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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.**

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ASIA PACIFIC

Workplace exposure standard review

2021-02-01

Safe Work Australia is evaluating the Workplace exposure standards for airborne contaminants to ensure they are based on the highest quality, contemporary evidence and supported by a rigorous scientific approach.

The draft evaluation reports and recommendations for the workplace exposure standards (WES) are provided for your information.

Each report includes:

- a recommended WES value

- information about the basis of the recommendation, and

- a summary of the data relied upon to make the recommendation.

The recommended WES values are health-based recommendations made by expert consultants using the agreed methodology ([External link](#))

developed by Safe Work Australia, and have been independently peer reviewed.

We would like your feedback on these values, in particular, comments of a technical nature regarding:

- the toxicological information and data that the value is based upon, and

- the measurement and analysis information provided.

We are seeking comments of a technical nature on the draft evaluation reports and recommendations for the workplace exposure standards throughout the project.

The workplace exposure standards currently open for feedback are listed below.

Your feedback is important for Safe Work Australia Members in making recommendations to Work Health and Safety (WHS) Ministers about any changes to the workplace exposure standards. Changes to the workplace exposure standards only become mandatory once agreed by a majority of WHS Ministers and adopted in the WHS laws in the Commonwealth, states and territories.

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The public consultation for the workplace exposure standards (WES) review ([External link](#)) will recommence on **1 February 2021** with **Release 15: Paraffin wax to Zirconium compounds**. Release 15 will also contain all reports deferred from previous releases.

This date also marks the final date that feedback will be accepted on previous releases 2-14. You can continue to submit your comments for these releases via our dedicated inbox WESconsult@swa.gov.au

until **1 February 2021**. Please indicate the chemical/s that you are providing feedback for and whether your feedback is for yourself or on behalf of your organisation.

You will be able to provide feedback for **Release 15: Paraffin wax to Zirconium compounds** until **30 July 2021** after which time feedback and recommendations will be finalised.

Subscribe to the chemical exposure standards mailing list ([External link](#))

to stay informed about the progress of the WES review.

[Read More](#)

Safe Work Australia, 1st February 2021

<https://engage.swa.gov.au/workplace-exposure-standards-review>

Model WHS Act comparison table now available

2020-12-15

Safe Work Australia has published a table comparing the model Work Health and Safety (WHS) Act and the WHS Acts adopted by the harmonised jurisdictions.

The table outlines the similarities and differences between the WHS Acts. Some jurisdictions have made minor variations to their WHS Act to make it consistent with other laws and processes.

Businesses that operate in more than one jurisdiction can use the comparison table to identify how the relevant WHS Acts differ.

Most jurisdictions have implemented the model WHS Act. Western Australia has implemented the model WHS Act but it will not commence operation until regulations are finalised. The model WHS Act has not been implemented in Victoria.

The draft evaluation reports and recommendations for the workplace exposure standards (WES) are provided for your information.

Some jurisdictions have made minor variations to their WHS Act to make it consistent with other laws and processes.

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The table will be updated periodically in consultation with jurisdictions, for example, to reflect any amendments to the model WHS Act or jurisdiction WHS Acts.

[Read More](#)

Safe Work Australia, 15 December 2020

<https://www.safeworkaustralia.gov.au/media-centre/news/model-whs-act-comparison-table-now-available>

Andrews government taken to court over West Gate Tunnel soil

2021-02-05

The Andrews government is being sued by a group of residents and a council in Melbourne's west over plans to dump soil contaminated with potentially carcinogenic PFAS chemicals from the West Gate Tunnel in a landfills located metres away from homes.

The residents, from Moorabool Environment Group, had a major legal triumph in December when they forced the Environment Protection Authority to quash all of its environmental approvals for landfills accepting the project's soil, after they pursued the regulator in court.

Documents lodged in the Supreme Court on Thursday show the Moorabool community group has requested a judicial review of Planning Minister Richard Wynne's decision to amend the Moorabool Planning Scheme, which would allow potentially millions of tonnes of PFAS-contaminated soil to be dumped at the Maddingley Brown Coal landfill in Bacchus Marsh.

It comes as Melton Council also launched separate legal proceedings against the Andrews government on Friday, over its move to amend the Melton Planning Scheme to allow the project's soil to be sent to Cleanaway Ravenhall.

[Read More](#)

The Age, 5 February 2021

<https://www.theage.com.au/national/victoria/andrews-government-taken-to-court-over-west-gate-tunnel-soil-20210205-p56zyb.html>

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AMERICA

Three must-haves for managing these common hazardous-materials returns

2021-01-21

Retailers had their hands full this last holiday season. A solid start to shopping was welcome news, but better-than-anticipated sales were just part of the story. As was expected, e-commerce drove the gains, and that means this year's seasonal returns volume will be especially heavy.

Retailers are enjoying the benefits of improved omnichannel fulfillment, and the effort they've given to activating shoppers across channels has been time well spent. However, with the impending increase in returns, it's essential that they pay equal attention to returns management, especially for products containing hazardous materials and waste.

With COVID-19 having already complicated the holiday shopping season, retailers need to be proactive in preparing for fully compliant disposition of hazardous-product returns. If not, they risk taking a serious hit to hard-won profits.

Anyone who thinks that states are too busy contending with the coronavirus to enforce compliance should think again. Even in the midst of the pandemic, environmental regulators and local governments are aggressively prosecuting retailers for improper handling, transportation and disposal of hazardous waste. And the ongoing civil enforcement is costing merchants millions of dollars in settlements and fines.

Perhaps not surprisingly, it's California that's been ringing up the settlement register as of late, collecting more than \$6.25 million in fees and fines from three leading retailers since September. In December, Ross Stores, Inc. was ordered by the Monterey County Superior Court to pay \$3.335 million as part of a settlement of a civil environmental prosecution.

According to the Alameda County District Attorney, more than 441 Ross and dd's Discount Stores throughout the state unlawfully handled and disposed of various hazardous wastes and materials, including electronic waste, cosmetics, batteries, mercury lamps, personal care products, aerosol spray cans and other toxic and ignitable materials.

In December, Ross Stores, Inc. was ordered by the Monterey County Superior Court to pay \$3.335 million as part of a settlement of a civil environmental prosecution.

...which would allow potentially millions of tonnes of PFAS-contaminated soil to be dumped at the Maddingley Brown Coal landfill in Bacchus Marsh.

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[Read More](#)

Supply Chain Brain, 21 January 2021

<https://www.supplychainbrain.com/blogs/1-think-tank/post/32404-three-must-haves-for-managing-hazardous-materials-returns>

Canada plastics pact launched

2021-02-01

Canada most recent country to launch a plastics pact within the Ellen MacArthur Foundation's global initiative; aims to by 2025 achieve 100% reusable, recyclable, or compostable plastic packaging, 50% effective recycle or compost rate, minimum 30% recycled content.

On January 27, 2021, the non-governmental organization *Ellen MacArthur Foundation* announced that Canada has joined the organization's Plastic Pact network. The new Canada Plastics Pact has so far received support from over 40 organizations including businesses, government institutions, and NGOs to achieve a set of targets by the year 2025. These include: (i) defining a list of plastic packaging to be designated as problematic or unnecessary and then implement measures to eliminate them, (ii) achieving 100% of plastic packaging to be designed as reusable, recyclable, or compostable, (iii) ensuring at least 50% of plastic packaging is effectively recycled or composted, and (iv) ensuring an average of at least 30% recycled content by weight across all plastic packaging.

Each plastic pact operates within its host country to bring together stakeholders "who through shared ambition, combined expertise and collaboration create regional and national solutions to plastic waste and pollution." The US recently launched a plastics pact within the network in August 2020 (FPF reported). Food brands and retailers within the plastic pacts are included in the *Food Packaging Forum's* brand and retailer initiatives database.

[Read More](#)

Food Packaging Forum, 1 February 2021

<https://www.foodpackagingforum.org/news/canada-plastics-pact-launched>

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Regulatory Update

FEB. 12, 2021

EPA announces approval of extensions to August 24, 2020, first-ever long-lasting antiviral product for use against COVID-19

2021-02-03

On January 19, 2021, the U.S. Environmental Protection Agency (EPA) **announced** the issuance of a Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Section 18 emergency exemption to the states of Oklahoma and Arkansas, permitting American Airlines to use SurfaceWise2, believed to inactivate coronaviruses like the SARS-CoV-2 virus on surfaces, in specific airport facilities and planes. EPA also has revised the terms of use for SurfaceWise2 for all current emergency exemptions.

EPA's initial emergency exemption for the state of Texas issued on August 24, 2020, specified that the product remained effective for seven days. According to its updated labels for all three states, EPA has now approved claims that SurfaceWise2 provides residual surface control of the coronavirus SARS-CoV-2 on surfaces that are undisturbed for up to 30 days. The **updated** labels state "When used in accordance with the directions for use, **SurfaceWise²** provides residual surface control of coronaviruses, including SARS-CoV-2, for up to 30-days on undisturbed (e.g., are not routinely disinfected with List N products) non-porous treated surfaces."

Of note, EPA also states in its announcement that SurfaceWise2 should be reapplied every time surfaces are disinfected to ensure continuous product performance as exposure to prolonged wetness may adversely impact the efficacy of the product. The updated labels state in the Directions for Use that the user must "Reapply **SurfaceWise²** after surfaces are disinfected to ensure continuous product performance" and "Do not expose **SurfaceWise²** to prolonged wetness as this may adversely impact the efficacy of the product."

FIFRA Section 18 authorizes EPA to exempt federal or state agencies from any provision of FIFRA in the event that emergency conditions require such an exemption. EPA regulations (40 C.F.R. Part 166) specify when state or federal government agencies will be permitted to use unregistered pesticides in response to an emergency. EPA's regulations provide that an emergency exists when:

There is an "urgent, non-routine" situation requiring the use of a pesticide to control a new pest not previously prevalent in the United States, to

EPA also has revised the terms of use for SurfaceWise2 for all current emergency exemptions.

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control significant risks to health, the environment, beneficial organisms, or endangered species, or to prevent specified types of economic loss; and

There is no registered pesticide or economically or environmentally feasible alternate method of control available.

[Read More](#)

Pesticide Blog, 3 February 2021

<http://pesticideblog.lawbc.com/entry/epa-announces-approval-of-extensions-to-august-24-2020-first-ever-long-last>

EUROPE

GB PIC: Annual reporting of exports and imports

2021-02-04

In the first quarter of each year, exporters and importers of PIC-listed chemicals must report to the DNA details of their exports and imports (together with the exact quantities) which took place during the previous calendar year. Note that this obligation applies to both exports from and imports into GB.

For mixtures and articles, the quantity should refer to the PIC chemical within the mixture/article and not to the mixture/article as a whole.

Quantities must be reported in kg.

Special RIN requests for exports in quantities below 10kg/year and per importing country for purpose of research and development are exempted and do not need to be reported.

The reports can be sent by email to the GB PIC DNA at ukdna@hse.gov.uk using the HSE templates.

[Template for annual reporting of exports of GB PIC chemicals \(.docx\)](#)

[Template for annual reporting of imports of GB PIC chemicals \(.docx\)](#)

The deadline is 31 March each year for reporting quantities from the previous year.

Aggregated, anonymised data will be published on HSE's website.

The deadline is 31 March each year for reporting quantities from the previous year.

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[Read More](#)

HSE, 4 February 2021

https://www.hse.gov.uk/pic/annual-reporting.htm?utm_source=govdelivery&utm_medium=email&utm_campaign=EU-Exit&utm_term=pic-1&utm_content=pic-4-feb-21

Ventilation and air conditioning during the coronavirus (COVID-19) pandemic

2021-02-05

The law requires employers to ensure an adequate supply of fresh air in the workplace and this has not changed during the pandemic.

Good ventilation, together with social distancing, keeping your workplace clean and frequent handwashing, can help reduce the risk of spreading coronavirus.

This guidance will help you identify poorly ventilated areas of your workplace and provides steps you can take to improve ventilation. It will apply in most workplaces.

[Why ventilation is important](#)

[Balancing ventilation with keeping people warm](#)

[Identifying poorly ventilated areas](#)

[How to improve ventilation](#)

[Natural ventilation](#)

[Mechanical ventilation \(including air conditioning\)](#)

[Fans and air cleaning units](#)

[Ventilation in vehicles](#)

Why ventilation is important

Good ventilation reduces the concentration of the virus in the air and therefore reduces the risks from airborne transmission. This happens when people breathe in small particles (aerosols) in the air after someone with the virus has occupied an enclosed area.

However, ventilation will have little or no impact on droplet or contact transmission routes.

Good ventilation, together with social distancing, keeping your workplace clean and frequent handwashing, can help reduce the risk of spreading coronavirus.

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You should consider ventilation alongside the relevant control measures required to reduce the risk of transmission as part of [making your workplace COVID-secure](#).

Balancing ventilation with keeping people warm

Providing adequate ventilation does not mean that workplaces have to be cold.

Good ventilation is a balance between making sure workplaces are warm but keeping a flow of air going through an area.

Simple steps, such as partially opening windows, can be taken to ensure ventilation is maintained. [Natural ventilation](#) can be used with heating systems to maintain a reasonable temperature in the workplace.

[Read More](#)

HSE, 5 February 2021

https://www.hse.gov.uk/coronavirus/equipment-and-machinery/air-conditioning-and-ventilation.htm?utm_source=govdelivery&utm_medium=email&utm_campaign=coronavirus&utm_term=ventilation-headline&utm_content=covid-4-feb-21

EU launches beating cancer plan

2021-02-04

On February 3, 2021, the *European Commission (EC)* presented its Beating Cancer Plan, which aims to enact a set of policy and research mechanisms over the coming years to improve Europe's efforts to prevent and treat cancer. The Commission further published a fact sheet as well as set of questions and answers about the plan and the government's aims in implementing it. The plan specifically includes a section dedicated to reducing exposure to hazardous substances and references the *EC's Chemicals Strategy for Sustainability* (FPF reported), which "will make it possible to deal with hazardous chemicals more rapidly, and effectively reduce the exposure of consumers and professionals to carcinogenic substances, or to other hazardous chemicals that interfere with the endocrine and immune systems."

The civil society organization *Health and Environment Alliance (HEAL)* recently published a set of demands for the new plan. It urges the *EC* to "fight cancer with the most vulnerable in mind" and to "prevent cancer from farm to fork," including that the EU "revises outdated EU legislation

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on food contact materials." It calls for the EU to uphold its current "zero pollution ambition in every part of the environment" and to work on raising public awareness about carcinogens in our daily lives.

[Read More](#)

Food Packaging Forum, 2 February 2021

<https://www.foodpackagingforum.org/news/eu-launches-beating-cancer-plan>

INTERNATIONAL

PAC launches PIP 360° benchmarking tool

2021-02-04

PAC Packaging Consortium free online tool scores product packaging based on factors including material type, weight, reuse/recyclability, renewable/recycled content; provides single score with recommendations for improvement

The industry association *PAC Packaging Consortium* has released a new online packaging benchmarking tool that "measures package circularity and identifies innovation pathways to better circular package designs and recycling processes." The freely available tool allows users to input information about products and components that make up the packaging. This includes information about the type of material, weight, reusability, recyclability, compostability, and renewable/recycled content of the packaging components. The results are provided as a single score on a scale from 0 to 360 points, and recommendations of how to improve the score are provided. An option is available for a third party to certify the results. Two webinars have been scheduled for February 10 and March 3, 2021 for interested stakeholders to learn more about its use.

[Read More](#)

Food Packaging Forum, 4 February 2021

<https://www.foodpackagingforum.org/news/pac-launches-pip-360-benchmarking-tool>

The freely available tool allows users to input information about products and components that make up the packaging.

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Kenya revises draft EPR regulation

2021-02-02

Ministry of Environment and Forestry releases new draft on extended producer responsibility (EPR) regulations; would require mechanism to control banned or dangerous substances in products; applies to range of products including plastics, rubber, aluminum, glass, paper and carton

On January 28, 2021, news provider *Chemical Watch* reported on a revised draft released by Kenya's *Ministry of Environment and Forestry* regarding regulations on extended producer responsibility (EPR) within the country. According to the regulation, companies that manufacture, import or sell a wide range of consumer products would be required to implement "a mechanism of controlling banned or dangerous substances in products." This would include plastic and rubber as well as aluminum, glass, paper, and carton products. The regulation would require companies to either independently or jointly create an EPR compliance scheme that also covers minimum targets for reuse, recycling or recovery, as well as logistics for collection and product design guidelines. Companies would need to register their EPR scheme with the appropriate authority in advance. The regulations are described to target "all products and packaging in all phases of their life cycle." An earlier version of the draft regulation was released for public comment in May 2020.

[Read More](#)

Food Packaging Forum, 2 February 2021

<https://www.foodpackagingforum.org/news/kenya-revises-draft-epr-regulation>

OECD will hold webinar on assessing the dispersion stability and dissolution of nanomaterials in the environment

2021-02-02

On February 25, 2021, the Organization for Economic Cooperation and Development (OECD) will hold a webinar on "Assessing the dispersion stability and dissolution (rate) of nanomaterials in the environment" to discuss the scope, content, and use of Test Guideline No. 318: Dispersion Stability of Nanomaterials in Simulated Environmental Media and its accompanying guidance document. According to OECD, "[t]he increased production and wide usage of manufactured nanomaterials suggest a higher probability of finding them in the environment. Therefore, testing

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the dissolution rate and dispersion stability for toxicity assessment are of paramount importance for adequate hazard assessment." Test Guideline No. 318 describes a test procedure to obtain information on dispersion stability of nanomaterials in simulated environmental media. The accompanying guidance document provides additional recommendations on dispersion stability measurements. OECD states that it is developing a Test Guideline to determine the solubility and dissolution rate of nanomaterials in the aqueous environmental media and that the webinar will include discussion of this Test Guideline.

[Read More](#)

Nano and Other Emerging Chemical Technologies Blog, 2 February 2021

<https://nanotech.lawbc.com/2021/02/oeed-will-hold-webinar-on-assessing-the-dispersion-stability-and-dissolution-of-nanomaterials-in-the-environment/>

According to OECD, "[t]he increased production and wide usage of manufactured nanomaterials suggest a higher probability of finding them in the environment.

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REACH Update

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Propelling satellites into the future

2021-02-04

Candidate 'green' satellite propellants within a temperature-controlled incubator, undergoing heating as a way to simulate the speeding up of time.

Today hydrazine is the most common propellant employed by thrusters aboard satellites: it is highly energetic in nature but also toxic and corrosive, as well as dangerous to handle and store. ESA initiated a study with European Astrotech Ltd in the UK to look into greener propellants and propulsion systems, to provide comparable performance with reduced toxicity and handling costs.

The testing investigated the compatibility between a variety of current and future materials and weld combinations with two propellant candidates in detail while checking others as well. By using materials already present in propulsion systems, the aim is to help to reduce any necessary modifications needed, shrinking costs and development times.

An eight-month test cycle became the equivalent of 5.33 years on-orbit by elevating temperature, hunting out for any degradation in the welds, materials and propellants - such as broken welds, material mass loss or etching.

Two green propellants called LMP-103S - flight-tested on Sweden's Prisma formation flying mission - and HTP - high-test peroxide, previously used in past UK rockets - were shown to have compatibility with up to ten welded materials (while HTP was incompatible with titanium).

The project was supported through ESA's Technology Development Element, investigating promising innovations for space.

It comes in response to the European Commission's Registration, Evaluation, Authorisation and Restriction of Chemical Substances (REACH) regulation, that seeks to limit industry's use of chemical substances that may be hazardous to human health or the environment.

[Read more](#)

Space Daily, 4 February 2021

https://www.spacedaily.com/reports/Propelling_satellites_into_the_future_999.html

Today hydrazine is the most common propellant employed by thrusters aboard satellites: it is highly energetic in nature but also toxic and corrosive, as well as dangerous to handle and store.

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REACH Update

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Towards sustainable outdoor shooting and fishing— ECHA proposes restrictions on lead use

2021-02-03

The European Chemicals Agency brings forward a proposal for further EU-wide restrictions on the use of lead in ammunition for hunting and outdoor sports shooting as well as in fishing. The proposal aims to address the risks of lead in these activities to protect people, wildlife and the environment.

Helsinki, 3 February 2021 – At the request of the European Commission, ECHA has assessed the health and environmental risks posed by the use of lead projectiles for hunting and outdoor sports shooting as well as lead used in fishing sinkers and lures.

The Agency concluded that an EU-wide restriction would be justified. ECHA estimates that at least 127 million birds are at risk of lead poisoning each year. In addition, citizens are exposed to lead, for example, through game hunted with lead ammunition or when making lead ammunition, fishing sinkers or lures at home. Exposure to lead is especially harmful to children's neurological development. About one million children are vulnerable to the toxic effects of lead due to game meat consumption.

The proposal assesses various risk management options and identifies a preferred option to address the risks. It describes the impacts of these measures on human health and the environment as well as the overall costs to society. In simple terms, ECHA's proposal is the following:

1. Lead sold and used in hunting, sports shooting and other outdoor shooting:

ban on the sale and use of lead gunshot (with a five-year transition period). As current Olympic rules specify the use of lead ammunition for certain disciplines, ECHA also considered an optional derogation for use of lead gunshot for sports shooting only under strict conditions, i.e. when releases to the environment are minimised.

ban on the use of lead in bullets and other projectiles (small calibre: five-year; large calibre: 18-month transition periods). Derogations for continued use if releases to the environment are minimised, i.e. when sports shooting ranges are equipped with bullet traps.

2. Lead sold and used in fishing:

ECHA estimates that at least 127 million birds are at risk of lead poisoning each year.

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ban on the sale and use of lead sinkers and lures (with transition periods depending on weight: ≤ 50 g three years; > 50 g five years)

immediate ban on the use of lead sinkers when the sinker is deliberately dropped to water (lead drop off techniques).

Military uses of lead ammunition, along with other non-civilian uses of lead ammunition such as by police, security and customs forces, are outside of the scope of the investigation. Indoor uses of lead ammunition are also excluded.

If adopted, the restriction would reduce lead emissions to the environment by approximately 1.7 million tonnes over 20 years. Additionally, the proposed restriction would protect the children of households that very frequently eat game meat. For example, it is assumed that phasing out the use of lead in large-calibre bullets and gunshot could avoid IQ loss in up to 7 000 children a year. The total costs of the restriction to society range from €260 million to €10.5 billion over 20 years depending on the sector affected and the type of restriction imposed.

The proposal is based on the information that was available to ECHA at the time of the preparation and can be updated if information justifying changes comes to light. All stakeholders have the possibility to provide their arguments backed by robust evidence during a six-month consultation, which is scheduled to start on 24 March. ECHA is planning to organise an online info session to explain the restriction process and help stakeholders take part in the consultation.

Next steps

ECHA's scientific Committees for Risk Assessment and Socio-Economic Analysis will evaluate the strengths and weaknesses of ECHA's proposal. In their evaluation, they will take into account the scientific evidence received during the consultations. The opinions of the two committees are expected by mid-2022.

The European Commission together with the 27 EU Member states will take the decision on the restriction and its conditions – based on ECHA's proposal and the committees' opinion.

Background

ECHA's proposal to further restrict the use of lead follows an earlier one covering *lead in gunshot for hunting and sports shooting in or around wetlands*. The European Commission adopted this restriction under the

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regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) on 25 January 2021. It will apply in all EU countries from 15 February 2023.

Read More

ECHA, 3 February 2021

<https://echa.europa.eu/-/towards-sustainable-outdoor-shooting-and-fishing-echa-proposes-restrictions-on-lead-use>

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Janet's Corner

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<https://www.benitaepstein.com/science%20cartoons/files/page22-1023-full.jpg>

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Hazard Alert

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n-Hexane

2021-02-12

Hexane is an alkane of six carbon atoms, with the chemical formula C_6H_{14} . There are 5 hexane isomers; n-hexane is the unbranched isomer. [1] n-Hexane is a chemical made from crude oil. Pure n-hexane is a colourless liquid with a slightly disagreeable odour. It evaporates very easily into the air and dissolves only slightly in water. n-Hexane is highly flammable, and its vapours can be explosive. [2]

USES [3]

Hexane is used in laboratories, primarily when it is mixed with similar chemicals to produce solvents. Common names for these solvents are commercial hexane, mixed hexanes, petroleum ether, and petroleum naphtha. The major use for solvents containing n-hexane is to extract vegetable oils from crops such as soybeans, flax, peanuts, and safflower seed. They are also used as cleaning agents in the textile, furniture, shoemaking, and printing industries, particularly rotogravure printing. N-hexane is also an ingredient of special glues that are used in the roofing, shoe, and leather industries. n-Hexane is used in binding books, working leather, shaping pills and tablets, canning, manufacturing tires, and making baseballs.

SOURCES OF EMISSION & ROUTES OF EXPOSURE

Sources of Emission [3]

- Industry sources: Releases from industries producing, using or handling hexane. For example, rubber and plastics products industries, oil refineries, chemical plants, footwear manufacturing, petrol, and paints and adhesives.
- Diffuse sources: Releases from service stations; evaporation of fuels during petrol refilling; underground storage tanks that leak. Releases during use of adhesives, paints, and paint thinners.
- Natural sources: Hexane is a natural constituent of crude petroleum. It also occurs naturally as a plant volatile and can be released from volcanoes. Furthermore, n-hexane occurs naturally in, forest fires, and some plants.
- Transport sources: Vehicle exhaust. Evaporation of vehicle fuels from motors and vehicle fuel tanks.

Hexane is an alkane of six carbon atoms, with the chemical formula C_6H_{14} .

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Hazard Alert

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- Consumer products: Consumer products that contain small amounts of n-hexane include petrol, rubber cement, type-over correction fluids, non-mercury (low temperature) thermometers, alcohol preparations, and aerosols in perfumes. n-Hexane is also a component of preparations such as paint thinners, general-purpose solvents, degreasing agents, and cleaners.

Routes of Exposure [3,4]

n-Hexane evaporates very quickly and so the most common exposure is from breathing air-containing hexane. It can also enter via the skin. The most probable route of human exposure to hexane is by inhalation. Since it is in gasoline, nearly everyone is exposed to very small amounts of n-hexane in the air. Exposure can occur at home if you use products containing n-hexane without proper ventilation. Individuals are most likely to be exposed to hexane in the workplace. Monitoring data indicate that hexane is a widely occurring atmospheric pollutant.

HEALTH EFFECTS

Acute Effects

- Acute inhalation exposure of humans to high levels of hexane causes mild CNS depression. CNS effects include dizziness, giddiness, slight nausea, and headache in humans.
- Acute exposure to hexane vapours may cause dermatitis and irritation of the eyes and throat in humans.
- Acute animal tests in rats have demonstrated hexane to have low acute toxicity from inhalation and ingestion exposure.

Chronic Effects

- Chronic inhalation exposure to hexane is associated with sensorimotor polyneuropathy in humans, with numbness in the extremities, muscular weakness, blurred vision, headache, and fatigue observed.
- Rats, chronically exposed by inhalation, have exhibited neurotoxic effects.
- Mild inflammatory, erosive, and degenerative lesions in the olfactory and respiratory epithelium of the nasal cavity have been observed in mice chronically exposed by inhalation. Pulmonary lesions have also been observed in chronically exposed rabbits.

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- The Reference Concentration (RfC) for hexane is 0.2 milligrams per cubic metre (mg/m³) based on neurotoxicity in humans and epithelial lesions in the nasal cavity in mice.
- EPA has not established a Reference Dose (RfD) for hexane.
- EPA has calculated a provisional RfD of 0.06 milligrams per kilogram body weight per day (mg/kg/d) based on neurological and reproductive effects in rats.

Reproductive/Developmental Effects

- No information is available on the reproductive or developmental effects of hexane in humans.
- Testicular damage has been observed in male rats exposed to hexane via inhalation.
- Teratogenic effects were not observed in the offspring of rats chronically exposed via inhalation in several studies.

Carcinogenicity

- No information is available on the carcinogenic effects of hexane in humans or animals.
- EPA has classified hexane as a Group D, not classifiable as to human carcinogenicity, based on a lack of data concerning carcinogenicity in humans and animals. (3,5)

SAFETY [6]

First Aid Measures

- Eye Contact: Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Get medical attention if irritation occurs.
- Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.
- Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.
- Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.
- 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

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breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

- Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Fire and Explosion Information

- n-Hexane is flammable.
- Auto-ignition temperature is 225°C (437°F)
- Flash Points: CLOSED CUP: -22.5°C (-8.5°F).
- Carbon monoxide (CO) and carbon dioxide (CO₂) are produced upon combustion.
- Highly flammable in presence of open flames and sparks, of heat.
- Non-flammable in presence of shocks.
- n-hexane is a flammable liquid that is insoluble in water.
- Dry chemical powder should be used to extinguish small fires
- Water spray or fog should be used to extinguish large fires.
- Special Remarks on Fire Hazards: Extremely flammable liquid and vapour. Vapour may cause flash fire.

Exposure Controls & Personal Protection

Engineering Controls

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

Personal Protective Equipment

The following personal protective equipment is recommended when handling n-hexane:

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

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Personal Protection in Case of a Large Spill:

- Splash goggles;
- Full suit;
- Vapour respirator;
- Boots;
- Gloves;
- A self-contained breathing apparatus should be used to avoid inhalation of the product.
- Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

REGULATION

United States [4,7]

NIOSH: The National Institute of Occupational Safety and Health has established a Recommended Exposure Limit (REL) of no more than 50 parts per million (ppm) in workplace air or 180 mg/m³.

OSHA: The Occupational Health and Safety Administration has set a Permissible Exposure Limit of 500 ppm for n-hexane in workplace air or 1800 mg/m³.

EPA: The Environmental Protection Agency requires that spills or accidental releases of 5,000 pounds or more of n-hexane be reported to the EPA.

Australia [3]

Safe Work Australia has set a maximum 8-hour time weighted average (TWA) exposure for n-hexane of 176 mg/m³.

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The legal and illegal ways people are turning to psychedelics as the drug regulator rejects reclassification bid

2021-02-04

In Melbourne's St Vincent's Hospital, down the hall from the cancer day unit, there's an unassuming room known simply as "The Retreat".

This is where a select few volunteers are offered a unique opportunity: to confront their deepest fears under a heavy dose of a psychedelic.

Terminally ill patients spend three to four hours here under the influence of psilocybin, the psychedelic compound found in "magic mushrooms".

The participants are supported by therapy before, during and after their psychedelic experience.

"We go to a lot of trouble to make sure that it doesn't look like a hospital room, but it looks more like a really chilled, really comfortable and inviting atmosphere," clinical psychologist Marg Ross said as she walked around the room.

The experience offers patients a rare chance to process the unavoidable reality of their imminent death, and to learn how to say goodbye to everyone they know.

"When you use terms like anxiety and depression, I think it kind of simplifies it a bit," psychiatrist Justin Dwyer said.

"Actually what people are dealing with is terror, which is very difficult to put into words — this sense that you will no longer be.

"The standard treatment, things like anti-depressants, anti-anxiety drugs, really have very little to offer."

It's a novel approach to palliative care, and for the time being, it won't be available in Australia outside these four walls.

Drug proposal rejected

Australia's drug regulator, the Therapeutic Goods Administration (TGA), yesterday rejected an application seeking to have two currently prohibited drugs rescheduled as controlled medicines in Australia.

Psilocybin — the drug used in the St Vincent's trial — was one of them.

Terminally ill patients spend three to four hours here under the influence of psilocybin, the psychedelic compound found in "magic mushrooms".

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The proposal sought to make it easier for doctors to prescribe the psychedelic as well as MDMA, also known as ecstasy, to people suffering from chronic anxiety, depression and PTSD.

The TGA's interim decision to reject the change follows an application made last July by the psychedelics advocacy group Mind Medicine Australia (MMA), run by soprano singer Tania De Jong and chaired by her investment banker husband, Peter Hunt.

MMA points to clinical trials completed overseas, where psilocybin was found to be effective in treating anxiety and depression in terminally ill cancer patients.

Last November, Johns Hopkins University in the US found psilocybin to be four times more effective than medicines traditionally prescribed to treat major depression.

But these trials have not yet advanced to Stage 3, which tests safety and efficacy on large populations.

Ms De Jong and Mr Hunt expressed disappointment yesterday at the TGA's desire to wait until current clinical research is complete before the rescheduling of these controversial drugs is considered.

"That could be years away," Mr Hunt said.

"How many people are going to suffer between now and then? And frankly, how many people are going to die from suicide because they can't actually get the treatments they need to get?"

"It is frankly nonsense to make these people who are suffering wait any longer."

The TGA cited advice from the Royal Australian and New Zealand College of Psychiatrists, which argued that while there are indications emerging that psilocybin can offer therapeutic benefits, the evidence "just isn't quite there yet".

Patient's 'sense of peace' brings researcher to tears

The trial at St Vincent's in Melbourne was established as a landmark opportunity to expand upon overseas studies by examining psilocybin's effectiveness as a therapeutic tool for not just cancer patients, but people with other terminal illnesses too.

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But the project was thrown an unexpected curveball in the form of a global pandemic.

“We’d only really just commenced before COVID hit and we’ve been on hold for several months, but we’ve just started recruiting again,” Dr Ross said.

She quickly pointed out how the richness of the patient experiences had already affected all involved.

“One of our qualitative researchers conducted an interview for one of our participants post-dose and emerged from the interview room and just burst into tears because of the profundity of what she’d heard in this interview.”

“To see and witness such profundity in that room, a sense of peace that can be achieved for people who are really struggling with and quite anguished by their death is something that I’m hoping that we can continue to offer beyond this study.

“Hopefully we can contribute to the body of research that will support that.

“If it continues to track the way that it has been, we can provide that experience for more people going forward who are facing death.”

Researchers hope that Australia could be joining a “psychedelic renaissance”, a revival of clinical studies into psychedelic therapy that’s underway in the United States and the United Kingdom after decades of indifference by the world’s major research institutions .

As well as the St Vincent’s trial, at least three other psilocybin trials are in the pipeline in Australia, while two more are investigating MDMA’s potential for treating PTSD.

“To paraphrase Malcolm Turnbull, there’s never been a more exciting time to be a psychedelic researcher in Australia,” quipped Dr Martin Williams, one of the lead investigators of the St Vincent’s project.

Underground psychedelic use

In the absence of regulated psychedelic treatment, there are Australians with significant mental health challenges who are turning to underground psychedelic ceremonies.

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Background Briefing attended a private event at a farmhouse near the New South Wales–Queensland border where a local variation of the traditional South American brew ayahuasca was imbibed.

The active ingredient in ayahuasca is DMT, a powerful psychedelic that can produce immersive hallucinations, and according to its devotees, even spiritual revelations.

The host of the farmhouse ceremony was Julian, a psychedelic enthusiast who’s been brewing DMT concoctions for two decades using Australian natives.

Several species of Australian acacia trees — more commonly known as wattles — can be a particularly rich source of DMT; the tea made from them is sometimes called “Aussie-huasca”.

Julian said that the worst that’s happened during a ceremony was when one participant ended up knocking out his front teeth.

“I find people [are] generally very well behaved,” he said.

“It’s ultimately about the medicine, what it does. I try and remain faithful to that and really step out of the way and let the medicine do its work.”

Like psilocybin, DMT is classed as a Schedule 9 drug by the TGA, meaning it’s illegal to possess for recreational use in all states and territories.

Julian shrugged off the suggestion he was engaging in criminal behaviour.

“I don’t know if that’s the right question. The right question we should have is, is it beneficial? Is it helpful to people? Is it useful? Is it doing good for society?”

One attendee aged in his 30s, Jimmy*, said he was returning for his fourth ayahuasca ceremony because he believed it helped him process his childhood trauma resulting from domestic violence.

“I looked at my life, pretty much everything was just in ruins, and I just had to have the challenge of digging myself out of that,” Jimmy said.

Without expert psychological support available, Jimmy had been using the ayahuasca experience to explore his own issues with expressing his feelings.

“One of my biggest struggles was my voice,” he said.

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"Every time I tried to express myself, or voice an opinion, my stepfather would just come down like the ton of bricks. So I traded my voice and self-expression for safety."

Jimmy credits ayahuasca with helping him turn his life around.

"Oh, absolutely. Because there are people in advanced ages that have lived their whole life through suffering. And this was like an intervention.

"So I've been through that trench of pain and misery and depression and anxiety and suffering. And now I'm just going up.

"I see things are getting much better. I've done ayahuasca, but it was like inner work [through] this inner foundation I've had to set."

Experts caution that unlawful users keen to experiment can face a host of risks, and not just potential legal troubles.

Psychedelic brews like ayahuasca can have potentially fatal interactions with prescription medication or cause frightening or anxiety-inducing hallucinations, and for a small percentage, a trip can spark a psychotic episode.

"We know that psychedelic substances can present a risk for people who have got a predisposition to a psychosis or a bipolar spectrum disorder," Dr Ross said.

Dr Dwyer added: "Is it something that I would recommend that people go out and just do? No, it's not.

"Aside from the fact that it's illegal, I think too that the psychological work that goes on around it is really very, very important."

*This name has been changed to provide anonymity

abc.net.au, 4 February 2021

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

Chemists create and capture einsteinium, the elusive 99th element

2021-02-04

Scientists have successfully studied einsteinium — one of the most elusive and heaviest elements on the periodic table — for the first time in decades. The achievement brings chemists closer to discovering the

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so-called "island of stability," where some of the heaviest and shortest-lived elements are thought to reside.

The U.S. Department of Energy first discovered einsteinium in 1952 in the fall-out of the first hydrogen bomb test. The element does not occur naturally on Earth and can only be produced in microscopic quantities using specialized nuclear reactors. It is also hard to separate from other elements, is highly radioactive and rapidly decays, making it extremely difficult to study.

Researchers from the Lawrence Berkeley National Laboratory (Berkeley Lab) at the University of California, recently created a 233-nanogram sample of pure einsteinium and carried out the first experiments on the element since the 1970s. In doing so they were able to uncover some of the element's fundamental chemical properties for the first time.

Very hard to study

Physicists know almost nothing about einsteinium.

"It is hard to make just because of where it is in the periodic table," co-author Korey Carter, an assistant professor at the University of Iowa and former scientist at Berkeley Lab, told Live Science.

Like other elements in the actinide series — a group of 15 metallic elements found at the bottom of the periodic table — einsteinium is made by bombarding a target element, in this case curium, with neutrons and protons to create heavier elements. The team used a specialized nuclear reactor at the Oak Ridge National Laboratory in Tennessee, one of the few places in the world where einsteinium can be made.

However, the reaction is designed to make californium — a commercially important element used in nuclear power plants — and so it makes only a very small amount of einsteinium as a byproduct. Extracting a pure sample of einsteinium from californium is challenging because of similarities between the two elements, which meant the researchers ended up with only a tiny sample of einsteinium-254, one of the most stable isotopes, or versions, of the elusive element.

"It is a very small amount of material," Carter said. "You can't see it, and the only way you can tell it is there is from its radioactive signal."PLAY SOUND

However, getting the einsteinium is only half the battle. The next problem is finding a place to keep it.

It is also hard to separate from other elements, is highly radioactive and rapidly decays, making it extremely difficult to study.

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Einsteinium-254 has a half-life of 276 days — the time for half of the material to decay — and breaks down into berkelium-250, which emits highly damaging gamma radiation. Researchers at Los Alamos National Laboratory in New Mexico designed a special 3D-printed sample holder to contain the einsteinium and protect the Berkeley Lab scientists from this radiation.

However, the element's decay also created other problems for the researchers.

"It's decaying consistently, so you lose 7.2% of your mass every month when studying it," Carter said. "You have to take this into account when you are planning your experiments."

The team at Berkeley Lab was used to dealing with other elements with short half-lives. Even so, the team began their work just before the outbreak of the COVID-19 pandemic, which meant that they lost valuable time and were unable to complete all the planned experiments.

Surprising results

The main finding from the study was the measurement of the einsteinium bond length — the average distance between two bonded atoms — a fundamental chemical property that helps scientists predict how it will interact with other elements. They found that einsteinium's bond length goes against the general trend of the actinides. This is something that had been theoretically predicted in the past, but has never been experimentally proved before.

Compared with the rest of the actinide series, einsteinium also luminesces very differently when exposed to light, which Carter describes as "an unprecedented physical phenomenon." Further experiments are needed to determine why.

The new study "lays the groundwork for being able to do chemistry on really small quantities," Carter said. "Our methods will allow others to push boundaries studying other elements in the same way."

The team's research could also make it easier to create einsteinium in the future. In that case, einsteinium could potentially be used as a target element for the creation of even heavier elements, including undiscovered ones like the hypothetical element 119, also called ununennium. One of the ultimate goals for some chemists would be to then discover hypothetical superheavy elements that have half-lives of minutes or even

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days — meaning they "live" on this island of stability — compared with the microseconds at most for the half-lives of other heavy elements.

The study was published online Feb. 3 in the journal Nature.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 4 February 2021

<https://www.livescience.com>

Traffic noise impairs songbirds' abilities

2021-02-04

A test of songbirds' problem-solving skills has revealed how traffic noise impairs the animals' abilities.

Scientists set zebra finches a "battery of foraging tasks" in the presence or absence of the noise.

They found that the sound of passing cars diminished the birds' ability to find food.

The results, published in the journal Proceedings B, suggest that noise pollution has "previously unconsidered consequences for wildlife".

Prof Christopher Templeton from Pacific University in Oregon, US, led the study, which he carried out in a behavioural lab with zebra finches. The researchers set the birds the tasks both in a quiet setting and while a recording of road traffic was played.

"Just hearing a car drive by is enough to really affect their performance," explained Prof Templeton.

The tasks were designed to mimic problem-solving and foraging (finding and gathering food) in the wild. One involved retrieving food from beneath leaf-like "lids" that the birds had to flip over to reveal the reward.

In another test, the birds had to work out the way into a cylinder that had a piece of food inside.

"They're almost twice as likely to do [the foraging tasks] correctly if they don't hear traffic noise," explained Prof Templeton.

"I think these results are going to be pretty widely applicable to other species," he continued. "While the zebra finches might live in a lab, it's

"Just hearing a car drive by is enough to really affect their performance," explained Prof Templeton.

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anything but quiet. You can imagine a colony of a whole bunch of birds making sounds all the time - it's pretty noisy."

There is mounting evidence that human-made noise has a variety of negative effects on wildlife. One study found that birds have actually changed their songs during the relatively quiet period of lockdown. And even in the deep ocean, the noise of sonar, seismic surveys and shipping can disrupt animal communication.

In another study published this week, researchers demonstrated the impact of traffic noise on crickets; the sound of road vehicles impairs the insects' ability to differentiate between potential mates based on their courtship songs.

media captionThe BBC's Victoria Gill looks at the wildlife species enjoying lockdown

Dr Adam Bent, a zoologist from the University of Cambridge, told BBC News: "This is causing a massive disruption to mate choice systems that have been in place for hundreds of thousands of years.

"That affects how a species will evolve, develop and adapt over time.

Dr Sophie Mowles from Anglia Ruskin University, in Cambridgeshire, added that humans were "continually changing the characteristics of environments, including through the production of anthropogenic noise". And protecting natural environments from that noise, say scientists, will be a challenge.

"It's quite sad," said Prof Templeton. "It's getting really, really difficult to find totally quiet environments not touched by human noise.

"But we can change road surfaces, think about redesigning a vehicle's tyres. I think there's great scope for trying to reduce noise - we just have to be clever with our engineering."

bbc.com, 4 February 2021

<https://www.bbc.com>

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New government report finds "toxic heavy metals" like arsenic and mercury in popular baby foods

2021-02-05

Baby food from several of the country's largest manufacturers are "tainted" with toxic heavy metals, according to a disturbing new government report.

The report, released Thursday morning, says those baby foods have "significant levels" of substances including lead, arsenic, cadmium and mercury. The metals can be especially dangerous to babies' and toddlers' brain development.

Parents often say they are looking for the healthiest, safest food for their babies. But as Connecticut mom Carrie Kerner found out, it's difficult to look for something you may not even be aware of.

"I just looked for the ingredients," Kerner told CBS News consumer investigative correspondent Anna Werner. "If there was any added preservatives, sweeteners or added sugars, I wouldn't buy it, so I basically just wanted to get organic."

Kerner had her first child, Chloe, a year ago. Ever since, she said she has been paying close attention to what is in Chloe's food.

But one thing Kerner and her husband Bryan, who is a doctor, never worried about was whether the baby food contained toxic metals.

She said the revelation was "very concerning as a new mom."

"That's the least thing a mother wants to think about. You're already worrying about her choking — about what goes into these foods," Kerner said.

Yet a new congressional subcommittee investigation found major concerns over the presence of metals in baby food. The report says "baby foods are tainted with dangerous levels" of "toxic heavy metals, including arsenic, lead, cadmium and mercury."

Researchers say that developing brains of babies and young children are "uniquely vulnerable" to toxic chemicals, which can cause "permanent brain injury." Troubling risks include lowering IQ, problems in school and even criminal behavior later in life.

Illinois Democratic Rep. Raja Krishnamoorthi told CBS News that getting heavy metals out of food sold for infants is critical.

The report says "baby foods are tainted with dangerous levels" of "toxic heavy metals, including arsenic, lead, cadmium and mercury."

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"I don't know a mom or dad that wants neurotoxins in their babies' foods," he said.

Investigators asked seven U.S. baby food manufacturers to provide internal documents and test results.

Of the four that did, all showed the presence of lead, arsenic and cadmium in their own test results — at levels the report says "eclipse" maximum levels set for other products.

Compared to the levels allowed by the FDA in bottled water, the report claimed, the results were "up to 91 times the arsenic level," "up to 69 times the cadmium level," and "up to 177 times the lead level."

CBS News asked those companies for comment, and all who responded said they are committed to safety.

All the companies that responded also said they either comply with government standards, have developed their own internal quality and testing standards, or both. Several said they are part of the Baby Food Council, a group formed with the goal of voluntarily reducing heavy metals in baby foods.

The problem is not new, however — Consumer Reports did its own testing of 50 nationally-distributed baby foods in 2018, finding "every product had measurable levels of at least one" of three heavy metals, and 68% "had worrisome levels of at least one heavy metal."

Consumer Reports' James Dickerson says there's not too much cause for alarm, since these heavy metals are naturally occurring.

"That's the real big issue. You want to minimize the risk, you can't eliminate it entirely, but you can minimize it. And there are steps that we can take," Dickerson said.

He tells parents to limit rice and sweet potato products, which tend to absorb more pollutants because of the way they are grown. Dickerson also recommends avoiding snacks like crackers and puffs, which in Consumer Reports' investigation had higher levels of heavy metals, and vary their child's diet.

Congressman Krishnamoorthi believes that voluntary entry efforts are not enough. He plans to introduce legislation to step up FDA oversight.

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"So now we need the FDA to step into the breach and do what I think the American people believe it is, is its job to do," he said. "Which is to make sure that the food that their babies consume is safe."

For worried parents wondering if they should throw out their baby food — experts say no, there is no need to panic if the products are in the pantry, and that the key is moderation.

When asked for a response, the FDA said it has been working on reducing exposure to toxic elements in foods, but acknowledges there is more work to be done.

According to Healthy Babies Bright Futures, a group dedicated to "measurably reduce the largest sources of babies' exposures to toxic chemicals," nearly nine out of ten baby foods tested had no enforceable federal safety limit for these heavy metals.

The FDA has been made aware of the report released today by the Subcommittee in Economic and Consumer Policy Committee on Oversight and Reform at the U.S House of Representatives and is reviewing its findings.

[cbsnews.com](https://www.cbsnews.com), 5 February 2021

<https://www.cbsnews.com>

Rolls-Royce tests 100% sustainable aviation fuel in small jet engine

2021-02-05

As part of its goal to reach net zero carbon dioxide emissions by 2050, Rolls-Royce has begun testing the viability of using 100-percent Sustainable Aviation Fuel (SAF) in small commercial business jets. The ground tests used the new Pearl 700 business jet engine in Dahlewitz, Germany, where the Rolls-Royce BR700 family of turbofan engines is manufactured, and follows on previous tests in the larger Trent 1000 engine in Derby, UK.

Sustainable Aviation Fuel is a name the aerospace industry prefers to biofuel because some biofuels are often relatively primitive or, like palm oil, cause too much environmental damage. Instead, SAFs are produced from a variety of sustainable sources, including municipal solid wastes; cellulose waste from the forestry industry; used cooking oil; energy crops, including comelina, jatropha, halophytes, and algae; and non-biological fuels like waste gases from steel works.

SAFs are attractive to the aerospace industry because they can address the problem of reducing carbon dioxide emissions immediately.

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SAFs are attractive to the aerospace industry because they can address the problem of reducing carbon dioxide emissions immediately. Such fuels can be “dropped in” by simply being added to conventional fuels without the need for extensive changes to existing infrastructure.

The Rolls-Royce tests used an SAF produced by World Energy in Paramount, California, for Shell Aviation. According to Rolls-Royce, the new fuel has the potential to reduce life-cycle carbon dioxide emissions by over 75 percent, and potentially even more with later refinements.

Currently, the civil air authorities only allow blends of up to 50 percent SAFs to be used with conventional kerosene-based jet fuels so the present tests are intended to show that a 100-percent SAF can be used in conventional jet engines as a drop-in option.

“Sustainable aviation fuels have the potential to significantly reduce the carbon emissions of our engines and combining this potential with the extraordinary performance of our Pearl engine family brings us another important step closer to enabling our customers to achieve net zero carbon emissions,” says Dr. Joerg Au, Chief Engineer – Business Aviation and Engineering Director Rolls-Royce Deutschland.”

[newatlas.com](https://www.newatlas.com), 5 February 2021

<https://www.newatlas.com>

Researchers develop biodegradable plastic using red seaweed

2021-01-28

The National Institute of Ocean Technology (NIOT) has developed a bioplastic film using red seaweed, *Kappaphycus alvarezii* and PEG-3000 which could have a huge impact on limiting the usage of non-biodegradable plastics and a game-changer in the plastic industry. Bioplastic films safely breakdown in the environment without leaving any toxicity. The physical and mechanical properties of bioplastic film meet the properties of conventional plastics.

Conventional Plastics Form Hazardous Chemicals

Conventional plastics are posing a grave threat due to their interaction with water resulting in the formation of hazardous chemicals that ultimately leach into the environment. Other bioplastics such as those made from plant materials like corn starch and sugarcane, though sold as

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eco-friendly and renewable, are found to be equivalent to seaweed-based bioplastic.

In their bid to find viable alternatives without hampering the land-based edible plants used for human consumption, researchers have now directed their research to find marine biomass as an alternative to producing biodegradable plastics more sustainably so that biomass used for feedstocks are not disturbed.

In a densely populated country like India, different hazardous plastics are used rampantly due to the need for packaging of different consumer and food products. Researchers from NIOT have successfully developed and tested bioplastic films by opting environment-friendly techniques utilizing seaweed. Utilization of renewable seaweed is one of those options they found viable.

Red Seaweed to Replace Conventional Plastics

Red algae *Kappaphycus alvarezii* is a seaweed proven to be an important commercial source of carrageenans and other products that have wide range of industrial applications. These algae are highly colloidal and are found to be cheap to grow within a short cultivation time (45 days) by just using sunlight without the need for freshwater or chemicals. They are also potential sources of polymers similar to the terrestrial plant-based polymers that are used to manufacture food packaging and carry bags which facilitate good oxygen and moisture permeability. As good oxygen and moisture permeability are two essential parameters for the packaging of fresh produce to extend their shelf life, NIOT researchers suggest that red seaweed could be our environmental savior when it comes to replacing harmful plastics.

NIOT researchers utilized a macro-algae *Kappaphycus alvarezii* (whole seaweed) which they cultivated in the Gulf of Mannar region for bioplastic film production with the plasticizer polyethylene glycol (PEG)-3000 to achieve higher tensile strength. PEG is a non-toxic and eco-friendly polymer, mainly used to increase the thermos-plasticity of the polymer used in the medicinal fields to make creams and dispersing agents that are used in medicinal products.

The result of the present NIOT study revealed that bioplastic polymers can biodegrade naturally in a short time without producing any toxic wastes. These can also be disposed of through ordinary food waste collection mechanism. The study suggests that commercial manufacturing of

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bioplastics from these seaweeds would be a game-changer in the coming time.

The study was led by Dr. Muthiyal Prabakaran Sudhakar, Mr. Dhassiah Magesh Peter and Dr. Gopal Dharani from Ocean Science and Technology for Islands, Marine Biotechnology, NIOT, Ministry of Earth Sciences, Government of India, Chennai. [~spolymer-additives.specialchem.com](https://www.polymer-additives.specialchem.com), 28 January 2021

<https://www.polymer-additives.specialchem.com>

Horse tranquilizer emerges as new and deadly street drug in US

2021-02-03

A horse tranquilizer is increasingly popping up as a street drug in the U.S., and it is now involved in nearly one-third of fatal opioid drug overdoses in Philadelphia, according to a new study.

The tranquilizer drug, called xylazine, is not considered an opioid, but it is often found mixed with the opioids heroin or fentanyl, a combination sometimes referred to as “tranq dope,” according to the study published Tuesday (Feb. 2) in the journal *Injury Prevention*.

The researchers found that detection of the drug during post-mortem exams has spiked sharply over the past decade among people who have died from opioid overdoses in Philadelphia.

The findings suggest that “the opioid epidemic throughout the USA continues to evolve,” the authors wrote. They say that overdose deaths involving xylazine may be underreported in the country because labs don’t always test for it. The authors call for increased monitoring of xylazine abuse in the U.S., as well as its health consequences.

Animal tranquilizer

Xylazine is a sedative used in veterinary medicine, particularly in horses. In the U.S., it is not approved for use in humans and is known to cause potentially dangerous side effects in people, including low blood pressure and a slowed heart rate.

Illicit drug users in Puerto Rico have been taking xylazine with opioids since the early 2000s, and more recently, it has appeared in the illegal drug supply in the continental U.S. Health departments in Maryland, Ohio and Michigan have all reported several cases of overdose deaths involving

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xylazine over the past two years. But overall, research on xylazine in the U.S. illegal drug supply is very limited.

In the new study, the researchers analyzed data on overdose deaths in Philadelphia from 2010 to 2019. Specifically, they examined unintentional deaths involving heroin or fentanyl, which are both types of opioids.

They found that, between 2010 and 2015, xylazine was detected in just 2% of these overdose deaths. But by 2019, that figure had jumped to 31%.

What’s more, data on illegal drug seizures from the U.S. Drug Enforcement Administration suggest that xylazine is increasingly appearing in “polydrug” samples, which contain heroin or fentanyl along with other drugs. Between 2010 and 2013, none of the polydrug samples that were tested in the agency’s labs contained xylazine, but by 2019, 25% contained the drug.

Studies on the health effects of xylazine combined with opioids are limited, but some research suggests that the mixture may increase the risk of opioid overdose death.

Still, the researchers note that their study could not determine which drug or combination of drugs was involved in the Philadelphia overdose deaths.

It’s also unclear exactly why xylazine is being added to the U.S. drug supply and whether the people who overdosed knowingly took the drug. Some focus groups in Philadelphia have found that people who use illegal drugs report that xylazine makes the effects of opioids last longer, the authors said.

The authors concluded that “further study is needed to understand the synergistic effects of fentanyl and xylazine use by humans and to better contextualize the reasons for its use in the USA.” And whenever possible, health jurisdictions should consistently test for the drug,

[livescience.com](https://www.livescience.com), 3 February 2021

<https://www.livescience.com>

Diabetes during pregnancy is tied to heart trouble later in life

2021-02-01

Diabetes brought on by pregnancy might set a woman up for heart trouble later on, even if her blood sugar levels snap back to normal. That

A smaller proportion of women who hadn’t had gestational diabetes — 149 of 994, or about 15 percent — went on to have CAC.

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finding, from a large, long-term study, suggests that doctors should pay careful attention to the hearts of people who previously had gestational diabetes.

The results, published online February 1 in *Circulation*, come from data collected by the CARDIA Study, a project designed to track heart health in young adults in the United States. Starting in 1985, CARDIA enrolled equal numbers of Black and white people, ages 18 to 30, from four cities. Following these people for 25 years, researchers looked for coronary artery calcification, or CAC, a hardening of blood vessels that can signal future heart disease.

More than a thousand participants gave birth during the study. Of these women, 139 had gestational diabetes, an often-temporary condition in which blood sugar levels spike. About a quarter of women who had this pregnancy complication — 34 women — went on to have CAC, even when post-pregnancy blood sugar levels normalized, researchers report. A smaller proportion of women who hadn't had gestational diabetes — 149 of 994, or about 15 percent — went on to have CAC.

The study doesn't indicate whether some aspect of gestational diabetes causes CAC, only that the two are linked. But it's possible that changes in blood vessels that can accompany gestational diabetes may play a role in heart health later, the researchers say.

Although the link between gestational diabetes and future CAC is disheartening, "the majority of women with gestational diabetes do not develop coronary artery calcification," says Khadijah Breathett, a cardiologist at the University of Arizona College of Medicine in Tucson who was not involved with the study. Still, the results highlight the importance of keeping blood sugar under control, she says.

sciencenews.org, 1 February 2021

<https://www.sciencenews.org>

Greenland is careening toward a critical tipping point for ice loss

2021-02-03

Frozen Greenland is on track to become significantly less frozen before the 21st century is over. By 2055, winter snowfall on the Greenland Ice Sheet will no longer be enough to replenish the ice that Greenland loses each summer, new research finds.

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Rising global temperatures are driving this dramatic change. If Earth continues to heat up at its present pace, average global temperatures should climb by nearly 5 degrees Fahrenheit (2.7 degrees Celsius) by 2055. Regional averages in Greenland become even hotter, rising by about 8 F (4.5 C), scientists reported in a new study.

Under those conditions, Greenland's annual ice loss could increase sea levels by up to 5 inches (13 centimeters) by 2100 — unless drastic steps are taken, starting now, to curb greenhouse gas emissions and slow global warming trends.

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Ice sheets are any thick masses of ice that cover more than 20,000 square miles (50,000 square kilometers) of land, and they grow their icy layers from snow that builds up over thousands of years, according to the National Snow and Ice Data Center (NSIDC). During the last ice age (around 115,000 to 11,700 years ago), ice sheets blanketed much of North America and Scandinavia. But today, only two ice sheets remain — in Greenland and in Antarctica — holding around 99% of Earth's freshwater reserves, NSIDC says.

Ice sheets aren't static — their own weight pushes them slowly toward the ocean, where they discharge ice and meltwater from ice shelves, streams and glaciers. An ice sheet can remain stable only so long as its lost ice is replenished seasonally by winter snowfall.

The Greenland Ice Sheet is roughly three times the size of Texas, measuring approximately 656,000 square miles (1.7 million square km), according to NSIDC. If all of Greenland's ice were to melt at once, sea levels would rise by about 20 feet (6 meters). While that catastrophic scenario is unlikely to happen anytime soon, Greenland has been steadily losing ice for decades, at a rate of about 500 gigatons per year since 1999, another study published in August 2020 found.

Those scientists said that Greenland was already losing more ice than it gained every winter. Their models factored in ice loss from iceberg calving, which can be substantial; a massive iceberg that separated and drifted alarmingly close to a Greenland village in 2018 was thought to weigh more than 12 million tons (11 million metric tons), Live Science previously reported.

However, the processes that drive icebergs to separate from the ice sheet are complex and unpredictable, said Brice Noël, lead author of the new

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study and a researcher with the Institute for Marine and Atmospheric research (IMAU) at Utrecht University in the Netherlands. For the new study, the researchers analyzed the Greenland Ice Sheet's surface to determine when melt would surpass snowfall, Noël told Live Science in an email.

"We explore the sensitivity of the Greenland Ice Sheet mass loss to atmospheric warming using a much higher resolution climate model — 1 km — compared to previous work (20 to 100 km)," Noël said. "Higher spatial resolution means that we can now better capture the high mass loss rates of small outlet glaciers;" this source of melt runoff was previously excluded from models, but contributes significantly to the total mass of ice lost, he explained.

"As a result, we can more accurately project the future evolution of the Greenland Ice Sheet mass loss and its contribution to sea-level rise," Noël said.

Stability of the ice sheet began to slip after the 1990s, as atmospheric warming boosted meltwater runoff during warm summer months, according to the study. Models showed that most of the runoff was produced at the margins of the ice sheet, in a narrow band called the ablation zone. As Earth warms, it melts the ablation zone's protective layer of tightly compressed snow. Once this layer is gone, the ice underneath — which is much less reflective than the bright snow — absorbs more sunlight, leading to more melt.

"The accelerating exposure of bare ice amplifies the runoff production, and thus the surface mass loss," Noël said.

In a scenario where humans don't lower greenhouse gas emissions and present warming continues, ice loss in Greenland will cross a new threshold — in which the ice sheet gets smaller each year — within just a few decades, according to the study. And that's a conservative estimate; that threshold could be crossed even earlier, depending on how much additional ice is lost annually from calving icebergs, the authors reported.

It could then take thousands of years for the ice sheet to melt completely, but saving Greenland's ice from disappearing would require halting or reversing global warming sooner rather than later — "during this century," Noël said.

The findings were published online Jan. 19 in the journal *Geophysical Research Letters*.

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Originally published on Live Science.

[livescience.com](https://www.livescience.com), 3 February 2021

<https://www.livescience.com>

The animals that ticks bite in the U.S. South can impact Lyme disease spread

2021-02-05

The paucity of Lyme disease cases in the southern United States may be partly due to what black-legged ticks in southern locales bite.

Although black-legged ticks (*Ixodes scapularis*) claim much of the eastern half of the country as their home, the Lyme disease they spread is largely concentrated in the Northeast and increasingly in the upper Midwest.

It's well known that ticks in the Northeast commonly latch on to white-footed mice. This relationship turns out to be a boon for Lyme disease. When infected with the bacteria *Borrelia burgdorferi*, which causes Lyme disease, these mice very efficiently spread it to the ticks, which can then pass it on to people.

But southern-residing ticks are different. They are more likely to bite lizards called skinks, which are poor transmitters of the bacteria, researchers report January 28 in *PLOS Biology*.

This study "shows that there's this really interesting switch" north to south in the predominant tick host, says disease ecologist Shannon LaDeau of the Cary Institute of Ecosystem Studies in Millbrook, N.Y., who was not part of the research team. "It looks like that is reducing the transmission" in the South of the bacteria that causes Lyme disease.

An estimated 476,000 people are diagnosed with Lyme disease each year in the United States, according to insurance data from 2010 to 2018. In about 70 to 80 percent of cases, a rash in the area of the tick bite is an early sign of the disease; other symptoms include fever, fatigue and achiness. Most people recover with early antibiotic treatment. If the diagnosis is missed, the infection can spread in the body and cause arthritis and nerve pain (SN: 6/22/19).

Scanning for and removing ticks after a hike is one part of Lyme disease control. Understanding the ticks' behavior and their relationship to the environment can inform other prevention methods.

This relationship turns out to be a boon for Lyme disease.

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Black-legged ticks need blood meals to progress through several developmental stages. The larvae that emerge from eggs are the first to seek out a host for blood; this is the point when they can first become infected with Lyme bacteria. The next blood meal is at the nymph stage. Nymphs infected as larvae can spread the bacteria to other hosts, including people.

There's been a long debate about the difference in Lyme disease cases between the North and the South, says research ecologist Howard Ginsberg at the Patuxent Coastal Field Station at the University of Rhode Island in Kingston. The ticks are in the South, so "why isn't there much Lyme disease?"

One possible reason is that nymphal ticks in the North seek hosts on top of or above leaf litter, which puts them in the path of passing hikers. But nymphal ticks in the South are more likely to stay under leaf litter, reducing the chance of such encounters, researchers reported in *Ticks and Tick-borne Diseases* in 2019. It may be that the ticks remain below the leaf litter in the hotter South to avoid drying out.

This host-seeking behavior and the results of the new study help to explain the North-South difference, Ginsberg says. In 2011 and 2012, he and his colleagues captured host animals in live traps and collected and tested ticks at eight sites in the eastern half of the United States. "We tried to catch everything that crawled on the ground that the tick might attach to," he says.

In the North, the most common hosts were mice, while in the South, the ticks selectively attached to skinks, Ginsberg says. At the Massachusetts site, for example, 75 percent of the larvae and 93 percent of the nymphs were removed from mice, which accounted for 79 percent of the captured host animals. The team caught no skinks.

But at the Florida site, although around 40 percent of the animals captured were mice, they had only 3 percent of the larvae and less than 1 percent of the nymphs. Meanwhile, skinks — which made up 28 percent of the host animals captured — had 92 percent of the larvae and 98 percent of the nymphs. The team also found that the ticks at the northern sites were much more likely to be infected with Lyme bacteria than ticks from southern sites.

Understanding the ecological context of Lyme disease can help identify targets to try to reduce human risk, LaDeau says. For example, the

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possibility of vaccinating mice against Lyme bacteria (SN: 8/9/17) may be more useful in the North.

The differences seen north to south also influence predictions of how climate change could impact Lyme disease. Black-legged ticks have moved farther north, bringing Lyme disease to Canada, in part due to warming. Perhaps the behaviors and biting patterns in the South will eventually expand to Maryland, Delaware and Virginia, reducing Lyme disease cases there, says Ginsberg. It will take more research to learn how climate change will affect skink populations and how warming might change tick behavior, he says.

[sciencenews.org](https://www.sciencenews.org), 5 February 2021

<https://www.sciencenews.org>

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In biblical times, purple was the new black

2021-01-29

In the ancient Middle East, purple was a symbol of prestige: To produce dye of this “royal” color, people had to collect and smash sea snails for their juices. Priests and royalty, including Kings David and Solomon, are often described in the Bible wearing clothing dyed with these extracts. Now, archeologists have excavated the oldest example of this purple dye ever found throughout the southern Levant, dated from 1000 B.C.E., The Times of Israel reports. The dyed wool fragments were found in an ancient copper mine at the Timna Valley in southern Israel, and go back to King David’s era, researchers report this week in PLOS ONE. Chemical analyses revealed the dye came from sea snails in the Mediterranean, more than 300 kilometers away from the site. The discovery opens a new window into the fashion trends and trade connections of the elite in the region during the early Iron Age.

sciencemag.org, 29 January 2021

<https://www.sciencemag.org>

How some drugs can turn into a cancer-causing chemical in the body

2021-02-05

When consumers get a prescription drug from the pharmacy, they assume that it’s been tested and is safe to use. But what if a drug changes in harmful ways as it sits on the shelf or in the body?

One dangerous result has been the creation of N-nitrosodimethylamine (NDMA), a probable carcinogen, in certain drugs. NDMA is found in chlorinated water, food and drugs in trace amounts. To minimize exposure, the Food and Drug Administration has set an acceptable level of NDMA in each pill at less than 96 nanograms.

But over the past few years the FDA has found excessive amounts of NDMA in several drugs for hypertension, diabetes and heartburn. As a result, the agency has initiated recalls to protect the public. These products were contaminated with NDMA during the manufacturing process. The FDA recommended best practices for manufacturers to minimize this risk going forward.

Unfortunately for the buying public, emerging evidence suggests that NDMA can also be created as some pills sit on the store shelf or medicine

Priests and royalty, including Kings David and Solomon, are often described in the Bible wearing clothing dyed with these extracts.

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cabinet, or even after the patient swallows it. Thus, there is no way to test for its presence in the factory.

I am a pharmacist and distinguished professor who has written extensively about manufacturing issues and FDA oversight associated with both drugs and dietary supplements in the past, including the issue of NDMA contamination. In a new article, I discuss how NDMA can end up in a patient’s medication if it wasn’t put there during its manufacture.

NDMA levels creep up after manufacture

Ranitidine (Zantac) was a commonly used heartburn and ulcer prescription and over-the-counter medication for decades before it was recalled by the FDA on April 1, 2020. It may now be the canary in the coal mine for the post-manufacturing creation of NDMA.

In one study, investigators found that ranitidine contained only 18 nanograms of NDMA after it was manufactured. However, when stored at 158°F for 12 days – as if the drug had been left in a hot car – NDMA dosages rose above 140 ng. This is only slightly above the 96 ng limit the FDA has deemed safe, but this was only 12 days later.

In another study, storing ranitidine where it was exposed to higher temperatures or high humidity enhanced the creation of NDMA over time. This suggests that some medications can leave the factory with a safe amount of NDMA but if kept for too long at home or on the store shelf can exceed known acceptable limits by the time patients use them.

In a new study in JAMA Network Open, investigators simulated the stomach environment and found that when ranitidine was exposed to an acidic environment with a nitrite source, these chemicals could create more than 10,000 ng of NDMA.

These results support a clinical study in which urine samples were collected from 10 adults both before and after using ranitidine. After people swallowed ranitidine, the urinary NDMA doses rose from about 100 ng to more than 40,000 ng over the next day.

Other drugs need closer investigation

In another study, investigators added chloramine, a disinfectant routinely added to sterilize drinking water, to water samples that contained one of several medications that are structurally similar to ranitidine. They found that several commonly used drugs, including antihistamines (doxylamine and chlorpheniramine), a migraine drug (sumatriptan), another heartburn

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drug (nizatidine) and a blood pressure drug (diltiazem) all generated NDMA.

It is unclear whether the amount of NDMA created by these drugs when stored in hot and humid environments or after a patient swallows them is dangerous, as with ranitidine. I believe that more studies need to be done right away to find out. It is always better to be safe than sorry, particularly when dealing with a possible carcinogen.

theconversation.com, 5 February 2021

<https://www.theconversation.com>

Is it ok to mix and match COVID-19 vaccines? Oxford researchers begin trial

2021-02-06

Researchers at the University of Oxford in the U.K. will begin to test what happens when they give people a mix of different COVID-19 vaccines.

Amid a shortage of vaccine supplies and the threat of emerging coronavirus variants, such an approach might provide an answer for both, according to a statement. The study, which will include more than 800 volunteers across England who are 50 years of age or older, is the first to analyze a mix-and-match approach to COVID-19 vaccination.

Some participants will be given a first dose of the Oxford-AstraZeneca vaccine followed by a second dose of the same vaccine or the Pfizer vaccine; and some will be given the Pfizer vaccine followed by a second dose of the same vaccine or the Oxford-AstraZeneca vaccine. **PLAY SOUND**

Some participants will be given the two doses four weeks apart and others will be given the vaccines 12 weeks apart (which is in line with the U.K.'s policy to vaccinate as many people as possible and delay the second dose by 12 weeks). The participants will all periodically give blood samples and the researchers will test the impact of the mixing and matching on their immune responses and will also test for any adverse reactions.

"Given the inevitable challenges of immunizing large numbers of the population against COVID-19 and potential global supply constraints, there are definite advantages to having data that could support a more flexible immunization program, if needed and if approved by the medicines regulator," Dr. Jonathan Van-Tam, the deputy chief medical officer and senior responsible officer for the study said in the statement. "It is also even possible that by combining vaccines, the immune response

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could be enhanced giving even higher antibody levels that last longer; unless this is evaluated in a clinical trial we just won't know."

The Oxford-AstraZeneca and the Pfizer vaccines were developed using two different approaches; to spur the immune system, the former uses a weakened adenovirus to deliver the genes of the spike protein and the latter uses messenger RNA enveloped in a nanoparticle.

It's not yet clear if giving two very different vaccines would confer any benefit. The closest data we have to this is on Russia's Sputnik V vaccine, which was 91% effective in preventing COVID-19 and uses two slightly different versions of its vaccine for its two separate doses, according to the Associated Press. Still, both versions were developed using the same adenovirus-based technology.

If the study does indeed show that a mix-and-match approach confers great benefit, it will still be formally reviewed for safety and efficacy by the Medicines and Healthcare products Regulatory Agency (MHRA) before such an approach is taken to vaccinate the rest of the public.

Currently, guidelines in the U.K. and in the U.S. say that COVID-19 vaccines should not be used interchangeably unless the same type of vaccine isn't available for a person's second dose or if it's unknown what vaccine the person got as a first dose, according to the AP.

The mix-and-match trial is run by the U.K.'s National Immunization Schedule Evaluation Consortium with government funding and will last for 13 months.

Originally published on Live Science.

livescience.com, 6 February 2021

<https://www.livescience.com>

A new chameleon species may be the world's tiniest reptile

2021-02-04

Hidden beneath the leaf litter of a northern Malagasy forest lives a chameleon so slight that it could tumble off the tip of your finger. Measuring just under 30 millimeters from snout to tail, the newly described species, *Brookesia nana*, may be the smallest reptile on Earth, researchers report January 28 in Scientific Reports.

The female measures 28.9 millimeters, considerably larger than the 21.6-millimeter-long male.

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Just two adult specimens, a male and female, are known. The female measures 28.9 millimeters, considerably larger than the 21.6-millimeter-long male. The size difference may have driven the male's genitalia to be quite large — nearly 20 percent of its body length — to be a better fit to his mate, herpetologist Frank Glaw of the Bavarian State Collection of Zoology in Munich and colleagues suggest.

Dubbed *B. nana* for its nano size, the species belongs to a genus of at least 13 other small chameleons spread out across the mountainous forests of northern Madagascar. Why *B. nana* and its cousins shrank to such minuscule proportions remains a mystery, though smallness does have its benefits: There's some evidence that small chameleons are especially good shots with their ballistic tongues.

In daylight, *Brookesia* chameleons scour the forest floor, snatching up mites and other small invertebrates, Glaw's team suspects. At night, the lizards retreat upward, gripping blades of grass or other plants for safety.

Deforestation and habitat degradation threaten *B. nana*'s future, the researchers say, though the region where the compact chameleons were found was recently designated a protected area by the Malagasy government. The species may soon be listed as critically endangered, the gravest rating made by the International Union for Conservation of Nature.

[sciencenews.org](https://www.sciencenews.org), 4 February 2021

<https://www.sciencenews.org>

South African coronavirus variant: All your questions answered

2021-02-03

A worrisome new coronavirus variant first detected in South Africa, known as B.1.351, has already spread to more than 30 countries. Experts are particularly alarmed by this variant because of its potential to "escape" protection from current vaccines, meaning vaccines might not stop people from getting infected with COVID-19. Here's what you need to know about the new variant.

What is it?

The B.1.351 variant is a strain of the coronavirus with eight distinctive mutations in the virus's spike protein, the structure that allows the virus to bind to and infect human cells, according to study by South African researchers posted to the preprint site medRxiv in December 2020.

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Where did it come from?

This variant was first detected in Nelson Mandela Bay, South Africa, in early October 2020, according to the Centers for Disease Control and Prevention. It took off rapidly, and within weeks it was the dominant strain in parts of the country. Now, South African officials are finding the variant in more than 90% of samples from COVID-19 patients that undergo genetic sequencing, according to The Washington Post.

"It's amazing and terrifying how quickly it came to dominate," Dr. Richard Lessells, an infectious disease expert at the University of KwaZulu-Natal in Durban, South Africa, told the Post.

What's more, the variant has now shown up in at least 32 other countries; and a number of countries, including the U.S. have banned travel from South Africa, the Post reported.

Is it in the U.S.?

Yes, the first two cases of B.1.351 were reported in the U.S. on Thursday (Jan. 28) in South Carolina, according to a statement from the South Carolina Department of Health and Environmental Control. The two cases do not appear to be connected, and neither case had a history of recent travel, which suggests the variant is spreading in the community.

Is it more contagious?

This variant does appear to spread more easily, with studies finding that it is about 50% more transmissible than earlier strains of the coronavirus. This is worrying because, the more people the virus infects, the greater the number of people will be hospitalized or die from the disease.

Do vaccines work against the South African variant?

Even more alarming is the finding that current COVID-19 vaccines may not work as well against this variant.

Johnson & Johnson released new data on its COVID-19 vaccine candidate on Friday (Jan. 29) which showed that its vaccine was 72% effective in the U.S. and only 57% effective in South Africa, where the new variant is dominant, Live Science previously reported.

In addition, another vaccine maker, Novavax, released early results Thursday (Jan. 28) showing that its vaccine was nearly 85% effective against the so-called U.K. variant, but only 50% effective at preventing infection with the South African variant, Nature reported.

Now, South African officials are finding the variant in more than 90% of samples from COVID-19 patients that undergo genetic sequencing, according to The Washington Post.

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This diminished effectiveness will likely crop up for other vaccines, too.

A recent study of the Moderna COVID-19 vaccine, which looked at blood samples from people who'd been vaccinated, found that the levels of antibodies produced in response to the South African variant were six-fold lower than levels produced in response to other strains, according to The Scientist.

Despite this reduction, the vaccine is still expected to offer some protection against the variant, the company said in a statement.

"You could diminish the vaccine-induced antibody efficacy by a few fold and still be well within the protective range," Dr. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases, said in a news briefing on Wednesday (Jan. 27).

Still, Moderna said that out of an abundance of caution, the company has started work on a "booster" vaccine dose against the South African variant, which could potentially be added to the two-dose series for the existing vaccine.

How does it differ from the U.K. variant?

The U.K. variant coronavirus variant was first detected in the United Kingdom in September 2020, Live Science previously reported. Both the South African and U.K. variant appear to be more transmissible than other strains. And the variants share some of the same mutations in the spike protein.

But the South African variant has a mutation known as E484K, which isn't widely found in the U.K. variant. (On Feb. 1, U.K. officials revealed that they had identified a handful of instances in which the U.K. coronavirus variant had developed the E484K mutation, Live Science previously reported.) This mutation may be responsible for the South African variant's ability to partially evade vaccines. The mutation is thought to reduce the ability of certain antibodies to neutralize, or inactivate, the virus, according to Newsweek.

There is early evidence that the U.K. variant may be more deadly than other variants, Live Science previously reported; but so far, there isn't evidence that the South African variant is more deadly.

Am I immune to the South African variant if I already had coronavirus?

Maybe not. The E484K mutation may also reduce the ability of antibodies from natural COVID-19 infection to neutralize the virus.

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In the Novavax trial in South Africa, many of the people were reinfected with the South African variant after already contracting the virus earlier in the pandemic.

And in a study of 44 people in South Africa who were previously infected with COVID-19 earlier in the pandemic, more than 90% showed reduced immunity against the new variant when researchers tested their blood, and nearly half had no protection against it, according to USA Today.

PLAY SOUND

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 3 February 2021

<https://www.livescience.com>

Marmosets eavesdrop on their neighbors—and judge them accordingly

2021-02-03

Like a nosy neighbor, marmosets eavesdrop on the conversations of others—and judge them based on what they "say," new research finds. The pint-size primates might be using the behavior to screen strangers, preferring to mingle with those they feel will make the best nannies for their offspring.

"This study is really cool because it pinpoints what's happening inside the animal" when they eavesdrop, says Sonja Koski, an evolutionary anthropologist at the University of Helsinki who was not involved with the work.

Common marmosets (*Callithrix jacchus*) are native to the forests of northeastern Brazil, where they scurry between branches like squirrels, thanks to their clawed fingernails. They're tiny, weighing about 250 grams, and have white ear tufts that evoke the untamed hair of Albert Einstein. But it's their social structure that really sets them apart.

Extended families of up to 15 marmosets live, eat, and hang out with each other, but only one or two pairs within each group breed. When babies are born, the whole clan pitches in: Siblings, cousins, aunts, and uncles all take turns caring for the young. It takes a village to raise a marmoset.

Because marmosets rely on others for help, they must evaluate who is or isn't good at cooperation, says Judith Burkart, an evolutionary

It takes a village to raise a marmoset.

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anthropologist at the University of Zurich (UZH). That's where the eavesdropping comes in. But what exactly is going on in the marmoset mind when they spy on the conversations?

To find out, Burkart teamed up with UZH evolutionary anthropologist Rahel Brügger. The duo and their colleagues placed a single marmoset in a room and played recordings of marmoset vocalizations from a hidden speaker. The chatter was either from a positive interaction, like an infant marmoset calling for food and an adult responding gently, or a negative one, like the adult reacting to the hungry baby with aggressive talkback. As a control, the scientists played calls from a single animal.

The researchers then pointed an infrared camera at the faces of the marmosets to record the temperature of their noses—"one of the only places on the face that is not covered by fur," Brügger says. They tested 21 marmosets over 90 total sessions, looking for drops in nasal temperature, which indicate the marmoset is alert and engaged. The animals got fired up during the combined calls but not during the individual vocalizations, indicating they perceived them as conversations and not just noise.

After the playbacks, the scientists let the marmosets into an adjoining room stocked with toys and a mirror. Because the primates don't recognize their own reflections, they're likely to approach a mirror and socialize with the image like it's an unknown monkey. The researchers set up the interaction so the animals would assume the calls they just heard were coming from the mirrored room—and from the individual in the mirror's reflection.

After hearing the playback of a positive interaction, the marmosets readily entered the room and ran up to the mirror ready to socialize with the supposed vocalizer, the researchers say. But after the uncooperative calls, the marmosets were hesitant to approach the monkey in the mirror. They were more interested in interacting with a "stranger" who was cooperative, the researchers report today in *Science Advances*.

The findings indicate marmosets aren't just passive observers, but make decisions about others based on what they hear—just like humans, the researchers say. The team plans to use this temperature-mapping approach to investigate even bigger questions about the origin of human traits like morality.

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Koski is on board. Using monkeys to understand the evolution of human behaviors "relies on the idea that animals understand what's happening in others' interactions," she says. "They have really pinpointed that here."

sciencemag.org, 3 February 2021

<https://www.sciencemag.org>

'Pile of rope' on a Texas beach is a weird, real-life sea creature

2021-02-05

A tangled mass of what looked like discarded yellow rope recently washed up on a beach in Texas. But this peculiar knotty pile wasn't garbage. It was a colorful sea whip — a type of soft, flexible coral.

Rebekah Claussen, a National Park Service (NPS) guide at the Padre Island National Seashore near the Gulf of Mexico, found one of these "rope balls" partly buried in the sand, and the park shared her photo on Facebook on Feb. 1.

Sea whips can be red, yellow, orange, violet, lavender or purple, according to the Marine Species Identification Portal. However, "we mostly see the yellow and red varieties washing up on our beaches," NPS representatives wrote in the Facebook post.

SOUND

The term "sea whip" can refer to several genera of soft corals in the order Scleractinia, but the species that washes up in North American coastal regions is a colorful sea whip (*Leptogorgia virgulata*). Sea whips' vibrant color comes from colonies of polyps — tiny, soft-bodied animals with eight tentacles forming a ring around their mouths. When these colonies cluster together they secrete proteins that form a dark-colored skeleton, which branches into whiplike stalks measuring up to 3 feet (0.9 meters) tall, according to the Tybee Island Marine Science Center (TIMSC) in Georgia.

Colorful sea whips live close to the shore, and *L. virgulata* can be found in waters as far north as New Jersey and as far south as the Gulf of Mexico, according to TIMSC. Polyps feed on plankton, and sea whips typically cling to ledges made of rock and limestone at depths between 10 and 66 feet (3 and 20 m), according to the Smithsonian Marine Station at Fort Pierce in Florida.

However, "we mostly see the yellow and red varieties washing up on our beaches," NPS representatives wrote in the Facebook post.

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But when sea whips are torn from their ocean habitats and deposited on beaches, they're easy to mistake for discarded fishing line, nets or cable. Several people who commented on the Facebook post mentioned that they had encountered sea whips while cleaning up a local beach, and they mistakenly collected it, thinking that it was garbage.

"Generally speaking, most of it is dead when it washes up," Claussen told Live Science in an email. "To my knowledge, the reason that the coral has washed up is that it has broken off and therefore no longer alive. I'm not sure that you would be able to tell even if it was alive," she added. "We recommend just leaving the sea whip on the beach because it is natural and will decompose and help the island," Claussen said.

"So the next time you're out for a stroll on the beach, look for the sea whip and remember, it's not trash!" NPS representatives wrote in the post.

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

<https://www.livescience.com>

COVID-19 precautions may be reducing cases of flu and other respiratory infections

2021-02-02

Heading into the dead of winter, doctors and scientists have noticed something odd: Missing cases of non-COVID-19 respiratory illnesses, specifically flu and respiratory syncytial virus, or RSV.

"We're seeing very low numbers of both of these infections, even now, while we're in the peak season," says Rachel Baker, an epidemiologist at Princeton University. "We really should be seeing cases go up."

Instead, positive flu tests reported in December are a little less than one one-hundredth of all of those tallied in December 2019, according to data from the U.S. Centers for Disease Control and Prevention. RSV's drop in reported cases — to one two-hundredth of those a year earlier — is even bigger.

This dramatic dip is probably due to COVID-19 precautions. The same handwashing and social distancing that can prevent the spread of SARS-CoV-2, the virus that causes COVID-19, can prevent the spread of other viruses and pathogens. But that could mean trouble ahead. A lack of cases

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ironically leads to a growing population susceptible to infection, so future outbreaks could be larger and more unpredictable.

In a typical year in the United States, RSV hospitalizes an estimated 58,000 children under age 5 and more than 177,000 older adults. "Most people recover in a week or two," says Benjamin Silk, an epidemiologist at the CDC. "But RSV infections can be serious, especially for infants, older adults and people with certain chronic medical conditions." Worldwide, 3.4 million children under 5 years old are hospitalized with RSV each year, accounting for about 5 percent of deaths in this age group.

Highly contagious, RSV is transmitted through respiratory droplets, which can remain infectious for more than six hours on hard surfaces. Prevention is rooted in strict hand hygiene — using hand sanitizer or washing with soap and water.

In the United States, RSV season usually starts in the fall, peaking between December and mid-February. This year, there essentially is no peak. In December 2020, the CDC's National Respiratory and Enteric Virus Surveillance System — which collects voluntarily reported data — reported just 120 RSV cases, compared with 24,280 in December 2019.

"RSV, in particular, is so stable — it does the same thing year after year," Baker says. "I don't think there's much else that could explain [the drop] apart from the COVID-19 phenomena as a whole, particularly the control measures."

Influenza infections are also down drastically. Flu regularly infects between 3 percent and 11 percent of the U.S. population and is especially deadly for older or immunocompromised people. The CDC estimates that in an average year, flu kills around 36,000 people and hospitalizes almost half a million.

According to the CDC's lead flu tracker Lynnette Brammer, the adoption of COVID-19 prevention measures in the spring of 2020 coincided with a drop in the percent of positive flu tests from more than 20 percent to less than 1 percent — and that number has stayed low through the fall and now into winter (SN: 9/18/20). In December 2019, the CDC's clinical lab FluVue reported 50,526 positive flu tests. In December 2020, that number was just 454. Preliminary data suggest this trend is continuing into January, when flu season typically peaks.

Brammer says the numbers of flu tests are steady, so it's not that people aren't going to get tested. They just aren't spreading it around as much.

"We really should be seeing cases go up."

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Some other infections, like parainfluenza, also seem to have declined with COVID-19 prevention measures, but viruses like rhinoviruses continue near their normal season levels. It could be because these viruses, unlike flu and RSV, aren't as thoroughly destroyed by handwashing and using sanitizers.

This great news comes with a warning, though. Fewer infections means fewer people being exposed and gaining immunity to these viruses, building up a population susceptible to these infections later. That could fuel a deadly rebound in infections post COVID-19, Baker, the Princeton epidemiologist, and her colleagues reported December 1 in *Proceedings of the National Academy of Sciences*. In the analysis, the team assumed COVID-19 precautions would reduce RSV and influenza infections by 20 percent, but the decrease is proving to be much larger.

"We need to be prepared for offseason outbreaks and potentially large outbreaks," Baker says.

That's what's happening right now in Australia's New South Wales. Clinical nurse Gemma Saravanos and her colleagues observed a more than 85 percent reduction of positive RSV tests during the peak of their season, between April and June, the team reported in the *Lancet* in September. But now, after beating back COVID-19 and lifting stringent protective measures, they have a record-breaking offseason RSV outbreak on their hands. In the last two weeks of December 2020, NSW reported more than 6,000 positive RSV tests — during a time they typically have a few hundred. In 2019, the RSV season peaked at around 4,695 detections in May.

"It's really extraordinarily unusual," says Saravanos, who works at the University of Sydney. "It's never been seen before."

A rebound outbreak might hit the United States, too, Baker says. Australia "could be an interesting foreshadowing of what is to come in the Northern Hemisphere."

That worries Carla Burroughs, a mother of four and former medic in Mobile, Ala., who has experienced RSV first hand. "The first time I heard of RSV, I was working on an ambulance, and I [transported] a child who passed away [from it]," she says. Then in December 2019, Burroughs' 3-year-old daughter, Kaylee, caught RSV and was hospitalized for three days. "The second the doctor told us RSV with Kaylee, it just brought flashbacks. It just sent me into such a panic mode; I immediately knew this is going to be bad."

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It did get bad. A week later, Burroughs' infant twins caught RSV. One, Mackenzie, was intubated for two weeks and stayed in the hospital for over a month. Seeing her daughter struggling to breathe, Burroughs says, "just changed everything. It took more of a toll on me than I expected."

Burroughs' children recovered, and she says now the new data show just how important basic hygiene behaviors are to helping prevent the spread of these viruses, saving thousands of lives every RSV and flu season — even without a pandemic. "It's sad that [the pandemic] is what it came down to," Burroughs says. "We should have already been doing all these things."

[sciencenews.org](https://www.sciencenews.org), 2 February 2021

<https://www.sciencenews.org>

Therapy for the end of the world

20210-02-05

ON SEPTEMBER 1, 2019, the category five storm Hurricane Dorian slammed into the Bahamas with gusts of 354 kilometres per hour and storm surges of over six metres. Instead of sweeping up what it could before steadily moving on, Dorian was patient, pummeling the islands for over forty hours straight. More than 70,000 people were displaced and 13,000 homes destroyed. On land, as the morgues filled up, bodies were piled high in refrigerated containers. Search-and-rescue dogs sniffed out corpses from under the debris; many were buried too deep for anyone to reach. Though the official death toll was seventy-four, some—including the Bahamas health minister at the time—believe the real number is much, much higher.

Bethuel Nyachienga is a mental health expert who has provided psychosocial support to more than 4,000 Hurricane Dorian survivors since September 2019. Nyachienga says the most common effects that survivors of catastrophes like this one report are insomnia, depression, and feeling retraumatized every time the wind is strong. What's clearer from observation is the excessive drinking and drug consumption that many survivors don't want to talk about. A 2017 report from the American Psychological Association (APA) titled *Mental Health and Our Changing Climate* details this kind of fallout, describing how PTSD, suicidality, depression, compounded stress, domestic abuse, child abuse, and substance abuse often spike after climate-linked calamities.

In recent years, the climate and wider ecological crisis has led to an explosion of what has been termed eco-anxiety, which the APA defines as the "chronic fear of environmental doom."

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Even far away from these disasters, psychologists are now finding, just knowing about the severity of our climate predicament can take its own kind of toll. In recent years, the climate and wider ecological crisis has led to an explosion of what has been termed eco-anxiety, which the APA defines as the “chronic fear of environmental doom.” It is born of the barrage of increasingly worse environmental news combined with the knowledge that actions taken so far to address the problem have been ineffective or insufficient, and it destroys people’s capacity to feel safe in the world. The stress of worrying about the future of the biosphere, the species, one’s community, and one’s life, as well as already occurring environmental disasters, can look more like cycling through grief, fear, shame, guilt, resignation, despair, and nihilism than just anxiety.

Last spring, University of Helsinki researcher Panu Pihkala wrote a piece for the BBC that explored this growing phenomenon. An environmental theologian, he described how many people, even far from the front lines of climate change, are increasingly being forced to confront the idea of their own vulnerability because “the world is revealed to be much more tragic and fragile than people thought it was.” This profound disruption then sends them into a process of mourning the future they believed would come—a future of ecological stability—and which they now know won’t.

IN 2019 the Yale Program on Climate Change Communication mapped the opinions of more than 9,000 Canadians, and 64 percent responded that they think climate change will start to harm people living in Canada within the next ten years. A national opinion survey of 2,000 people, carried out by Abacus Data that same year, showed that one in four Canadians think about climate change often and are getting “really anxious” about it. A similarly sized 2020 survey conducted by OnePoll revealed that 78 percent of Generation Z in the US do not plan on having kids because of climate change, while 71 percent of millennials in the US say that climate change has negatively affected their mental health. Stress levels are on the rise, and young people, who feel betrayed by older generations that aren’t cleaning up their own mess, are the most susceptible. As one young climate striker’s sign put it: “We won’t die from old age. We’ll die from climate change.” Another’s asked: “Why Should I Study For a Future I Won’t Have?”

“I’ve been seeing teens who [felt] suicidal because the pain and distress... from the coronavirus is finally starting to mirror how they’ve been feeling about climate change for a long time, and they’re wondering,

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Why on earth can’t people recognize the scale of the threat in the longer term?” says Caroline Hickman, a British clinical psychotherapist.

Hickman is part of a growing movement of “climate-aware” psychotherapists, who help people cope with complex emotions that stem from awareness of environmental crises. It can be difficult to isolate climate change as a reason for seeking therapy, so no one can say precisely how many therapists are working with people on climate-related issues. But those specializing in eco-anxiety and its companion emotions are starting to get professionally organized in groups like the Climate Psychology Alliances of the United Kingdom and North America, which between them have about 2,000 mental health care practitioners on their mailing lists.

Often, these therapists say, their clients seek them out because of work stress or depression, then concerns about the climate arise in the course of therapy. Some started mentioning the climate as a source of stress after the 2016 election of Donald Trump; others did so after the publication of major news, like the 2018 UN Intergovernmental Panel on Climate Change report, which was widely summarized as saying, “We have twelve years to avert climate catastrophe.” For others still, it was in the wake of a variety of climate disasters that have since struck. Leslie Davenport, a climate-aware marriage and family therapist in Tacoma, Washington, says those who sought her help for eco-anxiety made up 25 percent of her client base last year, up from none five years earlier.

The field is emerging, and the evidence base is not yet firmly established for which approaches work best to help people manage their environmentally linked distress. That’s partly because eco-anxiety is not a pathology. You won’t find it listed as a condition in the Diagnostic and Statistical Manual of Mental Disorders, and climate-aware therapists aren’t rushing to include it. “What you don’t want is for people to first and foremost think their eco-anxiety is in itself a problem,” Hickman says. It is a natural response to a real and unfolding threat, so the only label it deserves is “reasonable.” After all, what’s more daunting than realizing we’re all stuck on a cooking rock and have wasted the bulwark of precious time we had to cool it off before everything changes irreversibly? She typically tells her eco-anxious clients that their feelings are “a sign that you’re waking up; there’s nothing wrong with you. Welcome to a community that can share and mirror your concerns.”

That mirroring itself brings enormous relief. Social norms for talking about these emotions are still pretty underdeveloped. Even environmental professionals typically have to bottle up their eco-emotions at work. “It

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made me feel like I was crazy," says Mary Annaïse Heglar, who works at the US Natural Resources Defense Council. For years, her colleagues never seriously spoke of being rattled by the harrowing implications of the reports they were writing while she grew ever more unsettled. After an outpouring of support in response to an article she wrote about climate grief, Heglar felt a lot better, "realizing that it wasn't only me who felt this way and had to compartmentalize just to get through their day."

As the public narratives have gotten direr, so have people's psychological responses. And eco-anxiety can be a problem if it overwhelms a person so much that it interferes in their everyday life. Andrew Bryant, a climate-aware clinical social worker in Seattle who runs a website called Climate and Mind, has worked with people who believe societal collapse or human extinction are now inevitable, which can make the day-to-day feel meaningless. It's a delicate place, he says. "If they feel you don't get it and you're just trying to convince them it is not that bad, they'll stop coming. At the same time, I don't know what's going to happen, so I have to walk a careful line of not endorsing specific outcomes they are predicting while also not downplaying them."

A lot of climate-aware therapy is about helping people sit with overwhelming amounts of ecological uncertainty. The climate crisis can generate extreme scenarios in people's minds, futures in which humans will either save the world or die out within a few decades. Landing on an imagined future that sounds certain—whether or not it reflects scientific or political realities—can at least take a person out of that tense place of not knowing, which brings some relief. But it can be damaging when it isn't grounded in the truth, says Bryant. By transforming uncertainty into a sense of acceptance and courage about facing what's going to happen, climate-aware therapists try to help their clients imagine the role they could play in bringing the ecological future they hope for to life.

What traps people in eco-anxiety, Hickman says, is not their difficult feelings themselves but the feelings they have about their difficult feelings. Often, we resist these feelings because we fear they'll ruin our lives if we give them space. But it is this resistance to feelings we've been raised to think are negative, like vulnerability and grief, that make them frightening. A biomedical approach to therapy would file such hopelessness under depression and try to treat it with a pill. But several climate-aware therapists use mindfulness as a strategy to help their clients bear those painfully barren thoughts and feelings. The key lies in embracing complex emotions, Hickman says. This is another important aspect of addressing eco-anxiety, Davenport says: after you validate the

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legitimacy of the feelings, you learn not to banish them but to live with and, ideally, channel them.

A mindful approach holds that emotions are not bad or good but are natural and inevitable parts of the human condition. Paradoxically, if we learn to create some acceptance around our emotions by naming them, observing them, and eventually learning to sit with them with an element of curiosity, we can change our relationships to them. A successful experience with a climate-aware therapist is about channelling and transforming what the heaviness of the climate crisis makes one feel rather than weeding that heaviness out.

After years of battling eco-anxiety and trying to beat it into submission, twenty-one-year-old climate activist Clover Hogan learned, with the help of climate psychologists, to lean in to her difficult feelings. At Force of Nature, an organization she founded that engages youth to champion environmental and social justice, they encourage young people to welcome their eco-anxiety and use it as a compass. Hogan says that the grief and hopelessness so many eco-anxious youth feel reveal what matters most to them. When that's overlaid with their passions and talents—this is visualized for participants in a Venn diagram—a sweet spot of available agency emerges. "If you're into fashion, why not look at the fact that a third of the world's microplastics come from the textile industry? If you're motivated by your gut, why not rethink that 50 percent of [fresh produce] is wasted in America? If you're passionate about music, why not use your art to communicate the urgency of this situation in universal language?" Hogan says. The key to living well with eco-anxiety is finding some power to act.

Hogan is Australian. The record-breaking bushfires of the 2019/20 summer, which burned more than 20 percent of Australia's forests, marked the first time she grieved the loss of a part of her culture along with a part of herself. The fires forced her to look at the more than 3 billion animals that were harmed or killed, and her friends who lost their homes, and think, "Okay, I really get that we are fighting for our lives; this is do or die."

What Hogan finds hardest is accepting that all the action in the world may not be enough to save humanity and so many other species. Instead of advising her to banish that upsetting thought from her consciousness, climate-aware therapist Hickman (who has also served as a bit of a mentor) has helped her tap into it in order to keep going without expectation of what fruits her efforts will bear. Hogan will continue with her coaching work regardless of the outcomes. "Now that I've gone to the dark place of

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grief I was afraid of and come out the other side, I see I'm okay," she says, "and it makes me feel more authentic in my hope for the future."

thewalrus.ca, 5 February 2021

<https://www.thewalrus.ca>

In a warming world, it's better to be a small mammal than a bird

2021-03-04

In the early 1900s, Joseph Grinnell traversed the wilds of California in his Ford Model T truck, meticulously surveying its fauna. Along the Californian coast, he trapped pocket mice and watched condors soar; in the Mojave Desert, his team chronicled American kestrels swooping for insects and caught cactus mice hiding among rocks.

Now, by comparing Grinnell's data with modern surveys, ecologists have shown that climate change has not been an equal opportunity stressor. As the Mojave warmed by about 2°C over the past century, bird numbers and diversity declined dramatically, but small mammals like little pocket mice are holding their own. The survivors' secret seems to be a nocturnal lifestyle and an ability to escape the heat by burrowing, the team reports today in *Science*.

Until now, researchers have often assumed climate change challenges mammals and birds in similar ways, because both need to maintain their body temperature. But, "There are clearly winners and losers," says Elise Zipkin, a quantitative ecologist at Michigan State University.

The pineapple heiress who established the Museum of Vertebrate Zoology at the University of California, Berkeley, in 1908 wanted it to do research, and Grinnell, the founding director, took that mandate to heart. Loaded with binoculars, clunky cameras, snap traps, and shotguns, his team drove through mountains and deserts, camping and collecting along the way. When flat tires halted the convoy, Grinnell hired prospectors and mules. Mindful of future researchers, he had his teams take copious notes and photos and map study sites. "He was draconian about it," says Steven Beissinger, an ecologist at the museum and a co-author of the new study.

"The Grinnell-era field notes are so detailed, I know I put my boots on the same talus slope they did," adds co-author James Patton, a retired museum ecologist.

On average, every spot surveyed had lost more than 40% of its desert bird species, such as American kestrels or mountain quail.

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The animals Grinnell studied now live in a markedly hotter, drier climate. Resurveys published in 2018 and 2019 in the *Proceedings of the National Academy of Sciences* showed "the bird community has collapsed to a new, lower number of species found per site," Beissinger says. On average, every spot surveyed had lost more than 40% of its desert bird species, such as American kestrels or mountain quail. At most sites, even the remaining species were scarcer.

But the new study, led by Iowa State University physiological ecologist Eric Riddell, tells a more hopeful story for rats, mice, chipmunks, and other small mammals. Since Grinnell's survey, three species have declined, 27 have remained stable, and four have increased in number. "This paper is really big news for small mammals," says Rebecca Rowe, an ecologist at the University of New Hampshire, Durham.

To find out why birds are so much more vulnerable, Riddell spent 2 years measuring heat transfer and light absorption in the fur and feathers of museum specimens of 50 desert bird species and 24 small mammals. He then fed those numbers and data on the species' behavior and habitat into a computer program that modeled how much heat stress an animal would be exposed to, and how well it could cool itself, under different temperature conditions. To keep cool, birds must expend energy, for example by dilating blood vessels to evaporate moisture from their legs or mouths. The energetic costs of cooling in birds were more than three times higher than in mammals.

That's because most small mammals take refuge underground during the hottest parts of the day. Such behaviors even helped mammals such as woodrats, which are not specially adapted for desert life. Only mammals that find themselves in soil too shallow to provide much cooling, such as the cactus mouse, suffered from the heat.

In contrast, many birds, such as the American kestrel and the prairie falcon, are exposed "to the full brunt of global heating," explains Andrew McKechnie, a physiological ecologist at the University of Pretoria who was not part of the study. "The models establish a convincing biological mechanism to explain why birds and mammals responded differently to climate change," says Lauren Buckley, an ecologist at the University of Washington, Seattle.

Other studies have shown declines in biodiversity as the climate warms, but this one is "impressive ... because they provide the why," says Robert Cooke, an ecological modeler at the UK Centre for Ecology & Hydrology. "This hints at a worrying scenario that may be replicated for deserts across

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the globe as temperature rises." To ecologist Marlène Gamelon of the French national research agency CNRS in Lyon, the results suggest climate change poses as big a threat to desert ecosystems as it does to those in the fast-warming Arctic.

Mammals, too, may be at risk in the future. Thin soils cover just 2% of deserts today, but such areas are expected to grow as deserts get more arid. That's why "this paper shows the importance of preserving large areas with a diversity of microhabitats," says Linda Deegan, an ecologist at the Woodwell Climate Research Center.

Modeling studies like this one will also help conservationists make hard choices, says Mark Urban, an ecologist at the University of Connecticut, Storrs. "Understanding how species differ in their vulnerability to climate change will help us save money and time by ignoring those species that are doing just fine."

sciencemag.org, 4 March 2021

<https://www.sciencemag.org>

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