation of the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) regulation, the Classification, Labeling and Packaging (CLP) regulation, the Biocidal Products Regulation (BPR), EUON, and other issues relevant to ECHA’s work. NMEG is intended to improve the understanding of specific issues concerning nanomaterials/nanoforms of substances, leading to more informed and efficient discussions within ECHA’s committees. In 2019 and 2020, ECHA paused NMEG’s work. In January 2021, the NMEG mandate was updated to align fully with the mandates for the Persistent, Bioaccumulative, and Toxic (PBT) and the Endocrine Disruptors expert groups. Le Curieux states that the main change is that an NMEG meeting will be organized only when critical scientific issues or operational issues have been proposed by one of the NMEG members and robust documentation is provided. Moreover, according to Le Curieux, the NMEG outcomes should be useful to support decision making, and the connection between NMEG, the Member State Competent Authorities, and ECHA committees should be ensured. Le Curieux suggests that NMEG could provide recommendations on specific dossier evaluation or substance evaluation cases that the Member State Committee may take into account in their decision making.

[Read More](#)

Nano and Other Emerging Chemical Technologies Blog, 2 August 2021

<https://nanotech.lawbc.com/2021/08/euon-publishes-nanopinion-on-echa-nanomaterials-expert-group/>

Bulletin Board

REACH Update

AUG. 13, 2021

ECHA calls for tenders to perform study on impact of graphene, graphene oxide, and other 2D materials

2021-07-21

The European Chemicals Agency (ECHA) has launched a call for tenders to perform a study “[Assessment of the potential impact of graphene, graphene oxide and other 2D materials on health, and the environment](#)” as part of the European Union (EU) Observatory for Nanomaterials (EUON). According to the description, the goal of the study is to conduct a systematic literature review of the health and environmental effects of graphene, graphene oxide, and other two-dimensional (2D) materials, based on existing public information. The objective of the requested services is to collect information from existing public sources, including journal publications and EU-funded research projects. The study should also assess what general conclusions can be made regarding the potential health and environmental properties of 2D materials. Finally, the review should examine to what extent existing approaches to health and environmental testing of chemicals are applicable to graphene, graphene oxide, and other 2D materials, and what challenges and pitfalls exist surrounding the testing of these materials. The deadline for expressing interest is **August 13, 2021**.

[Read More](#)

Nano and Other Emerging Chemical Technologies Blog, 21 July 2021
<https://nanotech.lawbc.com/2021/07/echa-calls-for-tenders-to-perform-study-on-impact-of-graphene-graphene-oxide-and-other-2d-materials/>

NMEG is intended to improve the understanding of specific issues concerning nanomaterials/nanoforms of substances, leading to more informed and efficient discussions within ECHA’s committees.

Bulletin Board

Janet's Corner

AUG. 13, 2021

Standup Chemist

2021-08-13

LOOSE PARTS

DAVE BLAZEK



Dr. Monroe Irkleman: Standup Chemist

<https://twitter.com/LoosePartsGuy/status/608651086870802432/photo/1>

Bulletin Board

Hazard Alert

AUG. 13, 2021

Vanadium

2021-08-13

Vanadium is a chemical element with symbol V and atomic number 23. [1]

It occurs in nature as a white-to-grey metal compounds, and is often found as crystals. Pure vanadium has no smell. It usually combines with other elements such as oxygen, sodium, sulfur, or chloride. [2] Vanadium resists corrosion due to a protective film of oxide on the surface. Common oxidation states of vanadium include +2, +3, +4 and +5. [3] Vanadium and vanadium compounds can be found in the earth's crust and in rocks, some iron ores, and crude petroleum deposits. [2]

USES [3,4]

Most of the vanadium (about 80%) produced is used as ferrovandium or as a steel additive. Mixed with aluminium in titanium alloys is used in jet engines and high speed air-frames, and steel alloys are used in axles, crankshafts, gears and other critical components. Vanadium alloys are also used in nuclear reactors because vanadium has low neutron-adsorption abilities and it does not deform in creeping under high temperatures. Vanadium oxide (V_2O_5) is used as a catalyst in manufacturing sulfuric acid and maleic anhydride and in making ceramics. It is added to glass to produce green or blue tint. Glass coated with vanadium dioxide (VO_2) can block infrared radiation at some specific temperature.

A new use has been found in Vanadium Redox Batteries (VRB), which are flow batteries designed to store large amounts of energy in a safe manner that can be adjusted to meet variable energy loads.

IN THE ENVIRONMENT [2]

- Vanadium mainly enters the environment from natural sources and from the burning of fuel oils.
- It does not dissolve well in water.
- It combines with other elements and particles.
- Vanadium binds strongly to soil and sediments.
- Low levels have been found in plants, but it is not likely to build up in the tissues of animals.

Vanadium is a chemical element with symbol V and atomic number 23.

Bulletin Board

Hazard Alert

AUG. 13, 2021

SOURCES & ROUTES OF EXPOSURE

Sources of Exposure [2]

- Eating foods containing vanadium, higher levels are found in seafoods. Vanadium is found in some nutritional supplements.
- Breathing air near an industry that burns fuel oil or coal; these industries release vanadium oxide into the air.
- Working in industries that process vanadium or make products containing vanadium.
- Breathing contaminated air or drinking contaminated water near waste sites or landfills containing vanadium.
- Breathing cigarette smoke.
- Vanadium is not readily absorbed by the body from the stomach, gut, or contact with the skin.

Routes of Exposure [5]

- Inhalation – Minor route of exposure for the general population. Predominant route of occupational exposure.
- Ingestion – Predominant route of exposure for the general population through ingestion of contaminated food and water.
- Dermal – Not expected to be a significant route of exposure to general or occupational populations.

HEALTH EFFECTS [2,3]

Vanadium compounds are not regarded as serious hazard, however, workers exposed to vanadium peroxide dust were found to suffer severe eye, nose and throat irritation. The uptake of vanadium by humans mainly takes place through foodstuffs, such as buckwheat, soya beans, olive oil, sunflower oil, apples and eggs. Vanadium can have a number of effects on human health, when the uptake is too high. When vanadium uptake takes places through air it can cause bronchitis and pneumonia. The acute effects of vanadium are irritation of lungs, throat, eyes and nasal cavities. Other health effects of vanadium uptake are:

- Cardiac and vascular disease
- Inflammation of stomach and intestines
- Damage to the nervous system
- Bleeding of livers and kidneys
- Skin rashes

Bulletin Board

Hazard Alert

AUG. 13, 2021

- Severe trembling and paralyses
- Nose bleeds and throat pains
- Weakening
- Sickness and headaches
- Dizziness
- Behavioural changes

The health hazards associated with exposure to vanadium are dependent on its oxidation state. Elemental vanadium could be oxidised to vanadium pentoxide during welding. The pentoxide form is more toxic than the elemental form. Chronic exposure to vanadium pentoxide dust and fumes may cause severe irritation of the eyes, skin, upper respiratory tract, persistent inflammations of the trachea and bronchi, pulmonary oedema, and systemic poisoning. Signs and symptoms of overexposure include; conjunctivitis, nasopharyngitis, cough, laboured breathing, rapid heartbeat, lung changes, chronic bronchitis, skin pallor, greenish-black tongue and an allergic skin rash

The International Agency for Research on Cancer (IARC) has classified vanadium pentoxide as possibly carcinogenic to humans based on evidence of lung cancer in exposed mice. The Department of Health and Human Services (DHHS) and EPA have not classified vanadium as to its human carcinogenicity.

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. Cold water may be used. Get medical attention.
- Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
- Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.
- Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Bulletin Board

Hazard Alert

AUG. 13, 2021

- **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. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.
- **Ingestion:** If swallowed, 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 immediately.

Exposure Controls & Personal Protective Equipment

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 vanadium:

- 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.

Bulletin Board

Hazard Alert

AUG. 13, 2021

REGULATION

United States [7]

Exposure Limit	Limit Values	HE Codes	Health Factors and Target Organs
OSHA Permissible Exposure Limit (PEL)	Not established		
National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL)	1 mg/m ³ TWA 3 mg/m ³ STEL	HE16	Nose, throat, and respiratory irritation
American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV)	Not established		
CAL/OSHA PEL	Not established		

Note: The RELs are for ferrovanadium dust but also apply to vanadium metal.

Australia [8]

Safe Work Australia has set a time weighted average concentration for vanadium of 0.05mg/m³ for a 40-hour workweek.

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Bulletin Board

Hazard Alert

AUG. 13, 2021

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Bulletin Board

Gossip

AUG. 13, 2021

Snake-eating spiders are surprisingly common

2021-08-04

A spider's typical dinner menu might include insects, worms or even small lizards and frogs (SN: 2/3/21). But some arachnids have more adventurous tastes — they can eat snakes up to 30 times their size.

Take the Australian redback. Not including legs, a female of this species of spider is only about the size of an M&M candy. But she can take down relatively big prey such as juvenile eastern brown snakes, which are among the most venomous serpents in the world. A snake that gets trapped in a redback's web — a messy tangle of long, sticky silk threads that dangle to the ground — is quickly set upon by the spider, which subdues the struggling victim with more sticky silk before delivering a toxic bite that eventually kills the snake.

"I find it cool that tiny Australian redback spiders can kill brown snakes," says spider biologist Martin Nyffeler of the University of Basel in Switzerland. "[It's] very fascinating and a little frightening!"

But redbacks are far from the only spiders with an appetite for snake. At least 11 different families of spiders feed on snakes, Nyffeler and herpetologist Whit Gibbons report May 11 in *The Journal of Arachnology*.

Nyffeler and Gibbons, of the University of Georgia in Athens, searched for reports of snake-eating spiders in all sorts of places — from research journals and magazine articles to social media and YouTube videos. In all, the team analyzed 319 accounts from all over the world. Most reports came from Australia and the United States, but these spiders live on every continent except Antarctica.

"I didn't realize how common this was. I don't think anybody did," says evolutionary biologist Mercedes Burns of the University of Maryland, Baltimore County, who was not involved in the research.

Snakes that the spiders ate came from seven families. Some, including coral snakes, rattlers, palm-pitvipers and lanceheads, are highly venomous. "I was kind of surprised at the types of snakes that were described because some of them are pretty big, pretty strong," Burns says.

Tangle web spiders, a group that includes North American widow spiders and redbacks, are the most successful snake slayers, Nyffeler and Gibbons found. Relatively small, these spiders can catch snakes 10 to 30 times their size, Nyffeler says.

"I find it cool that tiny Australian redback spiders can kill brown snakes," says spider biologist Martin Nyffeler of the University of Basel in Switzerland.

Bulletin Board

Gossip

AUG. 13, 2021

Tidier orb weaver spiders don't do too shabbily either (SN: 8/3/20). A golden silk orb weaver in Florida caught a 1-meter-long green snake, the longest in the study. However, making a meal of green snakes may be a risky choice — these serpents often eat arachnids, including orb weaver spiders, the researchers say.

Not all snake-eating spiders trap the serpents with webs. Tarantulas actively hunt their prey, then use powerful jaws to deliver a potent venom (SN: 2/28/19). "Often a tarantula tries to catch the snake by the head and will hold on in spite of all efforts of the snake to shake him off," Nyffeler says. Once that venom takes effect, the snake calms down.

In some encounters, venom defeated snakes in minutes. In others, spiders took days to kill their prey, Nyffeler and Gibbons found.

Once the snakes die, spiders use enzymes to turn soft body parts into a soup that the arachnids suck into their stomach. "They have what's called a pumping stomach," Burns says. "It's almost like their stomach is attached to a rubbery straw. They have to kind of suck everything down."

Most of spiders in the study likely dine on snake only now and again, Nyffeler says. Some South American tarantulas, however, eat snakes and frogs almost exclusively.

Nyffeler hopes that his new study increases appreciation for spiders, which he calls extraordinary creatures. "The fact that small spiders are capable of killing much larger snakes is very fascinating," he says. "Knowing and understanding this enriches our understanding of how nature works."

sciencenews.org, 4 August 2021

<https://www.sciencenews.org>

Reef-harming sunscreens are now banned from all national marine parks

2021-08-04

Sunscreens are essential in protecting your skin from UV rays, but not all of them are great for corals and the marine ecosystem. Research studies have found that several UV-protection substances such as Oxybenzone and Octinoxate could cause coral bleaching and threaten the life cycle of coral reefs. The more tourists, the more hazardous substance that could bring into the waters. It is believed that an estimated 14,000 tons of sunscreen were bright into the waters in Hawaii and the Caribbean alone.

Bulletin Board

Gossip

AUG. 13, 2021

In an effort to protect and revive their marine ecosystem, several coastal nations have decided to put a ban on reef-harming sunscreens. Palau, the island nation in West Pacific, became the first country in the world to pass the sunscreen bill, which has been in effect since January 2020. According to Conde Nast Travelers, the other destinations that have banned reef-harmful sunscreens are Hawaii, Florida, US Virgin Islands, Aruba, Mexico's reserves, and Bonaire.

Now, Thailand has become the latest nation to ban coral-threatening sunscreens. The Royal Gazette, earlier today, released a document detailing a ban on the use of sunscreen containing certain types of chemical that harms the coral reefs in any of Thailand's national marine parks. The document stated that the high number of tourists has visited the marine parks and brought in the chemicals from the sunscreen applied on their bodies that maim the liveliness of coral reefs.

The ban is implemented on sunscreen products that contain the following chemicals:

- Oxybenzone (Benzophenone-3, BP-3)
- Octinoxate (Ethylhexyl methoxycinnamate)
- 4-Methylbenzylid Camphor (4MBC)
- Butylparaben

Bringing in and/or use of sunscreen products containing the aforementioned chemicals could cost you up to B100,000 (around USD3,000). The rule will be put into effect immediately.

Bonus: Wanna check whether the UV-protection products you are using contain those chemicals? Click these links: Oxybenzone (Benzophenone-3, BP-3), Octinoxate (Ethylhexyl methoxycinnamate), 4-Methylbenzylid Camphor (4MBC), Butylparaben

timeout.com, 4 August 2021

<https://www.timeout.com>

This hurricane season will be even more active than previously predicted, NOAA says

2021-08-05

It's been just over two months since the 2021 Atlantic hurricane season kicked off on June 1, and we can expect to see even more hurricanes and

In the new outlook, NOAA predicts that the season will see 15 to 21 named storms, compared with the 13 to 20 storms forecast in May.

Bulletin Board

Gossip

AUG. 13, 2021

named storms than experts previously predicted, before the season winds down on Nov. 30.

On Wednesday (Aug. 4), scientists with the National Oceanic and Atmospheric Administration (NOAA) updated their May 20 hurricane season forecast, in an online briefing. They had already warned in May of above-normal hurricane activity, Live Science previously reported, and their update confirmed the presence of atmospheric and ocean conditions that favor higher-than-average storm activity.

One such factor is the growing possibility of an emerging La Niña, a climate pattern that pushes warm waters in the Pacific Ocean toward Asia and carries cooler water to the surface off the western coast of North America, according to NOAA. When La Niña is dominant and waters around the equatorial Pacific are cooler, the Atlantic hurricane season can be more severe, Matthew Rosencrans, lead seasonal hurricane forecaster at NOAA's Climate Prediction Center, said at the briefing.

In the new outlook, NOAA predicts that the season will see 15 to 21 named storms, compared with the 13 to 20 storms forecast in May. Of those, seven to 10 will likely reach hurricane strength, whereas the May prediction estimated six to 10 hurricanes. There is no change to the number of anticipated major hurricanes — those strengthening to Category 3 or higher, with winds of at least 111 mph (178 km/h) — with three to five such storms expected, Rosencrans said.

"Given the increase in the predicted number of named storms and hurricanes, there is now a 65% chance for an above-normal season and a 25% chance for a near-normal season, with a 10% chance of a below-normal season," he added. However, as sea surface temperatures in the Atlantic are somewhat cooler now than they were at this time last year, it's likely that this hurricane season won't be quite as active as it was in 2020, Rosencrans said.

While the 2021 hurricane season is just getting started, it's already broken a record. Five named storms have formed so far, with number five — Elsa — becoming a hurricane. Elsa, which made landfall in Florida on July 7, was the earliest fifth named storm to form in the Atlantic, Rosencrans said. And the season's activity "does not show any signs of relenting as it enters the peak months ahead," NOAA Administrator Rick Spinrad said in a statement. (Peak hurricane season is mid-August through October.)

How can you prepare for hurricane season, if you live in a high-risk coastal area? Visit the Federal Emergency Management Agency's Ready.gov

Bulletin Board

Gossip

AUG. 13, 2021

website for information on how to ready your home before hurricanes strike and how to stay safe during a storm, according to the NOAA statement. You can also visit the National Hurricane Center's Hurricanes.gov website to follow hurricane updates and warnings as storms develop, NOAA says.

"Now is the time to be vigilant about preparedness plans and potential actions," Rosencrans said at the briefing. "Hurricanes are not limited to just damaging winds, but also dangerous storm surge and torrential rain leading to flooding. Regardless of the predicted activity, it does only take one storm to have catastrophic impacts on lives and communities."

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 5 August 2021

<https://www.livescience.com>

Study finds link between glyphosate exposure and pregnancy length

2021-08-06

Women exposed to the herbicide glyphosate were more likely to experience shorter pregnancies, according to a study published last week in the journal Environmental Research.

Glyphosate is the active ingredient in the widely-used herbicide Roundup. Most research on the health effects of glyphosate has focused on workplace exposures — people who work in agriculture and as groundskeepers, for example — and on cancer outcomes. The new study joins a small but growing body of research in the United States exploring the health risks of glyphosate exposure during pregnancy.

Glyphosate study follows several others

Researchers tested urine samples from a racially and geographically diverse cohort of 163 pregnant women in California, Washington, Minnesota, and New York. They detected glyphosate in more than 94 percent of the samples and found an association between glyphosate exposure and shorter pregnancies.

This latest study follows two others on glyphosate and pregnancy length, including a 2018 study of 71 pregnant women in Indiana which found that more than 90 percent had glyphosate in their urine. Those with higher glyphosate levels were more likely to have shorter pregnancies, which can

They detected glyphosate in more than 94 percent of the samples and found an association between glyphosate exposure and shorter pregnancies.

Bulletin Board

Gossip

AUG. 13, 2021

increase the risk of infant mortality and long-term health challenges like breathing difficulties and intellectual delays.

First author Corina Lesueur, an assistant professor in the Department of Environmental Medicine and Public Health at Mount Sinai's Icahn School of Medicine, cautioned about the limitations of the new, relatively small study that focused on a single time point and did not identify the specific sources of the women's glyphosate exposure. Further research, she said, will be necessary to confirm the results in larger populations and to ascertain additional exposure effects on pregnancy and infant health.

"Glyphosate is unavoidable"

But the results underscore the importance of understanding glyphosate's health impacts beyond cancer, said corresponding author Jia Chen, also a professor at Mt. Sinai. She added that the study raises questions about potential effects of even low-dose exposures to glyphosate among the general population, since the glyphosate levels in the women's bodies were well below current U.S. regulatory thresholds.

"Glyphosate is unavoidable, it's even in rainwater," Chen said. "I would want to know if the regulatory levels are really safe. They may not cause DNA mutations, for example, but they may have other effects."

Glyphosate-based herbicides are the most commonly used in the world. Residue has been widely detected in food as well as in soil, dust, and drinking water. Multiple studies have found widespread exposure to glyphosate in the general population, with exposure rates increasing dramatically in recent years. Glyphosate has been linked to an array of health problems, including birth defects, DNA damage, endocrine disruption, reproductive problems, and cancer.

Tens of thousands of people have filed U.S. lawsuits alleging health problems caused by Monsanto's glyphosate-based weedkiller Roundup. The agrochemical company was acquired by Bayer AG in 2018. Last week, Bayer announced it would remove glyphosate from all lawn and garden products sold in the United States by 2023 to manage future litigation risk.

Bayer said no changes were planned for its professional and agricultural market products, however, which constitute the largest uses.

ehn.org, 6 August 2021

<https://www.ehn.org>

Bulletin Board

Gossip

AUG. 13, 2021

'Doubly charming' tetraquark is the longest-lived exotic-matter particle ever found

2021-08-05

Scientists at the world's largest atom smasher have discovered the longest-lived exotic-matter particle ever observed, and it has twice the charm of anything discovered to date.

Physicists have yet to delve into the enigmatic nature of this newfound particle — called a double-charm tetraquark — but it's a truly weird mix, containing an unusual combination of two matter particles and two antimatter particles. And the doubly charming particle is so weird that we don't even know how its parts stick together.

The particles which combine to form the tetraquark, quarks, are some of the most basic building blocks of matter and come in six different types, or "flavors", each with their own masses and charge: up, down, top, bottom, strange, and charm. Though physicists have discovered many tetraquarks in recent years, this most recent addition — a mixture of two charm quarks and two antimatter quarks — is the first "doubly charmed" one, meaning it contains two charm quarks without any charm antiquarks to balance them out.

As for how the quarks are arranged inside the new tetraquark: All of the particles may be glued together equally, they may be two quark-antiquark pairs jumbled loosely together into a "molecule" or they may be a strange mixture of both, Matteo Palutan, a particle physicist at the National Laboratories of Frascati in Italy and the deputy spokesperson for the Large Hadron Collider beauty (LHCb) experiment, told Live Science.

Because quarks cannot exist on their own, they fuse together into various particle "recipes" called hadrons. Mixtures of three quarks are called baryons — such as the proton and the neutron — and mixtures of quarks and their antimatter opposites are called mesons.

But there's no hard-and-fast rule that quarks need only exist in pairs or triplets. Chris Parkes, a physicist at the University of Manchester in England and the spokesperson for the LHCb experiment, said theories have predicted the existence of hadrons containing more than two or three quarks since the early 1960s, but only in recent years have physicists spotted these hadron combinations briefly winking into existence. The first tetraquark to be discovered was found in 2003 by the Belle experiment in Japan. Since then, physicists have discovered a whole series of the

And the doubly charming particle is so weird that we don't even know how its parts stick together.

Bulletin Board

Gossip

AUG. 13, 2021

four-quark hadrons, and in 2015, they found two more, classified as “pentaquarks,” which contained five.

These rarer and odder combinations of quarks are known as exotic particles, and they have unusual properties that could help physicists better understand, or even rewrite, the rules governing matter.

“There are a wide range of predictions for what exotic states should be seen and what their properties will be,” Parkes told Live Science, referring to the plethora of proposed extensions to the Standard Model — a theory which describes all of the known fundamental particles and their interactions, but omits details on exotic particles and how they may be glued together. “As we discover more of these exotic hadrons, we can tune these models and test their predictions, so that we can learn more about how quarks combine to form hadrons.”

Although exotic particles are enticing objects for study, their incredibly short lifetimes make them difficult to investigate. The comparatively “long” life span of the double-charm tetraquark (written scientifically as T_{cc}^+) causes it to appear in the Large Hadron Collider (LHC), the world’s largest particle accelerator, for slightly longer than one-quintillionth of a second before it decays into lighter particles, the researchers said.

Nonetheless, the double-charm tetraquark has a longer lifespan than most exotic particles. This long life, along with the fact that the smaller particles it decays into are relatively easy to detect, makes it a perfect candidate for physicists looking to test existing theoretical models or probe for previously hidden effects.

Physicists at the LHC found the new tetraquark through “bump hunting,” a method that has revealed 62 new hadrons since 2009, including the famed Higgs boson in 2012. Put simply, bump hunting involves combing through data from the many thousands of millions of particle interactions logged by each of the LHC’s detectors. After all of the background noise and the signals from known interactions have been ruled out, any unexpected spike in the system’s readings could provide a vital clue that something more unusual occurred. Bump hunts can take anywhere from two to three years, Parkes said.

Usually, tetraquarks decay through the strong force — one of the four fundamental forces of nature — but they don’t have to decay that way. While T_{cc}^+ does decay via the strong force, physicists think it could point the way to a yet-to-be-discovered tetraquark that is forbidden from breaking down in this way. In theory, one undiscovered cousin of T_{cc}^+ ,

Bulletin Board

Gossip

AUG. 13, 2021

named T_{bb} (which contains two bottom quarks instead of two charmed quarks), should decay only through the weak force, giving it a life span orders of magnitude longer than that of T_{cc}^+ or of any other quark, Palutan told Live Science.

But because the T_{bb} is much harder to find than any other tetraquark yet spotted, physicists will likely need a more powerful detector to catch it. The data used to find the T_{cc}^+ came from the LHC’s two previous stints online, and Parkes believes it’s unlikely that data from those runs will yield a signal of the elusive T_{bb} . Instead, the researchers are planning to look for the particle in the data from a new run, using an upgraded detector, that will begin next year.

The new detector “will allow us to accumulate signal events at five times the rate we were used to during the past years,” Palutan said. “So we’re confident that if the T_{bb} is there, we will be able to catch it. It is a matter of being patient.”

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[livescience.com](https://www.livescience.com), 5 August 2021

<https://www.livescience.com>

Air pollution linked to higher risk of dementia

2021-08-05

The team from the University of Washington used data from two large, long-running study projects in the Puget Sound region—one that began in the late 1970s measuring air pollution and another that began in 1994 on risk factors for dementia.

The findings show a small increase in the levels of fine particle pollution (PM_{2.5} or particulate matter 2.5 micrometers or smaller) averaged over a decade at specific addresses in the Seattle area was associated with a greater risk of dementia for people living at those addresses.

“We found that an increase of 1 microgram per cubic meter of exposure corresponded to a 16% greater hazard of all-cause dementia. There was a similar association for Alzheimer’s-type dementia,” says Rachel Shaffer, who conducted the research as a doctoral student in the environmental & occupational health sciences department and is lead author of the paper in *Environmental Health Perspectives*.

EXTENDED PERIODS OF EXPOSURE

“We found that an increase of 1 microgram per cubic meter of exposure corresponded to a 16% greater hazard of all-cause dementia. [”]

Bulletin Board

Gossip

AUG. 13, 2021

Researchers looked at more than 4,000 Seattle-area residents enrolled in the Adult Changes in Thought (ACT) Study run by Kaiser Permanente Washington Health Research Institute in collaboration with the University of Washington. Of those residents, the researchers identified more than 1,000 people who diagnosed with dementia at some point since the ACT Study began in 1994.

Once researchers identified a patient with dementia, they compared the average pollution exposure of each participant leading up to the age at which the dementia patient was diagnosed. For instance, if a person was diagnosed with dementia at 72 years old, the researchers compared the pollution exposure of other participants over the decade prior to when each one reached 72.

In these analyses, the researchers had to account for the different years in which these individuals were enrolled in the study, since air pollution has dropped dramatically in the decades since the ACT study began.

In their final analysis, the researchers found that just a 1 microgram per cubic meter difference between residences was associated with 16% higher incidence of dementia. To put that difference into perspective, Shaffer says, in 2019 there was approximately 1 microgram per cubic meter difference in PM2.5 pollution between Pike Street Market in downtown Seattle and the residential areas around Discovery Park.

AIR POLLUTION'S EFFECT ON THE BRAIN

"We know dementia develops over a long period of time. It takes years—even decades—for these pathologies to develop in the brain and so we needed to look at exposures that covered that extended period," Shaffer says.

Because of long-running efforts to build detailed databases of air pollution in our region, "we had the ability to estimate exposures for 40 years in this region. That is unprecedented in this research area and a unique aspect of our study."

In addition to extensive air pollution and dementia data for the region, other study strengths included lengthy address histories and high-quality procedures for dementia diagnoses for the ACT Study participants.

"Having reliable address histories let us obtain more precise air pollution estimates for study participants," says senior author Lianne Sheppard, a professor of environmental and occupational health sciences and of biostatistics. "These high-quality exposures combined with ACT's regular

Bulletin Board

Gossip

AUG. 13, 2021

participant follow-up and standardized diagnostic procedures contribute to this study's potential policy impact."

WHAT CAN INDIVIDUALS DO TO LOWER THEIR RISK?

While there are many factors such as diet, exercise, and genetics associated with the increased risk of developing dementia, air pollution is now recognized to be among the key potentially modifiable risk factors. The new results add to this body of evidence suggesting air pollution has neurodegenerative effects and that reducing people's exposure to air pollution could help reduce the burden of dementia.

"How we've understood the role of air pollution exposure on health has evolved from first thinking it was pretty much limited to respiratory problems, then that it also has cardiovascular effects, and now there's evidence of its effects on the brain," Sheppard says.

"Over an entire population, a large number of people are exposed. So, even a small change in relative risk ends up being important on a population scale," Shaffer says. "There are some things that individuals can do, such as mask-wearing, which is becoming more normalized now because of COVID.

"But it is not fair to put the burden on individuals alone. These data can support further policy action on the local and national level to control sources of particulate air pollution."

Additional coauthors are from the University of Michigan and the University of Washington. The National Institute for Environmental Health Sciences, the National Institute on Aging, the University of Washington Retirement Association Aging Fellowship, and the Seattle chapter of the Achievement Rewards for College Scientists Foundation funded the work.

futurity.org, 5 August 2021

<https://www.futurity.org>

A horseshoe crab's blood is vital in testing drugs. Critics say using it endangers the ancient creature.

2021-08-01

Few organisms are as odd, or as old, as the horseshoe crab.

That they predate the dinosaurs, a time when everything was large, might explain their oversize, helmet-shaped shells, which can grow as large as

Anatomically, they're more like spiders than crustaceans, and they fluoresce under ultraviolet light.

Bulletin Board

Gossip

AUG. 13, 2021

20 inches. They limp along the tidal flats as if a smaller creature was hiding inside that shell, using it to move about incognito. Anatomically, they're more like spiders than crustaceans, and they fluoresce under ultraviolet light.

But perhaps their unique feature is how their blood, which is bright blue, coagulates when exposed to harmful bacterial endotoxins, a feature that has kept them alive for about 450 million years.

Bacterial endotoxins induce inflammation and fever, and can cause anaphylactic shock and death. They are responsible for venereal disease, bacterial meningitis as well as cholera, bubonic plague and other diseases. Immune cells in the crabs' blood trap and immobilize these type of endotoxins, rendering them inert.

It's a blessing and a curse because once scientists discovered this amazing defense system back in the 1960s, we began using it for ourselves, bleeding horseshoe crabs and separating out that clotting feature to test medications, needles and biomedical devices to make sure they are contaminant free.

Their blood has been so useful — enabling scientists to create vaccines that help humans fend off everything from migraines to melanomas and most recently the coronavirus — that we've made a dent in their population.

But while science created a problem, it may be able to fix it.

A new technology is available that uses a man-made version of crab blood to detect endotoxins, but it has stirred a debate over whether it is as good. The debate has pitted —conservation-minded scientists against a board that sets scientific standards for the pharmaceutical industry, which believes more study needs to be done before a synthetic version of crab blood can be used.

Last summer, as coronavirus infection rates continued to rise, a group of researchers from Eli Lilly, Bristol Myers Squibb, Pfizer and —Roche-Genentech published a research report that compared the two products — limulus amoebocyte lysate, or LAL, which is made from horseshoe crab blood, and the synthetic product, called recombinant Factor C assay, or rFC.

But the findings did little to quell a debate.

Bulletin Board

Gossip

AUG. 13, 2021

Pharmaceutical companies need to make sure their injectable drugs and medical devices such as hip and knee replacements are free of bacterial endotoxins. But conservationists say rFC can detect bacterial endotoxins equally well, and they have pushed the scientific standards board, known as the U.S. Pharmacopeia (USP), to adopt rFC as an alternative test for endotoxins, alongside LAL.

If drug companies continue to rely solely on LAL, they say, horseshoe crab populations will be put at risk.

It wouldn't be the first time this species has faced potential extinction. In the 1990s, the population of horseshoe crabs along the East Coast was decimated by fishermen who used them as bait to catch eel and corner the lucrative market for whelk or conch. Before that, scientists along the Delaware Bay could find an average of 45,000 horseshoe crab eggs per approximately 11 square feet in about the top two inches of sand. Since 1995, that figure has fluctuated between 5,000 and 10,000, according to the New Jersey Division of Fish and Wildlife. And the population struggles to rebound as companies that manufacture LAL now harvest crabs, some conservationists say. About 500,000 crabs are plucked from waters and beaches along the Atlantic coast each year to make LAL.

"I could show you a movie from 1986 that was filmed right over there, at Reeds Beach, and the eggs were this deep on the beach," said Larry Niles, a biologist formerly with the New Jersey's Fish and Wildlife division, holding his hand about eight inches above the sand.

The eggs aren't just a proxy for measuring crab populations. They are food for migratory shore birds such as the Rufa red knot, which flies 9,300 miles each year from Argentina's Tierra del Fuego to the Canadian Arctic to breed, stopping in the Delaware Bay to eat crab eggs. But its population fell 75 percent from the 1980s to the 2000s, in large part because the supply of horseshoe crab eggs dropped.

The hunt for coronavirus vaccines has only fired up concerns about the sustainability of horseshoe crabs. In March 2020, there were 241 therapies, including vaccines, in development. Today, there are about 838, according to Bio, a trade association representing biotechnology companies.

"Every drug or vaccine candidate or clinical trial or finished solution injected into the body has to have LAL testing. The water and raw materials going into such solutions also have to be tested," said Kevin Williams, a scientist who spent 30 years at Eli Lilly and now works for bioMérieux, a French multinational biotechnology firm that manufactures

Bulletin Board

Gossip

AUG. 13, 2021

rFC. “So this is an immense additive effect given how many companies are now working on vaccines and drugs for covid.”

Even before the coronavirus, the demand for horseshoe crab blood was already rising.

Bleeding labs, which bleed horseshoe crabs of about 30 percent of their blood and turn that blood into LAL, collected 637,029 horseshoe crabs in 2019, 30 percent more than they took the year before. While the crabs are returned to the water, fishing authorities take it for granted that at least 15 percent — or 95,554 — of them die. Some research puts that mortality figure as high as 30 percent.

“As it is now, the entire supply chain for endotoxin testing of drugs rests upon the harvest of a vulnerable or near extinct sea creature,” Williams said. “As prudent as the pharmaceutical industry is, this seems to be a current blind spot.”

The Food and Drug Administration, which reviews new drug applications, does accept medicines tested with rFC, but companies must do more work for their application than if they had used LAL, which is costly and time consuming, making it less likely they will use the product.

To date, Eli Lilly is the only company that uses rFC when submitting its new drug applications to the FDA — although last summer, French drugmaker Sanofi said it, too, planned on using rFC. But the momentum isn’t likely to pick up until the USP says in its guidelines that drugmakers can use the alternative. The European Pharmacopeia approved rFC for endotoxin testing last year.

“While rFC is an alternative to LAL, the data available today is not enough to put them at the same level so they can be used interchangeably,” said Fouad Atouf, vice president of global biologics at USP.

Atouf said USP isn’t the only organization that says this. When it considered putting rFC and LAL on equal footing in its compendium of standards, it asked industry stakeholders for comment, and there was not a broad consensus that there was enough data. Even the FDA expressed concerns, he said.

Jay Bolden, of Eli Lilly, says his study from September provides the USP with that data.

Bulletin Board

Gossip

AUG. 13, 2021

“We looked at all the available scientific literature on rFC, and we found a dozen studies that say exactly what we think the [USP] would need to make those kind of judgments,” Bolden said.

He said there is only one study, from a company that manufactures LAL, in which rFC appears to be inferior, and it is because it used pre-filtered water, which he said can skew the results.

Charles River Laboratories International, which did that study, notes it was peer-reviewed, and used samples from various points in the pharmaceutical water purification processes.

“While these water samples are not routinely tested for bacterial endotoxins, they do exist within manufacturing facilities and thus present risks to manufacturing operations,” said Samantha Jorgensen, associate director of public relations and social media for Charles River.

Jack Levin, professor at the University of California School of Medicine at San Francisco, and the scientist who helped discover the LAL test, disputes the notion that the LAL manufacturers are killing off the crabs.

While he acknowledges the crab population in the United States crashed about 15 years ago on account of the bait fishermen, the federal government intervened and instituted quotas, and the population has rebounded, he said.

“People have often approached this with a certain religious fervor and want to ignore that,” he said. “I certainly don’t believe in killing animals unnecessarily. And you can argue, if you want to, against animal research, until it impacts your own health, of course. But the argument that the lysate industry is depopulating the crab population is just not correct.”

The American horseshoe crab is not considered endangered, although it is classified as vulnerable on the Red List of Threatened Species of the International Union for Conservation of Nature (IUCN). But conservationists fear if it continues to be overfished, the species could go the way of the Asian horseshoe crab, which is already extinct in Taiwan, disappearing in Hong Kong and dwindling in China. The IUCN lists the Asian crab as endangered because of biomedical bleeding as well as coastal development destroying its habitat.

The USP says it is committed to finding ways to transition from animal-derived materials to synthetic ones, but it needs more proof that the two products are on par. The USP is conducting a large study of its own this summer comparing the two products — though much to the dismay of

Bulletin Board

Gossip

AUG. 13, 2021

those pushing for rFC, the study will also use some water samples that are unfiltered, not unlike the water used in the Charles River study.

Jessica Ponder, a regulatory testing analyst for the Physicians Committee for Responsible Medicine, says the American crab population may not be on the brink right now, but we don't want to be reliant on an animal, particularly one that can be found in only one country now. Her organization, which promotes in vitro assays to replace animal testing where they're not necessary, said she has looked at the test and believes the data to use rFC is there.

There's a reason Eli Lilly has switched over to rFC, and it's not just good stewardship but foresight, she said.

"They see this coming a mile away, that eventually we're not going to have this horseshoe crab blood available," she said. "Is that going to be today? Is it going to be 20 years from now? That's not something that's easy to predict when you have a natural resource, but at the same time, what are we waiting for?"

As our reliance on these crabs grows, they continue to do their job, emerging from the sea each May when the tide is high and the moon is full, and climbing up onto the beaches to spawn. For now, they are saving us. One day, it may be the other way around.

washingtonpost.com, 1 August 2021

<https://www.washingtonpost.com>

Melting sea ice could wipe out 98% of emperor penguins by the end of the century

2021-08-06

Emperor penguins — the largest species of penguin on Earth — are unlikely to survive past the end of the century if current rates of greenhouse gas emissions and melting sea ice continue, according to researchers.

A new study by an international team of penguin experts has revealed that 70% of emperor penguin colonies in Antarctica could become extinct by 2050 if the current rate of sea ice loss continues and that 98% of colonies could be wiped out by 2100 under the most extreme scenarios. This would make the species "quasi-extinct," meaning that, despite having remaining individuals, the species would not recover and would eventually die out.

Bulletin Board

Gossip

AUG. 13, 2021

"Given rapid climate change and projected loss of sea ice, it's not really surprising," lead author Stephanie Jenouvrier, a seabird ecologist at the Woods Hole Oceanographic Institution in Massachusetts, told Live Science.

The findings have led the U.S. Fish and Wildlife Service (USFWS) to propose listing the emperor penguin (*Aptenodytes forsteri*) as a threatened species under the Endangered Species Act (ESA). If conservation measures linked to that listing are successful, the species could still survive the coming decades, Jenouvrier said.

Melting sea ice

The main problem facing emperor penguins is a loss of sea ice in Antarctica resulting from rising global temperatures.

"Emperor penguins depend upon sea ice for breeding, molting and feeding," Jenouvrier said, so it is vital for their survival.

Especially when breeding, the penguins also rely on a certain amount of sea ice that researchers call the Goldilocks zone. For penguin parents, ice within this "just right" zone provides the perfect balance between safety for raising chicks and ample food.

"If there is too little sea ice, chicks can drown when sea ice breaks up early," Jenouvrier said. "If there is too much sea ice, foraging trips become too long and arduous, and the adults and chicks may starve."

But computer simulations predict that if current rates of ice loss continue, the Goldilocks zone will disappear in most places on the Antarctic coastline, which could cause widespread breeding failures and prevent populations from recovering, Jenouvrier said.

Certain colonies have already experienced breeding failures due to melting sea ice. For example, in 2016, melting sea ice led to a massive breeding failure in the colony at Halley Bay, when 10,000 chicks drowned after an early ice melt dumped them in the water before they had grown their waterproof feathers, the researchers noted in the paper.

The new findings will also have implications for a wide range of other species. "Emperor penguins are indicator species whose population trends can illustrate the consequences of climate changes for other species," Jenouvrier said. These species include Adélie penguins (*Pygoscelis adeliae*), leopard seals (*Hydrurga leptonyx*) and Weddel seals (*Leptonychotes weddellii*).

New listing

Bulletin Board

Gossip

AUG. 13, 2021

The USFWS has now taken the step of calling for emperor penguins to be listed as threatened under the ESA.

This move is notable because the USFWS lists very few species that are not native to the U.S. under the ESA. In addition, the current emperor penguin population is relatively stable, and the ESA generally covers species that are in dire need at the time of listing. Across 61 emperor penguin colonies in Antarctica, between 625,000 and 650,000 emperor penguins are estimated to be alive, according to the USFWS.

However, the risk the melting sea ice poses to emperor penguins is so great that steps to protect them have to be taken, the researchers said in the paper.

If listed as threatened, the species could no longer be imported into the U.S. for commercial reasons and fishing companies would be banned from targeting the penguins' prey around Antarctica, which include krill, small fish and squid. Federal agencies would also be required to ensure that their actions, including carbon emissions, do not jeopardize the penguins or their habitat. However, this last measure has been hard to enforce for other climate-impacted species, Jenouvrier said.

"I think it is a significant step because the USFWS has not consistently decided to list species that are threatened by climate change, and particularly sea-ice loss, so this decision can add to the precedent," Jenouvrier said.

Polar bears are the only other sea-ice-dependent species currently protected under the ESA.

Hopefully, the new listing will increase the emperor penguins' chances of survival "by increasing awareness about the impact of climate change and the need to take climate actions," Jenouvrier said.

The study was published online Aug. 3 in the journal *Global Change Biology*.

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[livescience.com](https://www.livescience.com), 6 August 2021

<https://www.livescience.com>

Bulletin Board

Gossip

AUG. 13, 2021

Contaminated pet food investigation traces toxic horse meat back to NT property

2021-08-10

A single property in the Northern Territory has been identified as the source of toxic horse meat, believed responsible for a spate of dog deaths in Victoria.

Key points:

- Authorities have traced toxic horse meat back to a single property in Central Australia
- At least 23 pet dogs have died, and 67 have been hospitalised in Victoria from indospicine poisoning
- Australia exported more than 800 tonnes of "edible horse" meat in 2020

Authorities are not naming the location but have visited the property and interviewed its manager — who is said to be shocked by what has happened.

It is understood the property sold a truckload of about 25 horses, but they were not intended to go to Victoria.

"I have been on the property and discussed the situation with the manager and he was completely unaware that the [final] destination of the horses was Victoria for manufactured pet food," Peter Saville, the NT's principal veterinary officer, said.

"The manager's understanding was the horses would go to a meatworks in Queensland for human consumption and our investigation has suggested the horses were re-directed [to Victoria] due to COVID lockdowns."

Dr Saville said samples had been collected from another 80 horses on the property, which will be tested for levels of the toxin indospicine.

When asked if the toxic horse meat would have been harmful to humans, Dr Saville said "not necessarily".

"Humans are far more tolerant to low-levels of indospicine than dogs and the amount of meat in a human diet is much lower than a dog diet ... given dogs are repeatedly fed the same diet almost every day."

'No signs of sick horses', NT vet says

When asked if the toxic horse meat would have been harmful to humans, Dr Saville said "not necessarily".

Bulletin Board

Gossip

AUG. 13, 2021

In the Northern Territory, under its Meat Industries Act 1996, it is illegal for a person to slaughter a horse for pet food "if he or she knows, or has reason to suspect, it has been in an area in which Birdsville Horse Disease occurs."

Birdsville disease is a toxic condition in horses caused by eating a native species of Indigofera.

Dr Saville said while inspecting the NT property linked to the Victorian pet food contamination, he saw no evidence of horses suffering from Birdsville disease and did not see any signs of the Indigofera plants growing on the property.

He described the horses in question as "semi-feral" and said it was very unusual for horses to be sold from the NT.

"The Northern Territory faces issues with an expanding [feral] horse population which leads to land degradation and animal welfare issues during dry times," he said.

"The owner of this property was very keen to reduce his horse numbers to try and avoid these issues.

"There isn't much of a market for horses at the moment and the movement of horses for slaughter has dropped off dramatically over the last 10 years and is almost non-existent.

"So when this person was contacted and asked if he could supply a truckload of horses he was very enthusiastic."

According to the Federal Department of Agriculture, Australia exported 808 tonnes of "edible horse meat" last year and 285 tonnes of "inedible horse".

'I miss him every day'

In Victoria, Laura Curtin is mourning the loss of her pet Labrador, named Hodge, who died on July 13 after suffering liver failure.

She says she took the dog to a vet several times between July 5 and 8 and was told Hodge's liver tests were "off the charts" and contaminated pet food was the likely cause.

At least 23 pet dogs have died, and 67 have been hospitalised in Victoria from indospicine poisoning.

Bulletin Board

Gossip

AUG. 13, 2021

Speaking to ABC Rural, Ms Curtin says she bought a kangaroo pet meat product for her dog in early July, and was horrified to learn it may have been contaminated with toxic horse meat.

Ms Curtin made the tough decision to put her pet down, when treatment did not appear to be working and her veterinarian suspected the dog had suffered neurological damage.

"I miss him every day," she said.

"There needs to be accountability, so it doesn't happen again in the future."

abc.net.au, 10 August 2021

<https://www.abc.net.au>

Frozen mummy of extinct cave lion is 'best-preserved ice age animal ever found,' researchers say

2021-08-11

About 30,000 years ago, when enormous mammoths and woolly rhinos roamed the Northern Hemisphere, a tiny cave lion cub with golden-brown fur took her final stroll through the Siberian tundra.

Disaster struck suddenly — perhaps a mudslide, or a crack splitting open the permafrost underfoot — and the cub fell. Buried in ice, she was quickly mummified; today, her fur, skin, organs and teeth remain almost exactly as they appeared on the day of her death, thousands of years ago.

Scientists named this ill-fated cub Sparta, after mammoth tusk hunters discovered her fossilized remains poking out of the melting permafrost of Yakutia, Siberia, in 2017. Along with Boris — a male cave lion cub discovered just 50 feet (15 meters) away in 2018 — Sparta is the subject of an extensive new study published Aug. 4 in the journal *Quaternary*, in which scientists examined the anatomy of the extinct cats in unprecedented detail.

"Sparta is probably the best-preserved ice age animal ever found, and is more or less undamaged apart from the fur being a bit ruffled," study co-author Love Dalén, a genetics professor at the Centre for Palaeogenetics in Stockholm, Sweden, told CNN.com. "She even had the whiskers preserved."

Cave lions (*Panthera spelaea*) are close relatives of modern African lions. They lived widely across the Northern Hemisphere during the last ice age (the chilly epoch that spanned from approximately 2.1 million to

"She even had the whiskers preserved."

Bulletin Board

Gossip

AUG. 13, 2021

11,600 years ago). Unlike their modern cousins, these large cats adapted to extremely harsh conditions, including freezing winds and long, cold winters marked by continuous nights.

According to the new study, Boris and Sparta didn't get much of a chance to test their mettle against the perils of the ice age. Through a variety of methods including radiocarbon dating, X-ray imaging and partial DNA sequencing, the researchers learned that the two cubs were approximately 1 to 2 months old when they died, with their sharp frontal teeth just beginning to emerge.

Although the cubs' remains were discovered a stone's throw away from each other, their deaths were separated by tens of thousands of years. A radiocarbon analysis of the cubs' skin, hair and muscle showed that Sparta died approximately 28,000 years ago, while Boris met his end more than 43,000 years ago. This finding suggests that the area was probably "attractive to cave lions for making dens, but it was probably also susceptible to them collapsing," the researchers wrote in the study.

X-ray scans of the cubs' bones seem to support a collapse scenario. Both cubs showed skull damage, dislocated ribs and other small "distortions" in their skeletons that could have been caused by "the earth's mass pressure," the researchers wrote. Further distortions likely occurred after the cubs were already buried, as the surrounding permafrost turned their bodies into furry mummies.

For all their injuries, the cubs didn't show any markings indicative of a predator attack, the team added.

At the moment, there's little more that can be learned about how the cubs died — but further research could help reveal how they lived. In future studies, the researchers hope to completely sequence Boris and Sparta's DNA, which could put the evolutionary history of cave lions in a broader context and reveal some of their unique genetic features. **PLAY SOUND**

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[livescience.com](https://www.livescience.com), 11 August 2021

<https://www.livescience.com>

Bulletin Board

Curiosities

AUG. 13, 2021

US astronaut moon landing 'not feasible,' by 2024, NASA's inspector general finds

2021-08-11

Because of anticipated delays in spacesuit development, it is "not feasible" for NASA to land humans on the moon by the agency's hopeful deadline of 2024, a new report from the agency's Office of Inspector General (OIG) has found.

In this new report, which the OIG's Office of Audits released on Tuesday (Aug. 10), NASA's Inspector General has audited the agency's development of next-generation spacesuits, called the Exploration Extravehicular Mobility Unit (xEMU). NASA is creating the suits to be worn and used as part of the agency's Artemis program, which the agency has said will return humans to the lunar surface by 2024. However, according to this evaluation, that timeline is not only unlikely, but even impossible.

"NASA's current schedule is to produce the first two flight-ready xEMUs by November 2024, but the agency faces significant challenges in meeting this goal," the audit reads. However, it adds, given anticipated delays in spacesuit development, "a lunar landing in late 2024 as NASA currently plans is not feasible."

PLAY SOUND

The OIG conducted the audit because, "The development of new spacesuits is a critical component of achieving NASA's goals of returning humans to the moon, continuing safe operations on the International Space Station (ISS), and exploring Mars and other deep space locations," the report reads. In the audit, inspectors "examined the extent to which NASA is addressing challenges related to cost, schedule, and performance of the next-generation spacesuit system."

Spacesuits currently in rotation among astronauts on the space station were designed 45 years ago for NASA's space shuttle program, and it is critical that NASA develop new suits for the safety and efficiency of future space missions and programs, the audit notes. And so, for the past 14 years NASA has been developing this next-gen replacement.

However, obstacles along the way in developing these suits could put NASA's ambitious moon plans on hold; one main obstacle being budget.

"We reported in 2017 that despite spending nearly \$200 million on extravehicular spacesuit development over the previous nine-year period, the agency remained years away from having a flight-ready spacesuit

However, according to this evaluation, that timeline is not only unlikely, but even impossible.

Bulletin Board

Curiosities

AUG. 13, 2021

to use on exploration missions. Since our 2017 report, NASA has spent an additional \$220 million — for a total of \$420 million — on spacesuit development,” the audit reads.

However, while NASA aims to invest \$625.2 million more into the development of these suits, bringing the grand total to over \$1 billion, the OIG still thinks that NASA cannot meet its current hopeful schedule of a 2024 lunar landing.

In addition to a multitude of budgetary concerns, the audit shows that this schedule includes about a 20-month delay in designing, verifying and testing the suits as well as creating two “qualification suits,” a demonstration suit for the space station and two lunar flight suits.

“These delays — attributable to funding shortfalls, COVID-19 impacts, and technical challenges — have left no schedule margin for delivery of the two flight-ready xEMUs,” the report reads. The audit found, in analyzing the suit development at Johnson Space Center in Texas and Marshall Space Flight Center in Alabama, reviewing NASA finances, program planning and budgeting and more, that “the suits would not be ready for flight until April 2025 at the earliest.”

“Moreover,” the audit added, “by the time two flight-ready xEMUs are available, NASA will have spent over a billion dollars on the development and assembly of its next-generation spacesuits.”

The report added that once the suits are ready it does not mean that a mission to the moon can launch right away. The agency will need to have these suits ready well ahead of any crewed missions so that astronauts can train with them not just for Artemis missions but for astronauts flying to the space station and astronauts that will work with other NASA programs.

Moving forward

As part of this audit, the OIG made four recommendations to NASA’s associate administrator for the Human Exploration and Operations Mission Directorate, who is currently Kathy Lueders.

These recommendations suggest that NASA adjust its schedule to land humans on the moon “as appropriate to reduce development risks”; develop a master schedule for all of its different programs (like Gateway, Artemis, ISS and more); solidify all technical requirements for the suits before moving forward; and develop an “acquisition strategy” for the suits that satisfies the needs of both the Artemis and ISS programs, according to the report.

Bulletin Board

Curiosities

AUG. 13, 2021

According to this audit, even with over \$1 billion in total projected spending for these new spacesuits, there are too many delays and obstacles and NASA cannot meet its 2024 moon landing goal.

However, a comment on the OIG audit from SpaceX founder Elon Musk has sparked discussions of a possible spacesuit collaboration between the company and NASA. In response to a social media post by CNBC reporter Michael Sheetz about the OIG audit, Musk tweeted “SpaceX could do it if need be.”

What exactly “it” is in this instance is unclear at this point, but it did show Musk’s interest in collaborating with NASA in some way with regard to the development of its next-generation spacesuits.

This is not the first inkling of commercial collaboration for NASA’s xEMUs. In April, the agency published a request for information (RFI) that revealed that it was looking for feedback from the space sector on a strategy to work with commercial partners on programs including spacesuits.

In the agency’s proposed new strategy outlined in the RFI, NASA would be “shifting acquisition of the exploration extravehicular activity (xEVA) system to a model in which NASA will purchase spacesuit services from commercial partners rather than building them in-house with traditional government contracts,” the statement reads.

[livescience.com](https://www.livescience.com), 11 August 2021

<https://www.livescience.com>

New poo, new you? Fecal transplants reverse signs of brain aging in mice

2021-08-09

As you age, your brain slows down. You may forget where you left your glasses or have trouble picking up a new skill. Now there’s hope from rodent experiments that some of these declines could be reversed—but it takes guts. New research shows a transplant of gut microbes, in the form of feces, from young mice to old ones can turn back the clock on the aging brain.

The study is “a tour de force” for the scope of data it collected, says Sean Gibbons, a gut microbe researcher at the Institute for Systems Biology. Still, he says, more work must be done before anyone considers doing anything similar with humans.

New research shows a transplant of gut microbes, in the form of feces, from young mice to old ones can turn back the clock on the aging brain.

Bulletin Board

Curiosities

AUG. 13, 2021

The bacteria in our intestines influence everything from our daily moods to our overall health. This “gut microbiome” also changes over the course of our lives. But whereas some studies have shown young blood can have rejuvenating effects on old mice, the microbiome’s impact on age-related declines hasn’t been clear.

To test whether a young microbiome could reverse signs of aging, researchers took fecal samples from 3- to 4-month-old mice, the equivalent of young adults, and transplanted them into 20-month-old animals—ancient by mouse standards. The scientists fed a slurry of feces to the old mice using a feeding tube twice a week for 8 weeks. As controls, old mice received transplants from fellow old mice, and young from young.

The first thing the team noticed was that the gut microbiomes of the old mice given young mouse microbes began to resemble those of the younger ones. The common gut microbe *Enterococcus* became much more abundant in old mice, just as it is in young mice, for example.

There were changes in the brain as well. The hippocampus of old mice—a region of the brain associated with learning and memory—became more physically and chemically similar to the hippocampus of young mice. The old mice that received young mouse poop also learned to solve mazes faster and were better at remembering the maze layout on subsequent attempts, the team reports today in *Nature Aging*. None of these effects was seen in old mice given old mouse feces.

“It’s almost like ... we could press the rewind button on the aging process,” says John Cryan, a neuroscientist at University College Cork who led the new study.

However, some things did not noticeably change for older mice given young feces. Many types of gut bacteria remained the same, for example, and the old mice didn’t become more social, which Cryan found surprising, because he’s seen the microbiome impact social interactions in other studies.

Arya Biragyn, a molecular biologist at the National Institute on Aging, says he would have liked the team to have done more to show the microbiomes had actually changed in the older mice. Because the researchers checked for differences in the gut microbiome soon after the transplants, there’s no way to know whether the new microbes had truly moved in or were just passing through, he argues.

Bulletin Board

Curiosities

AUG. 13, 2021

Gibbons also notes that the field of fecal transplants in mice remains a mixed bag. Whereas some studies have found such procedures appear to be beneficial, he says, at least one has found that they can lead to cognitive declines.

Cryan himself cautions about jumping the gun to humans, given that the study was entirely based on rodents. Still, he argues, the work offers hope. “The good thing about your microbiome—as opposed to your genome—is that you can change it.”

[sciencemag.org](https://www.sciencemag.org), 9 August 2021

<https://www.sciencemag.org>

Human influence on global warming is ‘unequivocal,’ IPCC report says

2021-08-09

Record-setting wildfires, historic floods, baking droughts and punishing heat waves have dominated headlines in recent months, and if you’re wondering if these extreme events are linked to climate change — and if humans are responsible — a new report by hundreds of climate experts confirms that this is indeed the case.

In fact, it’s “unequivocal” that human activity is driving climate change, and it’s affecting Earth’s oceans, atmosphere, ice and biosphere in ways that are “widespread and rapid,” according to the report.

On Monday (Aug. 9), the United Nations Intergovernmental Panel on Climate Change (IPCC), the UN body for evaluating climate science, released the first installment of the IPCC’s Sixth Assessment Report in a virtual press event. In the report, the authors reviewed more than 14,000 studies that: document evidence of climate change; record the influence of human activities on global warming; and model predictions of our future should we fail to reduce carbon dioxide (CO₂) and other greenhouse gas emissions that are driving climate change today.

“The fact that the IPCC has agreed — with the agreement of all 195 member countries — that it is unequivocal that human activity is causing climate change, is the strongest statement that the IPCC has ever made,” Ko Barrett, IPCC Vice Chair and Senior Advisor for Climate at the National Oceanic and Atmospheric Administration (NOAA), said at a briefing on Aug. 8.

In fact, it’s “unequivocal” that human activity is driving climate change, and it’s affecting Earth’s oceans, atmosphere, ice and biosphere in ways that are “widespread and rapid,” according to the report.

Bulletin Board

Curiosities

AUG. 13, 2021

Produced by the IPCC's Working Group I, this report addresses the scientific evidence of how Earth's climate is changing and how human activity is driving that change, summarizing the findings for global leaders and policy makers. Reports from two more working groups will be delivered by 2022; those reports will address climate vulnerability, impacts and adaptation in communities around the world, and potential strategies for mitigation, according to the IPCC.

More than 200 scientists authored and edited the new report, and they found that human activity, primarily the production of atmospheric CO₂ from the burning of fossil fuels, has driven global warming at a rate that is unprecedented in the last 2,000 years. Due to climate change, human communities everywhere on Earth are affected by extreme weather events that are longer, more intense and more frequent. If current warming continues, Earth will exceed 2.7 degrees Fahrenheit (1.5 degrees Celsius) of warming and reach 3.6 F (2 C) by 2050, which will further intensify the severity of extreme weather.

Under all the future emissions scenarios that were considered in the report, "surface temperatures will continue to increase until at least the mid-century," the authors wrote.

Incremental changes

Levels of atmospheric heat-trapping CO₂ are now higher than they've been in 2 million years; Arctic sea ice is at its lowest point in 1,000 years; and glacier retreat is at an unprecedented level for the past 2,000 years or more, according to the report. Seas have risen more in the past century than they did in the 3,000 years prior to that, at a rate of about 0.15 inches (4 millimeters) per year, and flooding events in coastal areas have doubled since the 1960s, Bob Kopp, an IPCC co-author and director of the Rutgers Institute of Earth, Ocean and Atmospheric Sciences, said at the briefing.

Heat waves on land and in the oceans are also more common now, occurring five times more often than they did in the 1950s. Severe droughts that used to take place once per decade have increased in frequency by 70% — and that number could double if global temperatures warm by 3.6 F, said IPCC co-author Paola Andrea Arias Gómez, an associate professor at the University of Antioquia in Medellín, Colombia.

"The fact that the IPCC has agreed — with the agreement of all 195 member countries — that it is unequivocal that human activity is causing climate change, is the strongest statement that the IPCC has ever made."

Bulletin Board

Curiosities

AUG. 13, 2021

Ko Barrett, NOAA

Powerful hurricanes are also forming more frequently — and deposit more rainfall — than they did decades ago; and most land areas are seeing precipitation events that are more frequent and intense, according to the report.

"With every additional increment of global warming, changes in extremes continue to become larger," the authors wrote. For example, extreme heat waves that used to happen once per decade now occur about three times in 10 years. With an increase of just 0.9 F (0.5 C) in global average temperatures, such heat waves would happen four times per decade, and resulting temperatures would be nearly 3.6 F (2 C) hotter. Record-breaking heavy rainfall events and droughts would similarly increase in frequency and intensity, should Earth continue to warm, the scientists reported.

No turning back

"There's no going back" to the climate that persisted on Earth for thousands of years, Barrett said at the IPCC briefing. However, some of the changes that we're now seeing can be slowed or even stopped in their tracks if we can limit the rise of global temperature averages to no more than 2.7 F above pre-Industrial levels, Barrett said. But without large-scale reductions in emissions that are currently warming the planet, that goal "will be beyond reach," she added.

"Achieving global net zero CO₂ emissions is a requirement for stabilizing CO₂-induced global surface temperature increase," the researchers wrote in the report.

Limiting warming to below 3.6 F would also dramatically affect sea level rise, Kopp added. Under current warming, oceans are on track to rise 7 feet (2 meters) by the end of the century. Ice loss from glaciers and ice sheets in Greenland and Antarctica is irreversible and is expected to continue for decades, so oceans will still rise even if global temperatures are cooler — but the process will lengthen by centuries "and possibly millennia," Kopp said.

"Even in the case where we're talking about the most extreme example of irreversible changes, which is the sea level and the ice sheets, there's a huge impact on how quickly that comes, and therefore how manageable those changes are," he said.

Future scenarios with low or very low emissions offer the most promising outcomes, with effects that could be noticeable within two decades,

Bulletin Board

Curiosities

AUG. 13, 2021

according to the report. While it's still possible to head off many of climate change's most dire impacts, "it really requires unprecedented transformational change [with] rapid and immediate reduction of greenhouse gas emissions to net zero by 2050," Barrett said at the briefing.

"The idea that there is still a pathway forward, I think, is a point that should give us some hope," Barrett said.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 9 August 2021

<https://www.livescience.com>

There's a 46% chance that fish you bought is mislabelled

2021-08-04

It's summer, and you're in a grocery store fish aisle. Tilapia, salmon, rockfish and snapper line the cooler boxes, descriptors clearly written on their packaging. You take one home, perhaps after deciding to opt for a sustainable, more expensive option.

However, a new Oceana Canada study says seafood isn't nearly that simple, and that almost half of seafood samples it tested from restaurants and grocery stores had incorrect labels. It says that means people are paying more for lower-quality seafood and restaurants and grocery stores are being duped in the process. Oceana's latest study, designed to highlight instances of fraud, tested types of seafood where fraud is known to be a problem. Therefore, it is not a comprehensive account of fraud across the entire industry.

The results build on a previous study from the organization, done between 2017 and 2019, which found results just a point higher: 47 per cent of the 472 samples it tested weren't labelled properly compared to this time around, where 46 per cent of the 94 samples from establishments in Toronto, Montreal, Ottawa and Halifax were mislabelled.

It's a concerning problem, says Sayara Thurston, the organization's seafood fraud campaigner. It can look like a farmed species being branded as wild, a product being labelled as something completely different or a piece of seafood caught illegally or out of quota ending up on your plate.

Snapper is a species that is often mislabelled, explains Thurston — only two of the 13 samples were correctly labelled. Ocean Canada also found

Bulletin Board

Curiosities

AUG. 13, 2021

that 10 products were mislabelled as escolar, a fish that can make you sick if ingested in portions larger than six ounces.

"Seafood fraud has been linked to illegal fishing practices around the globe, which also include things like human rights abuses, or people that can be trapped on vessels forced to work as forced labour," she said.

"And obviously as a consumer, you don't want to be paying more for something and then actually getting a cheaper product. So it's really an issue that has a whole kind of cascade of negative consequences."

Grocery stores and other retailers had a lower percentage of mislabellings than in the previous study, says Thurston, with 6.5 per cent of samples being falsely described, compared to 25 per cent in the previous study. The mislabelling rate among restaurants jumped 10 points — to 65 per cent.

As to why that might be, Thurston said the smaller sample size could be to blame, but that restaurants are often more prone to being victims of fraud, where larger grocery stores might have more opportunity to do their own traceability research.

"We know that this happens at any point in the supply chain. Seafood is one of the most highly traded food commodities in the world, and the supply chains are notoriously long and complex and opaque," she said.

"There's no one given point in a supply chain where we know seafood fraud happens; it's really throughout it that it can occur."

The results build on a previous study from Oceana Canada done between 2017 and 2019, which found results just slightly higher: 47 per cent of the 472 samples tested weren't labelled properly. #FishFraud

To guard against fraud, Dane Chauvel, CEO of Vancouver's Organic Ocean, traces the origin of all his products. His business, located on the brink of the Fraser River, supplies sustainable seafood to local restaurants and retailers.

Chauvel has long understood the complexities of tracing fish and seafood. Starting the random DNA testing partnership through the University of Guelph has helped Chauvel make sure he's delivering the right seafood. So, for the past few years, every few months at a random time, a sample of seafood is taken from Organic Ocean's storage facility, where it is then analyzed at the university. It's a partnership unique to his company and the school.

Bulletin Board

Curiosities

AUG. 13, 2021

Labelling is interesting in Canada, says Chauvel, because businesses can be compliant with the Canadian Food Inspection Agency, but still not have all the information a consumer may want. Rockfish is an example he points out, which currently requires a simple label of its name. However, some species of rockfish are more sustainable than others — which is cause for concern among consumers and those in the food industry.

“The chefs set the agenda for the mainstream, or the mass, market,” Chauvel said. “They’ve been interested in (traceability) for some time,” he said, noting that he’s seen an uptick in consumer interest to know where their food comes from.

Thurston and Oceana agree consumers want better labelling standards for seafood and say the Canadian government should implement a boat-to-plate traceability system, which it committed to doing in 2019.

Canada’s National Observer reached out to the Canadian Food Inspection Agency for confirmation on the status of a traceability system, but the agency did not respond to a request for comment by publication time.

“Some of our largest trading partners, the European Union and the United States ... have traceability systems in place, which basically means you’re following a product from its point of origin all the way through (to) the consumer,” said Thurston.

“Right now in Canada, what we require is only a one step forward, one step back traceability, which is basically what it sounds like ... it’s been shown that that’s just not sufficient for effectively monitoring legality and food safety at the same time. So we are falling behind some of our largest trading partners and global best practices.”

[nationalobserver.com](https://www.nationalobserver.com), 4 August 2021

<https://www.nationalobserver.com>

Squirrels use parkour tricks when leaping from branch to branch

2021-08-05

Parkour enthusiasts need look no further than up in the trees for inspiration. Squirrels’ aerial acrobatics make the rodents masters of the form, a new study suggests.

A detailed look at how squirrels navigate narrow branches that bend and sway with the wind — where the smallest error could spell death — shows

Bulletin Board

Curiosities

AUG. 13, 2021

that the rodents make split-second calculations to balance trade-offs between branch bendiness and the distance between tree limbs. And for particularly tricky jumps, squirrels improvise parkour-style moves in midair to stick the landing, researchers report in the Aug. 6 Science.

This study is “a great example of how cool ‘normal’ animals can be in their biomechanics,” says Michelle Graham, a graduate student in biomechanics at Virginia Tech in Blacksburg who was not involved with the research. “We’ve all seen squirrels do crazy stuff in nature, but no one ever pays any attention to it.”

That is unless you’re like Nathaniel Hunt, who has been mesmerized by watching squirrels flash through the overstory since graduate school. “Tree canopies are incredibly challenging environments to navigate,” says Hunt, an integrative biologist at the University of Nebraska Omaha. When jumping between bendy branches, a squirrel must assess how far it has to jump and know when to leap. Jump too early and the squirrel will fall short. Too late, and the squirrel will find itself on a branch too flimsy from which to launch. Hunt wondered, “How are they sensitive to that trade-off, managing to make accurate leaps?”

To find out, he and his colleagues designed an artificial forest obstacle course on the outskirts of the University of California, Berkeley campus. Then, the team used peanuts to coax free-ranging fox squirrels (*Sciurus niger*) into running and jumping through a series of acrobatic tests (SN: 1/29/19).

First, the unwitting subjects learned to leap from artificial branches of high, medium or low stiffness across a gap to reach a prize: a basket of peanuts at the end of a landing peg. High-speed video captured details of the jumps, from launch point to landing accuracy, for 12 squirrels spanning 96 leaping trials.

Unsurprisingly, the squirrels leaped from more bendy branches earlier — presumably to maximize jumping force — even though that increased the distance that the animals must clear, Hunt says. By comparing what the squirrels actually did with statistical models that simulated optimal jumping decisions, the researchers found something interesting: Branch flexibility had about six times as great an influence on when squirrels decided to jump as did the length of the gap. If squirrels had cared more about distance, they’d have jumped from about the same spot on the rod, regardless of its give. “We were surprised to see squirrels weighing both of these things simultaneously, but in different amounts,” Hunt says.

“We’ve all seen squirrels do crazy stuff in nature, but no one ever pays any attention to it.”

Bulletin Board

Curiosities

AUG. 13, 2021

The researchers upped the ante for five squirrels by increasing the flexibility of branches as well as gap distance. Initial leaps were less than graceful. No squirrels fell, but most landed clunkily at first, grasping the peg they leaped to with their front paws and swinging around to pull themselves up instead of landing neatly on all fours. But within five trials, “squirrels learned to compensate for their initial error,” Hunt says, which they did by modifying their initial velocity.

To better understand how squirrels leap from tree branch to tree branch without falling, researchers trained free-roaming squirrels to jump through a series of tests in an artificial forest obstacle course. High-speed camera footage showed that these rodents can learn to stick landings in just a few jumps, and that squirrels consider both branch bendiness and distance when deciding to leap from a limb.

If squirrels regularly encounter the same branches, such quick learning “might explain how they move so fluidly and rapidly” across particular branches, Hunt explains. The rodents might be such quick navigators, he says, because “they’ve already learned what they need to know about that branch.”

The squirrels surprised the researchers in other ways too. For longer jumps, or those that necessitated landing higher or lower than the starting point, many squirrels rotated midair, using their legs to “jump” off an adjacent vertical wall in a parkour-style maneuver. More often than not, squirrels employed parkour to slow down if they were coming in too hot to a landing. “It’s an additional point of control,” Hunt says.

For many arboreal animals, “jumping between limbs is such a common thing, and yet we so frequently only study it in pieces,” Graham says, such as looking just at the launch but not the landing. This study’s holistic look reveals “something really interesting about squirrels, that they take greater account of [branch bendiness] than the gap distance,” she notes. “I don’t know that I would’ve guessed that.”

sciencenews.org, 5 August 2021

<https://www.sciencenews.org>

This meat-eating plant is only a part-time killer

2021-08-09

Most carnivorous plants are full-time predators—the Venus fly trap, for example, lies in wait year-round to snag flies with its jawlike leaves. Now, researchers describe a meat-eating plant that only catches insects when

Bulletin Board

Curiosities

AUG. 13, 2021

it’s flowering. Overlooked because its sticky hairs are relatively common among plants, the species may be just one of many examples of “cryptic carnivores” yet to be discovered.

“It’s a really interesting finding and a well-designed study,” says Ulrike Bauer, a carnivorous plant expert at the University of Bristol who was not involved with the work.

There are about 800 species of carnivorous plants. Most belong to closely related groups. Many species have a snap trap, like the Venus fly trap, whereas other groups rely on sticky surfaces, and still others lure prey into chambers filled with digestive fluids. The last time a totally new type of carnivorous plant was discovered was in 2012: Researchers found a species in the Brazilian savanna that catches tiny worms with special leaves that grow underground.

The species in the new study, called the western false asphodel (*Triantha occidentalis*), lives in mountainous bogs and other nutrient-poor locations in western North America. The upper part of its flowering stalk is covered with small red hairs that exude a shimmering, sticky substance. The hairs often trap flies and small beetles in the droplets. But so do many other kinds of plants, which use these hairs as defense against pests rather than as a source of nutrition.

The clue to *Triantha*’s carnivorous diet emerged from a genomic study of plant evolution. Gregory Ross, a master’s student working in the lab of Sean Graham, a botanist at the University of British Columbia (UBC), Vancouver, noticed *T. occidentalis* lacks some genes that are also missing in carnivorous plants. (The genes are involved in fine-tuning photosynthesis, for example when plants are exposed to dappled sunlight.)

Qianshi Lin, then a Ph.D. student at UBC, decided to investigate. He prepared a special diet for *Triantha*: fruit flies that had been fed with an isotope, or form, of nitrogen that is rare in nature, which could reveal whether the plants were absorbing nutrients from the flies. After 150 flies had matured, Lin froze them. Then, he and colleagues visited a bog near Vancouver, where they added fruit flies to 10 individual *Triantha* plants and, as a control, to a similar-size plant that is not carnivorous.

One to 2 weeks later, the researchers brought the plants back to the lab. They could detect the nitrogen isotope in the stems, leaves, and fruits of *Triantha*, but not in the noncarnivorous plants. *Triantha* got more than half of its nitrogen from prey, similar to sundews, a carnivorous plant

**There are about
800 species of
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Bulletin Board

Curiosities

AUG. 13, 2021

living nearby, the team reports today in the Proceedings of the National Academy of Sciences.

“That’s the point at which you prove that it’s a carnivorous plant,” Lin says. “I felt quite excited to discover it.” He also showed that the hairs make the same enzyme, phosphatase, that other carnivorous plants use to extract the nutrient phosphorus from prey.

Many carnivorous plants use sticky hairs to snare flies and small beetles, but they locate these traps away from their flowers—it’s no good to eat an insect that’s needed for pollination. The western false asphodel doesn’t do this; it puts these sticky hairs on the main stem bearing its flowers, which grows up to 80 centimeters tall. The authors think the red hairs and shiny droplets attract insects, like in sundews. But the droplets are only sticky enough to trap small insects such as midges and not bees or other pollinators, says co-author Tom Givnish, a botanist at the University of Wisconsin, Madison.

Andreas Fleischmann, a botanist at the State Botanical Collection in Munich, isn’t convinced that *Triantha* is a true carnivore—for that, he says, it needs to be clearly demonstrated that the plant is luring insects to their deaths. He thinks it’s more likely that the hairs are used to kill insects that might steal pollen or nectar from its flowers without fertilizing them. *Triantha* is more of a passive killer, Fleischmann argues, not an active one with leaves modified for trapping.

One implication of the finding is that there may be other overlooked examples of carnivorous plants; the researchers found museum specimens of a related species with small insects attached to the flower stalk. *Triantha* is just a part-time carnivore, Lin says, because it only flowers briefly. Aaron Ellison, an ecologist at Harvard University, notes there’s only one other known example of a part-time carnivorous plant, a vine in West Africa that eats insects only as a juvenile but then outgrows the habit.

There’s something else remarkable about *Triantha*, Ellison notes: It’s one of just a few examples of carnivorous plants in a large group of plants called the monocots (which includes all grasses and lilies, for example). Why are carnivorous monocots so rare? Lin says it might be because the typical monocot leaf, like a blade of grass, is narrow with parallel veins, which may be less suitable for evolving into complex traps. The presence of carnivory in different ancient lineages is fascinating to study, Fleischmann and others say, because it’s like comparing the evolution of flight in animals as distinct as bats and insects.

Bulletin Board

Curiosities

AUG. 13, 2021

“This paper will be an important piece of carnivorous plant biology,” says biophysicist Rainer Hedrich of the Julius Maximilian University of Würzburg.

sciencemag.org, 9 August 2021

<https://www.sciencemag.org>

Which COVID-19 vaccine has the lowest rate of breakthrough infections?

2021-08-12

Unvaccinated people currently account for most new cases of COVID-19 in the U.S., but a small proportion of cases are in vaccinated people; these cases are known as breakthrough infections. But is there a difference in how often people get breakthrough infections depending on which vaccine they got?

The short answer is, we don’t know exactly, but there are some hints in the data. The Johnson & Johnson vaccine does seem to have higher rates of breakthrough infection than the Pfizer and Moderna vaccines, but that was expected based on the results of clinical trials. Some very early hints show a slightly lower rate of breakthrough infections with the Moderna vaccine than with the Pfizer vaccine, but that early finding is based on data on a few million people from only two locations and thus may not represent the overall picture in the country.

Because no vaccine is 100% effective, breakthrough infections have been expected from the start of the vaccine rollout. In the context of clinical trials, about 0.04% of people given the Pfizer vaccine got infected with SARS-CoV-2, versus about 0.07% with Moderna and 0.59% with Johnson & Johnson. **PLAY SOUND**

Now that the vaccines are authorized, scientists have the chance to track how many breakthrough infections occur in the real-world, beyond clinical trials. When breakthroughs do occur, most people experience mild symptoms, if they fall ill at all, and a small percentage develop severe disease, require hospitalization or die, current data suggests.

The recent rise of the highly-transmissible delta variant might raise the risk of breakthrough infections, though. For example, a recent Centers for Disease Control and Prevention (CDC) study, published Aug. 6 as a Morbidity and Mortality Weekly Report (MMWR) report, found that the delta variant surged in Mesa County, Colorado between May and June; at

But is there a difference in how often people get breakthrough infections depending on which vaccine they got?

Bulletin Board

Curiosities

AUG. 13, 2021

the same time, the county accrued a “significantly higher” proportion of breakthrough cases compared with other Colorado counties, where delta was less prevalent.

Reporting of breakthrough infections now falls largely on the states, and of the 25 or so states that report breakthrough infections, most don’t yet provide data on the number of cases linked to each vaccine brand, Live Science found in a search of state health department websites.

However, Oklahoma and Washington, D.C., do make this information public. These data could provide “early signals” regarding how well the vaccines are working, particularly as new variants emerge, the DC Health website states. That said, there are many limitations: The data sets are small, each vaccine was given to different numbers of people and the timing of the doses makes it hard to interpret the data.

Still, as of Aug. 1, more than 299,000 D.C. residents had been fully vaccinated, according to data from DC Health. Of these people, nearly 151,000 received the two-dose Pfizer vaccine, about 124,700 got the two-dose Moderna vaccine and about 24,000 received the one-dose Johnson & Johnson vaccine.

In this population, the highest rate of breakthroughs was seen in those who got the Johnson & Johnson shot: 77 people, or 0.32% of the roughly 24,000 recipients. The second highest rate was seen among Pfizer recipients, of whom 308 people, or 0.2%, tested positive for the virus. Finally, 161, or 0.13%, of the Moderna recipients caught a breakthrough infection.

These numbers include asymptomatic, mild, moderate and severe breakthrough cases. Some people with asymptomatic or mild infections may not get tested, so their cases would be missed, meaning this is probably an undercount of breakthroughs.

Oklahoma has reported similar results.

As of Aug. 2, more than 1.5 million Oklahomans had been fully vaccinated, according to a report from the Oklahoma State Department of Health. About 817,000 had received Pfizer shots, 674,000 received Moderna and 102,000 got Johnson & Johnson. Again, the Johnson & Johnson recipients showed the highest rate of breakthrough cases, with 215, or 0.21%, testing positive for the virus; 1,468 Pfizer recipients, or 0.17% of the total, caught a breakthrough infection; and 831 Moderna recipients, or 0.12%, tested positive for the virus.

Bulletin Board

Curiosities

AUG. 13, 2021

These snapshots from Oklahoma and D.C. likely offer an incomplete picture of breakthrough cases in each region, however, and for now, it’s unclear if the observed patterns are representative of the country as a whole. To accurately compare the vaccine brands, particularly with the delta variant still running rampant, we simply need more data, Robert Darnell, a physician scientist at The Rockefeller University in New York, told National Geographic.

That said, other preliminary research also suggests Moderna’s vaccine offers more protection against the delta variant than Pfizer’s, which could help explain the differences in breakthrough rates, Reuters reported. One study, posted Aug. 8 on the preprint database bioRxiv, included more than 50,000 patients in the Mayo Clinic Health System and found that the Moderna vaccine’s real-world effectiveness fell from 86% to 76% between January and July, when delta gained prominence. In the same time window, Pfizer’s effectiveness fell from 76% to 42%.

However, that study has not been peer-reviewed yet, so the results still need to be confirmed.

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<https://www.livescience.com>

Concerns over pollution and hot weather add another challenge to marathon swimming

2021-08-04

TOKYO — Murky water laps the shoreline at Odaiba Marine Park in a gentle rhythm, as traffic hums across the Rainbow Bridge in the distance, skyscrapers tower over Tokyo Bay and 48-foot-high Olympic rings float nearby in one of the trademark settings at the Summer Games.

But months of questions followed the 25 women who plunged into the water shortly after dawn Wednesday for the open-water swimming competition.

Under the best of circumstances, the 10-kilometer race is one of the most demanding tests among the 33 sports at the Olympics. For two hours, swimmers navigate seven laps around the course while fighting off competitors — the thrashing pack can become physical without lane lines — gulping occasional drinks extended to the water by long poles

This race, however, came after persistent controversy over high water temperatures and pollution raised safety concerns among some athletes and coaches.

Bulletin Board

Curiosities

AUG. 13, 2021

and, in the case of one woman, fending off a fish that smacked her in the chest.

This race, however, came after persistent controversy over high water temperatures and pollution raised safety concerns among some athletes and coaches.

“You can always prepare for what you think it’s going to be, but it’s always going to be different,” said Haley Anderson, a USC graduate who lives in Santa Monica and finished sixth. “You never know how hot you’re going to get during a race because 10K is a really long time.”

Anderson and Ashley Twichell, who placed seventh, were the first U.S. athletes to qualifying for the Games in July 2019. Though the pandemic delayed their appearance by a year, worries grew about how Tokyo’s notorious summer heat would impact the venue used for the open-water races and the swimming portion of the triathlon.

Following an open-water test event in mid-2019, one competitor told reporters the bay “smelled like a toilet.” The swimming leg of a paratriathlon the same year had to be canceled after tests found *E. coli* levels in the water exceeded the threshold set by World Triathlon.

High water temperatures provided another problem. The issue loomed large for open-water swimmers in a sport in which Fran Crippen, the U.S. star who died after overheating in warm water during a race in the United Arab Emirates in 2010, still casts a long shadow.

Though the Olympic marathon and race-walking events were moved to Sapporo to avoid the Tokyo heat, the open-water and triathlon events remained in place.

During a Reddit question-and-answer session in early 2020, Anderson wrote that the water temperature was “very unsafe” and “There is also no plan B venue, which in my opinion should be non negotiable.”

Organizers installed triple-layered polyester mesh screens to filter bacteria around the competition area that’s essentially walled off from the rest of the bay, along with water circulators to pull up cool water from the depths in an attempt to lower the temperature. They also moved the start time to 6:30 a.m.

But the water temperature for the men’s triathlon was 86 degrees earlier in the Games — USA Swimming doesn’t allow long-distance races when the water temperature exceeds 85 degrees. FINA, the worldwide governing

Bulletin Board

Curiosities

AUG. 13, 2021

body for aquatics, has a looser standard of 88 degrees for open-race competitions.

On Wednesday morning, water temperature at three points in the course ranged from 84.6 degrees to 84.9 degrees. The air was sweltering, even at the early hour, with an 82-degree temperature that felt like 91 degrees. One of the men’s open-water swimmers — their race is Thursday — tweeted this week that the bay felt like a “warm puddle.”

Anderson, who won a silver medal at the London Games in 2012 and is competing in her third Olympics, trained in a warm pool to help acclimate to the heat and wore a cooling vest over her swimsuit before the race.

“The water was pretty warm,” she said. “Luckily we had some clouds.”

Twichell led in the early laps but fell off the pace as a small armada of motorboats, personal watercrafts and kayaks followed the swimmers around each lap. Brazil’s Ana Marcela Cunha pulled away to claim the gold medal in 1 hour, 59 minutes, 30.8 seconds.

Ana Marcela Cunha of Brazil celebrates after winning the gold in women’s marathon swimming Wednesday.

(David Goldman / Associated Press)

All 25 competitors finished, though by the time they left the water, the air temperature felt like 99 degrees.

“It was tough conditions at the end,” said Sharon Van Rouwendaal of the Netherlands, who took silver. “It got warmer and warmer as we went faster and faster.”

As competitors filtered away from the bay after the race in search of rest and shade, the water lapped the shore, the sun felt relentless and the temperature rose.

latimes.com, 4 August 2021

<https://www.latimes.com>

But he came back the next day with three painful red bumps on his leg that he thought were bug bites.

Bulletin Board

Curiosities

AUG. 13, 2021

Arizona man went a month without knowing he had the plague

2021-08-06

A man in Arizona went nearly a month without knowing he had contracted the plague, which can be deadly if not treated promptly, according to a new report.

The man recovered, but his case underscores the need to identify infections with serious and potentially contagious pathogens, such as *Yersinia pestis* — the bacterium that causes plague — in a timely manner, according to the report, from the Centers for Disease Control and Prevention (CDC).

The 67-year-old man first went to the emergency room on June 18, 2020, with symptoms of dehydration, nausea and weakness, according to the case report, which was published Thursday (Aug. 5) in the CDC journal *Morbidity and Mortality Weekly Report*. Doctors treated him with IV fluids and released him shortly thereafter. But he came back the next day with three painful red bumps on his leg that he thought were bug bites. This time, doctors suspected he had cellulitis, a skin infection caused by bacteria. He was given prescriptions for two antibiotics and again released from the hospital.

The man came back the next day with more serious symptoms, including fever, dizziness, chills and “swollen glands.” He was admitted to the hospital and treated with antibiotics for suspected sepsis, potentially life-threatening body-wide inflammation that can result from an infection.

He tested negative for COVID-19 twice, and a blood sample was sent to a commercial laboratory to help identify the cause of his infection. On June 30, 2020, the lab reported that the man tested positive for *Yersinia pseudotuberculosis*, a bacterium that can spread from animals to people and can cause fever, abdominal pain and, in some cases, a rash and blood infection. It’s closely related to *Yersinia pestis*. The man started a two-week course of the antibiotic vancomycin and was allowed to leave the hospital on July 1, 2020.

But the diagnosis of *Y. pseudotuberculosis* would turn out to be wrong. On July 10, 2020, the hospital sent a sample of the man’s blood to Arizona State Public Health Laboratory, which identified *Y. pestis* in the sample. Health officials confirmed the diagnosis of plague on July 15, 2020, nearly a month after the man first experienced symptoms.

Bulletin Board

Curiosities

AUG. 13, 2021

The man was diagnosed with septicemic plague, a type of plague that causes fever, chills, extreme weakness, abdominal pain and sometimes bleeding into the skin and other organs, according to the CDC. (People with septicemic plague have sepsis caused by *Yersinia pestis*.)

He was then prescribed the appropriate treatment, which in this case was a 10-day course of the antibiotic doxycycline. The delay in diagnosis could have threatened the man’s chances of survival. “This patient did not receive high-efficacy antibiotic treatment ... until approximately 30 days after symptom onset,” the report said.

The man’s eventual recovery may have been due, in part, to his early treatment with antibiotics; although they were not the best antibiotics to treat plague, they do have some effectiveness against plague bacteria, the report said.

Plague is perhaps best known for causing the Black Death in Europe in the 1300s. The infection still occurs today, but it is very rare, with about seven cases of plague occurring in the U.S. each year, on average, according to the CDC. The man’s case was the first reported case of plague in Arizona since 2017, the authors said.

Humans can catch the plague through fleabites or contact with the tissue or bodily fluids of an infected animal. The man reported handling a dead pack rat (a rodent belonging to genus *Neotoma*) while wearing gloves before he became ill.

Early and prompt treatment with antibiotics is important to avoid serious complications, including death. Before the advent of antibiotics, the death rate from plague in the U.S. was about 66%, but today the rate is around 11%, according to the CDC.

In Arizona, hospitals and labs that identify any bacterium within the *Yersinia* genus are required to submit the samples to the state public health lab for further testing within one business day, the report said. But in this case, there was a 10-day delay in submitting the sample. The reason for the delay is unclear, but the laboratory staff underwent re-education about this requirement, the report said.

“Rapid reporting might have led to timelier diagnosis of his acute illness and initiation of a more effective antibiotic therapy closer to disease onset,” the report concluded.

Bulletin Board

Curiosities

AUG. 13, 2021

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<https://www.livescience.com>

Bayer heads into next U.S. cancer trial, opening statements set for Thursday

2021-08-05

Despite Bayer AG's efforts to put an end to costly litigation inherited in its acquisition of Monsanto, opening statements in yet another trial are set for Thursday as a woman suffering from non-Hodgkin lymphoma claims Monsanto's Roundup herbicide caused her cancer.

A jury of seven men and five women have been seated in the case of Donnetta Stephens v. Monsanto in the Superior Court of San Bernardino County in California.

The trial comes a week after Bayer announced it would stop selling Roundup, and other herbicides made with the active ingredient glyphosate, to U.S. consumers by 2023. Monsanto was purchased by Bayer AG in 2018, and Bayer insists, just as Monsanto has for decades, that there is no valid evidence of a cancer connection between its weed killing products and cancer.

Bayer said the move to stop selling the herbicides to consumers was "to manage litigation risk and not because of any safety concerns." The company said it will continue to sell its glyphosate-based herbicides for commercial use and for use by farmers.

Bayer also said last week it was setting aside \$4.5 billion – on top of roughly \$11 billion already earmarked for Roundup litigation settlements – to cover "potential long-term exposure" to liability associated with claims from cancer victims such as Stephens.

Bayer further said with respect to ongoing litigation, it "will be very selective in its settlement approach in the coming months."

Evidence at issue

Ahead of the opening statements, Judge Gilbert Ochoa ruled – in agreement with Monsanto – that federal law regarding Environmental Protection Agency (EPA) oversight of pesticide product labeling preempts

Bulletin Board

Curiosities

AUG. 13, 2021

"failure to warn" claims under state law, meaning Stephens' lawyers would not be able to pursue such claims.

The plaintiffs still hope to argue, however, that separate from the labeling issues, Monsanto could have, and should have, warned consumers about the potential cancer risk in other ways, according to Stephens' lawyer Fletcher Trammell. He and Stephens' other lawyers will seek to prove that Monsanto made an unsafe herbicide product and knowingly pushed it into the marketplace despite scientific research showing glyphosate-based herbicides could cause cancer.

Lawyers for Stephens say that she was a regular user of Roundup herbicide for more than 30 years and it was that extended exposure to the glyphosate-based products made popular by Monsanto that caused her non-Hodgkin lymphoma.

Stephens was diagnosed in 2017 and has suffered from numerous health complications amid multiple rounds of chemotherapy since then. She is one of tens of thousands of plaintiffs who filed U.S. lawsuits against Monsanto after the World Health Organization's cancer experts classified glyphosate – the active ingredient in Monsanto's herbicides – as a probable human carcinogen with an association to non-Hodgkin lymphoma.

The list of evidence to be presented at trial runs more than 250 pages and includes scientific studies as well as Monsanto emails and other internal corporate documents. The federal judge who has been overseeing nationwide Roundup litigation stated in a recent order that there is "a good deal of damning evidence against Monsanto—evidence which suggested that Monsanto never seemed to care whether its product harms people."

Close to 70 people are listed as witnesses to testify at trial, either live or through deposition testimony, including many former Monsanto scientists and executives.

The first witness set to take the stand is retired U.S. government scientist Christopher Portier, who has been an expert witness for the plaintiffs in each of the prior Roundup trials. Portier has previously testified that there is clear scientific evidence showing glyphosate and glyphosate-based formulations such as Roundup can cause cancer in people. He has also testified in the past that U.S. and European regulators have not properly assessed the science and have ignored research showing cancer concerns with Monsanto's herbicides.

Bulletin Board

Curiosities

AUG. 13, 2021

Before retiring, Portier led the National Center for Environmental Health/ Agency for Toxic Substances and Disease Registry at the Centers for Disease Control and Prevention (CDC), part of the U.S. Department of Health and Human Services. Prior to that role, Portier spent 32 years with the National Institute of Environmental Health Sciences, where he served as associate director, and director of the Environmental Toxicology Program, which has since merged into the institute's National Toxicology Program. Portier was also an "invited specialist" to the International Agency for Research on Cancer unit of the World Health Organization when the group made its probable carcinogen classification of glyphosate in 2015.

Bayer hopes for help from Supreme Court

Monsanto has lost three out of three previous trials, with a jury in the last trial – held in 2019 – ordering a staggering \$2 billion in damages due to what the jury saw as egregious conduct by Monsanto in failing to warn users of evidence – including numerous scientific studies – showing a connection between its products and cancer. (The award was later shaved to \$87 million.)

In trying to free itself from the weight of Monsanto-related woes, Bayer said last week that in addition to replacing its glyphosate-based products in the U.S. residential market with new formulations using alternative ingredients, it is exploring changes to Roundup labeling.

"It is important for the company, our owners, and our customers that we move on and put the uncertainty and ambiguity related to the glyphosate litigation behind us," Bayer CEO Werner Baumann said during a recent investor call.

The company also said it will file a petition this month seeking U.S. Supreme Court review of one of its trial losses – the case of *Hardeman v. Monsanto*. Bayer said if the Supreme Court grants review, the company "will not entertain any further settlement discussions" while the court reviews the appeal.

In the event of a "negative Supreme Court outcome," Bayer said it would set up a claims' administration program that will offer "pre-determined compensation values" to "eligible individuals" who used Roundup and developed non-Hodgkin lymphoma over the next 15 years.

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Bulletin Board

Technical Notes

AUG. 13, 2021

(NOTE: OPEN YOUR WEB BROWSER AND CLICK ON HEADING TO LINK TO SECTION)

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[In vitro prediction of clinical signs of respiratory toxicity in rats following inhalation exposure](#)

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