

# Bulletin Board

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JUL. 23, 2021

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### CONTACT US

subscribers@chemwatch.  
net  
tel +61 3 9572 4700  
fax +61 3 9572 4777

1227 Glen Huntly Rd  
Glen Huntly  
Victoria 3163 Australia

**\* 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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## Regulatory Update

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### ASIA PACIFIC

#### October is National Safe Work Month—a time to commit to building a safe and healthy workplace

2021-07-12

During October each year, we ask workers and employers across Australia to commit to safe and healthy workplaces for all Australians.

Being healthy and safe means being free from physical and psychological harm. No job should be unsafe and no death or injury is acceptable. A safe and healthy workplace benefits everyone.

The theme for national Safe work Month this year is think safe. work safe. be safe.

This October think safe. work safe. be safe. at your workplace by planning and implementing work health and safety procedures.

[Read More](#)

Safe Work Australia, 12 July 2021

<https://www.safeworkaustralia.gov.au/national-safe-work-month>

#### Imports of cosmetics, personal care products in Oman subject to safety regulation from August 1

2021-07-12

Thousands of different types of cosmetics and personal care products imported into the Sultanate will be brought under the strict purview of the GCC and Omani standards and specifications with effect from August 1, 2021 — a move aimed at ensuring that all such goods are safe for use by consumers.

Accordingly, importers of cosmetics and personal care products will be required to submit technical information about their merchandise when routing their goods through Customs, an official of the Ministry of Commerce, Industry and Investment Promotion (MoCIIP) said.

This comes in line with the implementation of Ministerial Decision No. 128/2019, that considering the Gulf standard specifications for safety requirements in cosmetics as an obligatory Omani specification in terms of regulating imports and ensuring their safety for use by the consumer in whatever related to personal care requirements and cosmetics.

**A safe and healthy workplace benefits everyone.**

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[Read More](#)

Zawya, 12 July 2021

[https://www.zawya.com/mena/en/legal/story/Imports\\_of\\_cosmetics\\_personal\\_care\\_products\\_in\\_Oman\\_subject\\_to\\_safety\\_regulation\\_from\\_August\\_1-SNG\\_223889147/](https://www.zawya.com/mena/en/legal/story/Imports_of_cosmetics_personal_care_products_in_Oman_subject_to_safety_regulation_from_August_1-SNG_223889147/)

#### Consultation on proposed agvet chemical legislation changes now open

2021-07-15

The Department of Agriculture, Water and the Environment is consulting on proposed changes to regulations for agricultural and veterinary (agvet) chemicals.

In 2018 the department consulted with industry on measures that were incorporated into the [APVMA Board and other Improvements Bill](#), which was introduced into parliament on 18 September 2019.

The Bill requires supporting delegated legislation to fully implement some of its measures. While the department has already consulted on some of these supporting measures, the details of others are new.

The department would like to know what you think of the proposed new supporting measures.

For more information on the proposed measures and how to make a submission visit [Have Your Say](#).

[Read More](#)

APVMA, 15 July 2021

<https://apvma.gov.au/node/88181>

#### National Return to Work Strategy 2020-203—Key achievements and scorecard report now published

2021-07-13

Safe Work Australia has published a report on our progress in the first year of the **National Return to Work Strategy 2020-2030**.

The **Key achievements and scorecard report** captures baseline national measures based on the **Measurement Framework** as we strive towards

**While the department has already consulted on some of these supporting measures, the details of others are new.**

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achieving the National Return to Work Strategy 2020-2030 vision and outcomes over the 10 years.

The report indicates that implementation of the Strategy is on track with Safe Work Australia progressing several early initiatives that will inform later projects and action areas.

Publication of the **Key achievements and scorecard report** enables Safe Work Australia to meet progress reporting commitments outlined in Strategy. The Agency will publish further reporting in 2023, 2026, 2028 and 2030; with a more detailed mid-term report will occur in 2025.

For more, see the National Return to Work webpage: <https://www.safeworkaustralia.gov.au/rtw>

[Read More](#)

Safe Work Australia, 13 July 2021

<https://www.safeworkaustralia.gov.au/doc/key-achievements-and-scorecard-report-2020>

## AMERICA

### Sustainable shopping initiative highlights EPA's Safer Choice Program

2021-07-14

The U.S. Environmental Protection Agency (EPA) announced on July 13, 2021, that Amazon's Climate Pledge Friendly initiative now includes cleaning and other products certified by EPA's Safer Choice program. According to EPA, Safer Choice is now one of 30 sustainability certifications highlighted under Amazon's Climate Pledge Friendly initiative that helps customers shop for more than 75,000 products through the company's online store. EPA notes that highlighting Safer Choice-certified products makes it easier for consumers to locate products that contain safer chemical ingredients without sacrificing quality or performance. Products identified as Climate Pledge Friendly are distinguished on Amazon's website by an hourglass-with-wings symbol. The company also provides its customers with detailed web pages that include information on how and why products are certified as sustainable.

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[Read More](#)

TSCABlog, 14 July 2021

<http://www.tscablog.com/entry/sustainable-shopping-initiative-highlights-epas-safer-choice-program>

### Are silver nanoparticles a silver bullet against microbes?

2021-07-14

Antimicrobials are used to kill or slow the growth of bacteria, viruses and other microorganisms. They can be in the form of antibiotics, used to treat bodily infections, or as an additive or coating on commercial products used to keep germs at bay. These life-saving tools are essential to preventing and treating infections in humans, animals and plants, but they also pose a global threat to public health when microorganisms develop resistance to them, a concept known as antimicrobial resistance.

One of the main drivers of antimicrobial resistance is the misuse and overuse of antimicrobial agents, which includes silver nanoparticles, an advanced material with well-documented antimicrobial properties. It is increasingly used in commercial products that boast enhanced germ-killing performance—it has been woven into textiles, coated onto toothbrushes, and even mixed into cosmetics as a preservative.

[Read More](#)

Phys.org, 14 July 2021

<https://phys.org/news/2021-07-silver-nanoparticles-bullet-microbes.html>

### Connecticut Act prohibits the sale and distribution of food packaging with PFAS

2021-07-09

The state of Connecticut passed into law Act No. 21-191, which prohibits the sale and distribution of food packaging and packaging elements with intentionally added perfluoroalkyl or polyfluoroalkyl substance (PFASs). The law also prohibits the use of substitute chemicals which pose an equal or greater hazard. The effective date is January, 2024. The law includes the following definitions: - Perfluoroalkyl or polyfluoroalkyl substance: a class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom. - Food packaging: any package or packaging component that is applied to or in direct contact with any food or beverage. - Package:

**They can be in the form of antibiotics, used to treat bodily infections, or as an additive or coating on commercial products used to keep germs at bay.**

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any container, produced either domestically or in a foreign country, used for the marketing, protecting or handling of a product and includes a unit package, an intermediate package and a shipping container, as defined in the ASTM D966. "Package" also means any unsealed receptacle such as a carrying case, crate, cup, pail, rigid foil or other tray, wrapper or wrapping film, bag or tub. - Packaging component: any part of a package, produced either domestically or in a foreign country, including, but not limited to, any interior or exterior blocking, bracing, cushioning, weatherproofing, exterior strapping, coating, closure, ink, label, dye, pigment, adhesive, stabilizer or other additive. Tin-plated steel that meets specification ASTM A623 shall be considered as a single packaging component. Electro-galvanized coated steel and hot dipped coated galvanized steel that meets ASTM A653, A924, A879 and A591 shall be treated in the same manner as tinplated steel.

[Read More](#)

Bureau Veritas, 9 July 2021

<https://www.cps.bureauveritas.com/sites/g/files/zypfnx236/files/media/document/Bulletin-21B-077.pdf>

## EUROPE

### Updated BPR active substance and authorised products lists

2021-07-07

Information on Active substances and products authorised for the NI market are now available.

The latest updates to the

- BPR Active Substance list for GB and NI
- UK Authorised Biocidal Products list

now provide separate information about active substances and biocidal products for the GB and the NI markets.

[Read More](#)

HSE, 7 July 2021

<https://www.hse.gov.uk/biocides/index.htm>

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### EU and Ukraine kick-start strategic partnership on raw materials

2021-07-14

Today, the EU and Ukraine have launched a strategic partnership on raw materials, with the aim of achieving a closer integration of raw materials and batteries value chains. Vice-President Maroš Šefčovič and Prime Minister of Ukraine Denys Shmyhal signed a [Memorandum of Understanding](#) underpinning the partnership during the dedicated [High Level Conference](#).

The strategic partnership with Ukraine will include activities along the entire value chain of both primary and secondary critical raw materials and batteries, and in line with the objectives of the EU's [Critical Raw Materials Action Plan](#), it will help diversify, strengthen and secure both sides' supply of critical raw materials, essential for achieving the green and digital transitions. The partnership will also be decisive in preserving global competitiveness and developing resilience of EU and Ukrainian industry.

Today's signature constitutes the first tangible deliverable under the enhanced cooperation between the European Union and Ukraine in the areas of the [European Green Deal](#) and the [Industrial Strategy](#). It follows on the mutual commitment and interest expressed at the [7<sup>th</sup> Association Council](#) meeting between the EU and Ukraine on 11 February 2011.

[Read More](#)

European Commission, 14 July 2021

[https://ec.europa.eu/commission/presscorner/detail/en/ip\\_21\\_3633](https://ec.europa.eu/commission/presscorner/detail/en/ip_21_3633)

### What you need to know about the European Green Deal—and what comes next

2021-07-13

Nearly two years after the European Commission launched the European Green Deal in December 2019, the EU's landscape has changed greatly, with the COVID-19 pandemic causing a contraction of the bloc's GDP by 6.1% in 2020. Yet as countries continue their vaccination campaigns and focus on economic recovery, there's hope that the region can rebound. The IMF projects that the Europe's GDP could return to pre-pandemic levels by 2022.

**The partnership will also be decisive in preserving global competitiveness and developing resilience of EU and Ukrainian industry.**

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The European Green Deal has the potential to play a key role not only in ensuring this recovery in the short term but also in addressing long-term climate change threats. The launch of the “Fit for 55” package this week is expected to mark an important step in overhauling climate policies and enabling the EU to deliver on its commitment to reduce emissions by 55% by 2030.

Here’s a look at the deal, what it has achieved so far and what to expect next.

What are the areas of focus?

Ranging across eight policy areas - biodiversity, sustainable food systems, sustainable agriculture, clean energy, sustainable industry, building and renovating, sustainable mobility, eliminating pollution and climate action - the deal represents an unprecedented effort to review more than 50 European laws and redesign public policies.

The deal aims to achieve three main goals. First, it focuses on achieving net-zero emissions by proposing specific strategies that can help curb emissions across all sectors, with a strong focus on energy, which makes up more than 75% of total EU-27’s greenhouses gas. The objective is to increase the share of renewable energy in the EU’s energy mix.

[Read More](#)

World Economic Forum, 13 July 2021

<https://www.weforum.org/agenda/2021/07/what-you-need-to-know-about-the-european-green-deal-and-what-comes-next/>

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## REACH Update

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### EC postpones decision on 13 substances ECHA recommended for REACH

2021-07-09

On June 18, 2021, the *European Commission (EC)* notified the *World Trade Organization (WTO)* of their intention to add five substances to Annex XIV of the REACH regulation known as the Authorization List. Substances on the Annex XIV list are “progressively replaced by suitable alternative substances or technologies where these are economically and technically viable.” The five chemicals the *EC* propose to regulate come from a list of 18 substances of very high concern (SVHCs) that the *European Chemicals Agency (ECHA)* recommended for regulation under REACH in October 2019 (FPF reported).

Of the 13 substances the *EC* postponed action on, six are food contact chemicals (FCCs) included in the *Food Packaging Forum’s FCCdb*. Out of these six, five are classified as “priority hazardous substances”: (i) bisphenol A (BPA, CAS 80-05-7), (ii) lead oxide sulfate (12036-76-9), (iii) hexahydromethylphthalic anhydride (CAS 25550-51-0), (iv) 2-methoxyethanol (CAS 109-86-4), and (v) 2-ethoxyethanol (CAS 110-80-5).

According to news provider *Chemical Watch*, “the Commission said it deferred the decision on the endocrine disruptor BPA because other regulatory steps have been taken to restrict their uses.” Namely, a REACH Annex XV dossier that is currently being prepared. Substances included in Annex XV are restricted for use in the *EU* after being “assessed that [the] substance is not adequately controlled and needs to be addressed on a Union-wide basis.”

[Read More](#)

Food Packaging Forum, 9 July 2021

<https://www.foodpackagingforum.org/news/ec-postpones-decision-on-13-substances-echa-recommended-for-reach>

**Of the 13 substances the EC postponed action on, six are food contact chemicals (FCCs) included in the Food Packaging Forum’s FCCdb.**

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## Janet's Corner

JUL. 23, 2021

## Eye Patch

2021-07-23



<http://www.dierk-raabe.com/science-cartoons/>

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## Hazard Alert

JUL. 23, 2021

## Silver

2015-07-23

Silver is a chemical element with symbol Ag and atomic number 47. The metal occurs naturally in its pure, free form (native silver), as an alloy with gold and other metals, and in minerals such as argentite and chlorargyrite. Most silver is produced as a by-product of copper, gold, lead, and zinc refining. [1]

Pure silver is nearly white, lustrous, soft, very ductile, malleable, it is an excellent conductor of heat and electricity. It is not a chemically active metal, but it is attacked by nitric acid (forming the nitrate) and by hot concentrated sulfuric acid. It has the highest electrical conductivity of all metals, but its greater cost has prevented it from being widely used for electrical purposes. Silver does not oxidise in air but reacts with the hydrogen sulfide present in the air, forming silver sulfide (tarnish). This is why silver objects need regular cleaning. Silver is stable in water. [2]

## USES [3]

Silver is used to make jewellery, silverware, electronic equipment, and dental fillings. It is also used to make photographs, in brazing alloys and solders, to disinfect drinking water and water in swimming pools, and as an antibacterial agent. Silver has also been used in lozenges and chewing gum to help people stop smoking.

## SOURCES &amp; ROUTES OF EXPOSURE

## Sources of Exposure [3]

- Breathing low levels in air.
- Swallowing it in food or drinking water.
- Carrying out activities such as jewellery making, soldering, and photography.
- Using anti-smoking lozenges or other medicines containing it.

## Routes of Exposure [4]

Silver's wide variety of uses allows exposure through various routes of entry into the body. Ingestion is the primary route of entry for silver compounds and colloidal silver proteins. Inhalation of dusts or fumes containing silver occurs primarily in occupational settings. Skin contact occurs in occupational settings, from the application of burn creams and from contact with jewellery. Silver can also gain entry into the body

**Silver is a chemical element with symbol Ag and atomic number 47.**

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## Hazard Alert

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through the use of acupuncture needles, catheters, dental amalgams, or accidental puncture wounds.

### HEALTH EFFECTS [3]

- Exposure to high levels of silver for a long period of time may result in a condition called argyria, a blue-grey discoloration of the skin and other body tissues. Argyria is a permanent effect, but it appears to be a cosmetic problem that may not be otherwise harmful to health.
- Lower-level exposures to silver may also cause silver to be deposited in the skin and other parts of the body; however, this is not known to be harmful.
- Eye contact: may cause severe corneal injury if liquid comes in contact with the eyes.
- Skin contact: may cause skin irritation. Repeated and prolonged contact with skin may cause allergic dermatitis.
- Inhalation hazards: exposure to high concentrations of vapours may cause dizziness, breathing difficulty, headaches or respiratory irritation. Extremely high concentrations may cause drowsiness, staggering, confusion, unconsciousness, coma or death.
- Liquid or vapour may be irritating to skin, eyes, throat, or lungs. Intentional misuse by deliberately concentrating and inhaling the contents of this product can be harmful or fatal.
- Ingestion hazards: moderately toxic. May cause stomach discomfort, nausea, vomiting, diarrhoea, and narcosis.
- Aspiration of material into lungs if swallowed or if vomiting occurs can cause chemical pneumonitis, which can be fatal.
- Animal studies have shown that swallowing silver results in the deposit of silver in the skin. One study in mice found that the animals exposed to silver in drinking water were less active than unexposed animals.
- No studies are available on whether silver affects reproduction or causes developmental problems in people.
- No studies are available on whether silver may cause cancer in people.
- The only available animal studies showed both positive and negative results when silver was implanted under the skin.
- The EPA has determined that silver is not classifiable as to human carcinogenicity.

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## Hazard Alert

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### SAFETY [5]

#### First Aid Measures

- Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.
- Skin Contact: No known effect on skin contact, rinse with water for a few minutes.
- Inhalation: Allow the victim to rest in a well-ventilated area. Seek immediate medical attention.
- Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.
- Ingestion: Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

#### Exposure Controls & Personal Protection

##### Engineering Controls

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

##### Personal Protective Equipment

The following personal protective equipment is recommended when handling silver:

- Splash goggles
- Lab coat

Personal Protection in Case of a Large Spill:

- Splash goggles
- Full suit
- Boots
- Gloves



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- Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product

## REGULATION [6,7]

## United States

Exposure Limit	Limit Values	HE Codes	Health Factors and Target Organs
OSHA Permissible Exposure Limit (PEL) - General Industry See <a href="#">29 CFR 1910.1000 Table Z-1</a>	0.01 mg/m <sup>3</sup> TWA	HE3	Argyria
OSHA PEL - Construction Industry See <a href="#">29 CFR 1926.55 Appendix A</a>	0.01 mg/m <sup>3</sup> TWA	HE3	Argyria
OSHA PEL - Shipyard Employment See <a href="#">29 CFR 1915.1000 Table Z-Shipyards</a>	0.01 mg/m <sup>3</sup> TWA	HE3	Argyria
National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL)	0.01 mg/m <sup>3</sup> TWA	HE3	Argyria
		HE4	Eye and skin burns
		HE14	Eye and skin irritation
American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) (2001)	Metal dust: 0.1 mg/m <sup>3</sup> TWA Soluble compounds: 0.01 mg/m <sup>3</sup> TWA	HE3	Argyria

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Exposure Limit	Limit Values	HE Codes	Health Factors and Target Organs
CAL/OSHA PELs	Metal: 0.01 mg/m <sup>3</sup> TWA Soluble compounds: 0.01 mg/m <sup>3</sup> TWA		

## Australia

Safe Work Australia: Safe Work Australia has set a time weighted average (TWA) concentration of 0.01 mg/m<sup>3</sup> for silver over a 40-hour workweek.

## REFERENCES

- <https://en.wikipedia.org/wiki/Silver>
- <http://www.lenntech.com/periodic/elements/ag.htm>
- <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=538&tid=97>
- <http://annhyg.oxfordjournals.org/content/49/7/575.full>
- <http://www.sciencelab.com/msds.php?msdsId=9927253>
- <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/772/Workplace-exposure-standards-airborne-contaminants.pdf>

## Bulletin Board

## Gossip

JUL. 23, 2021

**Mysterious DNA sequences, known as 'Borgs', recovered from California mud**

2021-07-15

In the TV series *Star Trek*, the Borg are cybernetic aliens that assimilate humans and other creatures as a means of achieving perfection. So when Jill Banfield, a geomicrobiologist at the University of California, Berkeley, sifted through DNA in the mud of her backyard and discovered a strange linear chromosome that included genes from a variety of microbes, her Trekkie son proposed naming it after the sci-fi aliens. The new type of genetic material was a mystery. Maybe it was part of a viral genome. Maybe it was a strange bacterium. Or maybe it was just an independent piece of DNA existing outside of cells. Whatever it is, it's "pretty exciting," says W. Ford Doolittle, an evolutionary biologist at Dalhousie University who was not involved with the work.

Researchers have found many examples of DNA floating independently outside the chromosome or chromosomes that make up an organism's standard genome. Small loops called plasmids, for example, exist inside microbes and ferry genes for thwarting antibiotics among different kinds of bacteria.

But Banfield wasn't looking for DNA that could move between organisms. Instead, she and graduate student Basem Al-Shayeb were searching for viruses that infect archaea, a type of microbe often found in places devoid of oxygen. They would dig 1 meter or more below the surface and collect mud samples that might harbor archaea and their viruses. Next, they would sequence every stretch of DNA in the samples and use sophisticated computer programs to scan for sequences that signified a virus, rather than any other organism.

"We started off with a piece of mud and 10 trillion pieces of DNA," Banfield says. One sample, taken from the mud on her property, contained a gene-filled stretch of DNA almost 1 million bases long—and more than half the genes were novel. This linear stretch of DNA also had a particular pattern of bases at its beginning and end, distinct stretches of repetitive DNA between its genes, and two places along the sequence where DNA duplication could begin—which indicated the Borg could make copies of itself. Together, this suggested it was not just a random concoction of genes.

After they identified the first Borg sequence, the researchers began to scan microbial DNA in public databases to see whether they could

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find anything similar. They found a few variations in groundwater from Colorado—there, the first purported Borg showed up about 1 meter deep and got more abundant deeper down. Other versions showed up in DNA from the discharge of an abandoned mercury mine in Napa, California, and from a shallow riverbed of the East River in Colorado.

Altogether, the researchers isolated 23 sequences they think may be Borgs—and 19 they have identified as having all the characteristics of the first Borg they discovered, they write this week on the preprint server bioRxiv. Some are almost 1 million bases long. "I don't think anything else that's been discovered is as big as these guys are," among previously known extrachromosomal DNA elements, Doolittle says.

In every place, copies of the Borg co-occurred with DNA linked to a methane-oxidizing archaeon called *Methanoperedens*. That suggests the Borgs may exist inside the microbe, the researchers say. But because *Methanoperedens* can't be grown in a lab, the team hasn't been able to confirm this suspicion. Meanwhile, team members have ruled out the possibility that the Borg came from another microbe, as they lack many necessary genes for life, or a virus, which typically have shorter chromosomes.

But Graham Hatfull, a microbiologist at the University of Pittsburgh, wonders whether there could be other large viruses, similar to the bacteria-invading viruses that he helped discover, that infect archaea. Could the Borg be a part of such viruses? Demonstrating that will be challenging, he admits. "If you want to know about [Borg] biology, it's experimentally really tough." One thing the find reinforces, he says, is the idea that many genetic elements can hop between an organism's chromosomes or between organisms, making it easier for creatures to acquire new genes to adapt to changes in their environment.

Each Borg—which are now named after colors such as "olive" and "lilac"—includes not just novel genes, but recognizable ones whose functions scientists already know. For example, a few contain genes important for processing methane; such genes seem to have been acquired from specific microbes, such as *Methanoperedens*. Because methane is a greenhouse gas that many microbes either break down or produce, the researchers suggest Borgs may influence that cycling by boosting its host's ability to process methane.

Banfield says she and her colleagues don't really know how Borgs arose, but they suspect that at one time, the DNA sequences were the genomes of a close relative of *Methanoperedens* that got scooped up and began

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living inside the archaeon. Eventually only the DNA, now much modified, remains inside the microbe, but apart from its own chromosome.

Banfield hopes her team's discovery will lead other researchers to look for Borgs in their favorite microbes, particularly those in environments with little to no oxygen. And Hatfull predicts there will be new ones found in microbes other than Methanoperedens. In the meantime, he and other researchers are eagerly awaiting the peer-reviewed version of Banfield's paper—and confirmatory experimental work on the Borgs. "What are they?" Doolittle asks. "It's an interesting question that demands to be answered."

sciencemag.org, 15 July 2021

<https://www.sciencemag.org>

### Society is right on track for global collapse, new study of infamous 1970s report finds

2021-07-20

Human society is on track for a collapse in the next two decades if there isn't a serious shift in global priorities, according to a new reassessment of a 1970s report, Vice reported

In that report — published in the bestselling book "The Limits to Growth" (1972) — a team of MIT scientists argued that industrial civilization was bound to collapse if corporations and governments continued to pursue continuous economic growth, no matter the costs. The researchers forecasted 12 possible scenarios for the future, most of which predicted a point where natural resources would become so scarce that further economic growth would become impossible, and personal welfare would plummet.

The report's most infamous scenario — the Business as Usual (BAU) scenario — predicted that the world's economic growth would peak around the 2040s, then take a sharp downturn, along with the global population, food availability and natural resources. This imminent "collapse" wouldn't be the end of the human race, but rather a societal turning point that would see standards of living drop around the world for decades, the team wrote.

So, what's the outlook for society now, nearly half a century after the MIT researchers shared their prognostications? Gaya Herrington, a sustainability and dynamic system analysis researcher at the consulting

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firm KPMG, decided to find out. In the November 2020 issue of the Yale Journal of Industrial Ecology, Herrington expanded on research she began as a graduate student at Harvard University earlier that year, analyzing the "Limits to Growth" predictions alongside the most current real-world data.

Herrington found that the current state of the world — measured through 10 different variables, including population, fertility rates, pollution levels, food production and industrial output — aligned extremely closely with two of the scenarios proposed in 1972, namely the BAU scenario and one called Comprehensive Technology (CT), in which technological advancements help reduce pollution and increase food supplies, even as natural resources run out.

While the CT scenario results in less of a shock to the global population and personal welfare, the lack of natural resources still leads to a point where economic growth sharply declines — in other words, a sudden collapse of industrial society.

"[The BAU] and CT scenarios show a halt in growth within a decade or so from now," Herrington wrote in her study. "Both scenarios thus indicate that continuing business as usual, that is, pursuing continuous growth, is not possible."

The good news is that it's not too late to avoid both of these scenarios and put society on track for an alternative — the Stabilized World (SW) scenario. This path begins as the BAU and CT routes do, with population, pollution and economic growth rising in tandem while natural resources decline. The difference comes when humans decide to deliberately limit economic growth on their own, before a lack of resources forces them to.

"The SW scenario assumes that in addition to the technological solutions, global societal priorities change," Herrington wrote. "A change in values and policies translates into, amongst other things, low desired family size, perfect birth control availability, and a deliberate choice to limit industrial output and prioritize health and education services."

On a graph of the SW scenario, industrial growth and global population begin to level out shortly after this shift in values occurs. Food availability continues to rise to meet the needs of the global population; pollution declines and all but disappears; and the depletion of natural resources begins to level out, too. Societal collapse is avoided entirely.

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This scenario may sound like a fantasy — especially as atmospheric carbon dioxide levels soar to record highs. But the study suggests a deliberate change in course is still possible.

Herrington told Vice.com the rapid development and deployment of vaccines during the COVID-19 pandemic is a testament to human ingenuity in the face of global crises. It's entirely possible, Herrington said, for humans to respond similarly to the ongoing climate crisis — if we make a deliberate, society-wide choice to do so.

"It's not yet too late for humankind to purposefully change course to significantly alter the trajectory of [the] future," Herrington concluded in her study. "Effectively, humanity can either choose its own limit or at some point reach an imposed limit, at which time a decline in human welfare will have become unavoidable."

Read more about the report at Vice.com.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 20 July 2021

<https://www.livescience.com>

### Man in China dies of rare 'monkey B' virus

2021-07-20

A veterinarian in China has died after he contracted an extremely rare viral infection known to infect monkeys, according to news reports.

The 53-year-old veterinarian is the first known human case of this virus, called monkey B virus, to be reported in China, according to The Washington Post.

The man worked as a veterinary surgeon at a Beijing-based institute that specializes in experimental research in non-human primates, according to a report from the Chinese Center for Disease Control and Prevention. In early March, he dissected two dead monkeys; one month later, he developed a fever, nausea, vomiting, and neurological symptoms, the report said. Despite treatment at several hospitals, the man died on May 27.

Doctors diagnosed the man with monkey B virus, also known as B virus. The virus most commonly infects macaque monkeys, and it is rarely seen in humans — there have been just 50 human cases of the virus reported since it was discovered in 1932, according to the U.S. Centers for Disease

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Control and Prevention (CDC). But when the virus does "jump" from monkeys to people, it is often deadly — of the 50 people infected, 21 have died, the CDC said. Most of the human cases have occurred in people who work with monkeys, such as veterinarians or researchers, the Post reported.

Once the virus jumps to humans, it doesn't spread easily between people. There has been just one reported case of a B virus infection in a human spreading to another person, according to the CDC.

The novel coronavirus is also thought to have emerged from a "zoonotic" source, meaning it jumped from animals to people. But for the B virus, humans are a "dead-end," Dr. Nikolaus Osterrieder, dean of Jockey Club College of Veterinary Medicine and Life Sciences in Hong Kong, told the Post. "It's not jumping from one human to another human."

Still, Chinese health officials said the new report suggests that the virus "might pose a potential zoonotic threat" to people who work with monkeys; and so it is necessary to "strengthen surveillance in laboratory macaques and occupational workers in China."

Monkey B virus is different from monkeypox virus. Monkey B virus belongs to a family of viruses called herpesviruses — the same family that includes human herpes simplex 1, which typically causes cold sores, and herpes simplex 2, which causes genital herpes. Monkeypox virus, on the other hand, belongs to a family of viruses called orthopoxviruses, and is related to the virus that causes human smallpox.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 20 July 2021

<https://www.livescience.com>

### Delta variant now makes up 83% of new COVID-19 cases in US

2021-07-21

The SARS-CoV-2 delta variant now makes up 83% of new U.S. cases, Dr. Rochelle Walensky, the director of the Centers for Disease Control and Prevention, said on Tuesday (July 20) at a Senate hearing.

"This is a dramatic increase up from 50% the week of July 3," Walensky said. "In some parts of the country, the percentage is even higher, particularly in areas of low vaccination rates."

**But nearly two-thirds of U.S. counties have less than 40% of their residents vaccinated, Walensky said.**

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A total of 161.5 million people, or 48.6% of the total U.S. population, has been fully vaccinated, according to CDC data. But nearly two-thirds of U.S. counties have less than 40% of their residents vaccinated, Walensky said. "Areas with limited vaccine coverage are allowing for the emergence and rapid spread of the highly transmissible delta variant."

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But some areas with high vaccination rates, such as San Francisco, are also seeing a rise in cases, according to a state data tracker. Still, the vast majority of people who are currently hospitalized in San Francisco with COVID-19 have not been vaccinated, according to ABC7 News.

The delta variant, or B.1.617.2, was first discovered in India, but has now spread to more than 100 countries, according to the World Health Organization. Delta is thought to be around 60% more transmissible than the previous dominant strain, the alpha variant, Live Science previously reported.

In June, Dr. Anthony Fauci, the director of the National Institute of Allergy and Infectious Diseases, called the delta variant the "greatest threat," to the U.S. efforts to eliminate COVID-19, Live Science previously reported.

"The reason [delta is] so formidable is the fact that it has the capability of transmitting efficiently from human to human in an extraordinary manner well beyond any of the other variants that we've experienced up to now," Fauci said during the hearing on Tuesday. That's why delta has now become the dominant variant, he added.

"In areas where vaccine coverage is low, cases and hospitalizations are starting to climb again," Walensky said in the hearing. COVID-19 deaths in the U.S. have increased by nearly 48% over the past week to about 239 deaths per day, she said. "Each death is tragic and even more heartbreaking when we know that the majority of these deaths could be prevented with a simple, safe, available vaccine," Walensky said.

Current data indicates that vaccines work against the circulating variants in the U.S. (including the delta variant) and protect people against severe disease, hospitalization and death, she said. "The message from CDC remains clear: The best way to prevent the spread of COVID-19 variants, is to prevent the spread of disease," she said. "Vaccination is the most powerful tool we have."

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During the briefing, Fauci reiterated that the vaccines being used in the U.S. are highly effective at protecting people against delta, particularly in preventing hospitalizations and death.

Now, studies are being done to determine whether or not booster shots will be needed to increase the durability of protection against SARS-CoV-2. "We don't want people to believe" that the reason there's all this talk about boosters is because the vaccines aren't effective," Fauci said. "They're highly effective," and a booster may just be needed to increase the durability of that protection.

Experts have said that most people who are fully vaccinated against COVID-19 in the U.S. are strongly protected against the highly transmissible delta variant of the coronavirus, and likely do not need booster shots yet, Live Science previously reported. But people who are immunosuppressed may need boosters as part of their initial vaccination regimen, Fauci said.

Right now, it is of "extraordinary importance," to get as many people vaccinated as we possibly can, Fauci added.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 21 July 2021

<https://www.livescience.com>

### Seattle study of breast milk from 50 women finds chemical used in food wrappers, firefighting foam

2021-07-18

In August 2019, Vera Harrington put a quarter cup of her breast milk into the refrigerator. She gave this milk not to her daughter, Flora, but a team of researchers investigating a pervasive class of chemicals that have found their way into humans all over the world.

These chemicals are called Per- and polyfluoroalkyl substances — or PFAS — and have been used over the decades in products ranging from firefighting foams to cosmetics, nonstick pans, rain gear, stain-protected sofas, some types of fast food wrappers and even dental floss.

Harrington, who lives in an Eastlake town house in Seattle, was one of 50 Puget Sound area first-time mothers who participated in the study. This past April, she got the results, which documented nine types of PFAS in her breast milk.

**This past April, she got the results, which documented nine types of PFAS in her breast milk.**

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Harrington's cumulative tally of 146 parts per trillion was modestly higher than the median contamination levels of 121 parts per trillion for all 50 study participants. But for Harrington, now pregnant with her second child, the findings were jarring. Reading through the results, she wondered what might have been the sources of the chemicals in her breast milk, and how they could have been avoided.

A confidentiality cloak typically protects participants in clinical studies. Harrington decided she wanted to speak to The Seattle Times to help raise public awareness about PFAS chemicals.

"I was really really concerned, and upset. I started thinking ... I would have to buy new furniture, and it became kind of overwhelming," Harrington said. "Then I had this moment when I realized that I could do the best job I could, and I would still run into things out of my control. Then it just was really, really frustrating."

The potential health impacts of these chemicals is a focal point of ongoing research by the National Institutes of Health and other organizations. Though much has been learned during the past two decades, there still is uncertainty about impacts of some chemicals, and what levels pose significant health threats.

Some PFAS have been found in laboratory animals to pose increased risks of liver toxicity, reduced birthrates and disruption of the immune and endocrine systems.

The unsettling findings do not mean that mothers should shy away from breast feeding. The study co-authors and other health researchers say that the advantages of breast feeding, which include improved protection against infections and increased immune response, still far outweigh the risks that the chemicals pose to infants.

"Definitely, the evidence still shows that breast is best — there are so many benefits," said Dr. Sheela Sathyanarayana, a co-author of the study and professor at the University of Washington Medical Center whose research focuses on pediatric environmental health.

## Legacy of PFAS

The first PFAS were developed the middle of the last century. They now consist of a class of more than 4,000 chemicals and their breakdown components, many of them characterized by strong bonds between carbon and fluorine atoms that make them persist in the environment, and have gained them the nickname "forever chemicals."

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Some of the worst U.S. pollution has been documented in sites where PFAS was used in manufacturing, such as a Dupont plant in West Virginia that made Teflon. In 2017, DuPont and a spinoff company, Chemours, agreed to pay more than \$670 million to settle more than 3,500 lawsuits filed by Ohio and West Virginia residents who allege that PFAS pollution released into the air, ground and water had sickened them. The chemicals have been widely used in industries across the country and an Environmental Working Group study released last week — based on a review of federal data — identified almost 30,000 sites that potentially discharged PFAS.

In Washington, some water systems in Issaquah and Whidbey Island as well as Pierce and Spokane counties were found to have PFAS contamination from firefighting foams used in training. In Washington, new regulatory standards for these chemicals have been proposed for drinking water. Also, the Legislature has passed laws to phase out some products that contain PFAS.

"Washington is absolutely at the forefront. Our state is the first to pass legislation banning PFAS, as a class, in firefighting foam, and other states have followed our lead," said Erika Schreder, a co-author of the breast milk study and science director at Seattle-based Toxic-Free Future, a group that has advocated for new regulation.

These chemicals can make their way into the human body through many pathways, including food, food wrappers or drinking water as well as by breathing in dust and air inside buildings where stain protectants or PFAS-coated materials are present.

One survey indicated that they are now present, to some degree, in the blood of 98% of Americans. From the blood, PFAS migrates to tissues, moving through the placenta to the fetus and also into the milk that is for their nourishment.

The PFAS study of the 50 Puget Sound women was a cooperative effort involving researchers from Indiana University, the University of Washington's Children's Research Institute and Toxic-Free Future. Their findings went through peer review, and were published in a May edition of Environmental Science & Technology.

This study represented the first PFAS analysis of breast milk in U.S. women since 2004, and offered a mixed progress report.

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Two older chemicals that U.S. manufacturers no longer produce — PFOS and PFOA — were detected at less than half the levels found in a 2008 study. But both of these chemicals can linger in the body for years, and they still represented nearly 40% of the total PFAS contamination.

Meanwhile, new PFAS, with shorter chains of carbon molecules, are showing up at higher concentrations than in the earlier study, a trend also detected by researchers in other countries. Two of these, PFHxA and PFHpA, were detected in most of the milk samples of the Puget Sound-area women.

“These findings make it clear that the switch to newer PFAS over the last decade didn’t solve the problem,” said Dr. Amina Salamova, study co-author and associate research scientist at Indiana University. “This study provides more evidence that current-use PFAS are building up in people. What this means is that we need to address the entire class of PFAS chemicals, not just legacy-use variations.”

#### Moves to phaseout

The unfolding saga of PFAS pollution has prompted some companies to pledge to move away from using any of these chemicals, including eight fast-food and restaurant chains with more than \$130 billion in annual sales, according to Toxic-Free Future.

McDonald’s, for example, announced this year that by 2025 it would stop using PFAS — typically for grease resistance — in all packaging. The action came after a 2020 investigation by Toxic-Free Future and Mind-the-Store detected the presence of fluorines that suggested PFAS on a McDonald’s small fry bag, a Big Mac clamshell and a cookie bag, which resulted in a petition drive urging the fast-food chain to stop using PFAS.

In Olympia, Toxic-Free Future has lobbied for legislative action to curb the use of PFAS products, including a 2018 law that requires the Ecology Department to ban PFAS in food packaging as safer alternatives and cost-efficient alternatives are identified.

In a report released in February, the Ecology Department found substitutes for four of 10 packaging categories. That means those categories — wraps and liners, plates, pizza boxes and “food boats” used to serve up hot dogs — must be free of intentionally used PFAS by February 2023, according to Rae Eaton, an Ecology Department chemist.

The Ecology Department has embarked on a second round of assessments that is likely to result in more requirements for substitutes. The department

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also is developing protocols to test for PFAS before spreading biosolids — treated sewage effluents — on farm land.

Meanwhile, the state Department of Health, responding to a petition filed by Toxic-Free Future, is preparing to release proposed “action levels” for five PFAS chemicals in drinking water systems that cover most of the state’s population.

These levels range from just 10 parts per trillion for PFOA, the long-lived older chemical, to 345 parts per trillion for PFBS, which clears much more quickly from the human body, but has been shown to affect thyroids and development in mice.

If managers of a water system find PFAS levels that exceed these limits, then they must notify customers and continue surveillance, and would be eligible for state assistance to install filters that can capture the contaminants.

The standards are expected to be finalized this year and would be set low enough to protect someone who might be drinking this water over a lifetime.

“We need to be concerned with the biggest risks of exposure ... and we have to take protective action even when we don’t have all the information,” said Barbara Morrissey, the state Department of Health toxicologist who helped to develop the proposed standards.

#### Living with PFAS

Harrington has found no obvious red flags as she has investigated the potential sources of PFAS that ended up in her body.

Harrington is a marathon and trail runner who favors organic foods, although not exclusively. She was raised in Chicago, studied at Indiana University and made her way to Boston before she moved with her husband Neil Harrington to take a job in the tech industry.

In her study sample, the highest measurement was for PFOS, which was phased out of U.S. production in 2003. Still, it could have been used as a stain resistant on old furniture or an old rug in one of the buildings she has lived or worked in through the years.

And she also is taking a look around her condominium to try to spot current sources of PFAS contamination, such as a rocker she bought to nurse her daughter that could have a stain-resistant coating of a newer

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formulation PFAS and a carpet that was purchased by an earlier owner of the house.

"I didn't live my life trying to avoid these substances because I didn't know they were going to impact me and my future child," Harrington said.

Harrington is now preparing for the arrival of her second child, due in October, and plans once again to breast feed. She is considering abandoning the stain-resistant rocker she bought before her first pregnancy that now sits in her daughter's room. She also wants to do away with any chemical treatments when her carpets are cleaned.

By the time she starts breast feeding once again, she hopes that the PFAS contaminant levels will have eased.

"I think that everyone is left with a little bit of the unknowns," Harrington said.

seattletimes.com, 18 July 2021

<https://www.seattletimes.com>

### Curiosity rover discovers that evidence of past life on Mars may have been erased

2021-07-17

Evidence of ancient life may have been scrubbed from parts of Mars, a new NASA study has found.

The space agency's Curiosity rover made the surprising discovery while investigating clay-rich sedimentary rocks around its landing site in Gale Crater, a former lake that was made when an asteroid struck the Red Planet roughly 3.6 billion years ago.

Clay is a good signpost towards evidence of life because it's usually created when rocky minerals weather away and rot after contact with water — a key ingredient for life. It is also an excellent material for storing microbial fossils.

But when Curiosity took two samples of ancient mudstone, a sedimentary rock containing clay, from patches of the dried-out lake bed, dated to the same time and place (3.5 billion years ago and just 400m apart), researchers found that one patch contained only half the expected amount of clay minerals. Instead, that patch held a greater quantity of iron oxides, the compounds that give Mars its rusty hue. **PLAY SOUND**

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The team believes the culprit behind this geological disappearing act is brine: supersalty water that leaked into the mineral-rich clay layers and destabilized them, flushing them away and wiping patches of both the geological — and possibly even the biological — record clean.

"We used to think that once these layers of clay minerals formed at the bottom of the lake in Gale Crater, they stayed that way, preserving the moment in time they formed for billions of years," study lead author Tom Bristow, a researcher at NASA's Ames Research Center in Mountain View, California, said in a statement. "But later brines broke down these clay minerals in some places — essentially resetting the rock record."

The rover completed its analysis by drilling into the layers of the Martian rock before using its chemistry and mineralogy instrument, known as CheMin, to investigate the samples.

The process of chemical transformation in sediments is called diagenesis, and it could have created new life beneath Mars even as it erased some of the evidence of the old life on its surface, according to the study authors. So even though old records of life may have been erased in the brine patches, the chemical conditions brought about by the influx of salty water may have enabled more life to spring up in its place, the scientists said.

"These are excellent places to look for evidence of ancient life and gauge habitability," study co-author John Grotzinger, a geology professor at the California Institute of Technology, said in the statement. "Even though diagenesis may erase the signs of life in the original lake, it creates the chemical gradients necessary to support subsurface life, so we are really excited to have discovered this."

Curiosity's mission to Mars began nine years ago, but the rover has continued to study the Red Planet well past its initial two-year mission timeline, to establish the historic habitability of Mars for life. It is now working in collaboration with the new Perseverance Mars rover, which landed in February 2021 and has been tasked with collecting rock and soil samples for a possible return to Earth.

The research done by Curiosity has not only revealed how the Martian climate changed but also helped Perseverance determine which soil samples to collect to increase the odds of finding life.

"We've learned something very important: There are some parts of the Martian rock record that aren't so good at preserving evidence of the



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planet's past and possible life," co-author Ashwin Vasavada, a Curiosity project scientist at NASA's Jet Propulsion Laboratory in California, said in the statement. "The fortunate thing is, we find both close together in Gale Crater and can use mineralogy to tell which is which."

The search for life on Mars has been given fresh impetus by a new study that could have triangulated the possible location of the six methane emissions detected by the Curiosity rover during its time in Gale crater, Live Science reported. Since all of the methane in Earth's atmosphere comes from biological sources, scientists are thrilled to find the gas on Mars.

The researchers published their findings July 9 in the journal Science.

Originally published on Live Science.

livescience.com, 17 July 2021

<https://www.livescience.com>

### Nitrite "Poppers"

2021-07-15

Health care providers are reporting increases in deaths and hospitalizations related to intentional ingestion or inhalation of nitrite products for recreational use, including sexual experience enhancement.

Commonly referred to as "poppers," these products contain chemical substances similar to the prescription medication, amyl nitrite, which is prescribed for the relief of chest pain. However, poppers have not been evaluated by the FDA for safe use. These products are not safe to ingest or inhale.

Poppers are often packaged in small bottles similar to energy shot beverage products and commonly sold online, in adult novelty stores, and at other locations and are marketed as:

- air fresheners
- liquid incense
- deodorizers
- leather cleaners
- cosmetics

**However, poppers have not been evaluated by the FDA for safe use.**

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- solvents
- nail polish removers

"Make no mistake, ingesting or inhaling poppers seriously jeopardizes your health," Judy McMeekin, Pharm. D., Associate Commissioner for Regulatory Affairs, said. "These chemicals can be caustic and damage the skin or other tissues they come in contact with, cause difficulty breathing, extreme drops in blood pressure, decreases in blood oxygen levels, seizures, heart arrhythmia, coma, and death. Do not ingest or inhale under any circumstances."

Additionally, manufacturers are packaging and labeling these products in a way that may mislead consumers into thinking the poppers are safe or intended to be inhaled or ingested by drinking. They are often packaged in the same style of bottles as energy shots/drinks, and labeled with names like:

- Rush
- Super Rush
- Jungle Juice
- Locker Room
- Sub-Zero
- Iron Horse

"Don't be fooled. These poppers, often purchased online or in novelty stores, are unapproved products and should not be inhaled or ingested, regardless of how they are packaged, labeled or displayed," McMeekin said. "Used as a recreational drug, they can cause serious health issues. They are not worth your life."

If you think you are having a serious side effect that is an immediate danger to your health, call 9-1-1 or go to your local emergency room. To report a complaint or adverse event (illness or injury), you can

- Call an FDA Consumer Complaint Coordinator if you wish to speak directly to a person about your problem.
- Complete an electronic Voluntary MedWatch form online.

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- Complete a paper Voluntary MedWatch form and mail it to the FDA.

fda.gov, 15 July 2021

<https://www.fda.gov>

### The Amazon rainforest is officially creating more greenhouse gases than it is absorbing

2021-07-15

Forests absorb huge amounts of carbon dioxide (CO<sub>2</sub>) from Earth's atmosphere, making them a key part of mitigating climate change. But humans may have already rendered the world's largest rainforest useless in — and perhaps even detrimental to — the battle against greenhouse gases, a new study finds.

According to the study, published July 14 in the journal *Nature*, the Amazon rainforest is now emitting more than 1.1 billion tons (1 billion metric tons) of CO<sub>2</sub>, a greenhouse gas, a year, meaning the forest is officially releasing more carbon into the atmosphere than it is removing.

The carbon balance tipped due to "large-scale human disturbances" in the Amazon ecosystem, the researchers wrote in their study, with wildfires — many deliberately set to clear land for agriculture and industry — responsible for most of the CO<sub>2</sub> emissions from the region. These fires also reinforce a feedback loop of warming, the team found, with more greenhouse gases contributing to longer, hotter dry seasons in the Amazon, which lead to more fires and more CO<sub>2</sub> pollution.

The eastern Amazon, in particular — which has seen historically greater amounts of deforestation over the past 40 years — has become hotter, drier and more prone to fires than the rest of the rainforest, the researchers found. The result is greater amounts of greenhouse gas emissions from the region and fewer trees to suck up the carbon again through photosynthesis.

"The first very bad news is that forest burning produces around three times more CO<sub>2</sub> than the forest absorbs," lead study author Luciana Gatti, a researcher at Brazil's National Institute for Space Research, told *The Guardian*. "The second bad news is that the places where deforestation is 30% or more show carbon emissions 10 times higher than where deforestation is lower than 20%."

In the new study, the researchers analyzed nearly 600 CO<sub>2</sub> measurements from four sites in the Brazilian Amazon, collected with small aircraft from

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2010 to 2018. The team found that, on average, fires poured about 1.6 billion tons (1.5 billion metric tons) of CO<sub>2</sub> into the atmosphere each year, while healthy trees absorbed only about half a billion tons.

The team also found that, while the eastern Amazon has become a net source of carbon emissions, the western Amazon — which has seen much less deforestation — is neither a carbon source nor a carbon sink. There, CO<sub>2</sub> absorption by healthy forests balances the emissions from fires, the team wrote.

The Amazon basin contains about 2.8 million square miles (7.2 million square kilometers) of jungle, representing more than half of the tropical rainforest area remaining on Earth. Limiting deforestation, and especially wildfires, is key to reversing this dangerous trend in the Amazon.

"Imagine if we could prohibit fires in the Amazon — [the forest] could be a carbon sink," Gatti told *The Guardian*. "But we are doing the opposite — we are accelerating climate change."

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 15 July 2021

<https://www.livescience.com>

### One mutation may have set the coronavirus up to become a global menace

2021-07-12

A single change in a key viral protein may have helped the coronavirus behind COVID-19 make the jump from animals to people, setting the virus on its way to becoming the scourge it is today.

That mutation appears to help the virus' spike protein strongly latch onto the human version of a host protein called ACE2 that the virus uses to enter and infect cells, researchers report July 6 in *Cell*. That ability to lock onto the human cells was stronger with the mutated virus than with other coronaviruses lacking the change. What's more, the mutated virus better replicates in laboratory-grown human lung cells than previous versions of the virus do.

"Without this mutation, I don't think the pandemic would have happened like it has," says James Weger-Lucarelli, a virologist at Virginia Tech in Blacksburg. The coronavirus's global spread might have been less likely, he says.

**"Without this mutation, I don't think the pandemic would have happened like it has," says James Weger-Lucarelli, a virologist at Virginia Tech in Blacksburg.**

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Where exactly the coronavirus came from is still a mystery that researchers are trying to unravel (SN: 3/18/21). But figuring out how an animal virus gained the ability to infect people could help researchers develop ways to prevent it from happening again, such as with antivirals or vaccines, Weger-Lucarelli says.

The new findings hint that the mutation is important, but “it’s potentially one of multiple” changes that made the jump from animals to people possible, says Andrew Doxey, a computational biologist at the University of Waterloo in Canada who was not involved in the study. “It’s not necessarily the only mutation.”

Virologist Ramón Lorenzo Redondo agrees. The researchers employed an approach that is not typically used for viruses, says Redondo, of Northwestern University Feinberg School of Medicine in Chicago. That means the method may have overlooked other important mutations.

In the study, Weger-Lucarelli and colleagues analyzed more than 182,000 genetic blueprints of the coronavirus, looking for signs of mutations that might have helped the virus adapt to and spread among humans. The team compared changes in the building blocks, or amino acids, of the virus’ spike protein with four coronaviruses from bats or pangolins that don’t infect people. The scientists pinpointed one swap that replaced the amino acid threonine that is found in the animal viruses with the amino acid alanine that is found in the coronavirus that causes COVID-19.

The researchers predict that the mutation, named T372A, removes some sugars that coat the spike protein. Those sugars might be “getting in the way,” Weger-Lucarelli says, so removing them gives the virus better access to ACE2 to break into cells.

Experiments suggest that’s true. Once a virus with an alanine gets into laboratory-grown human lung cells, it replicates more than versions with threonine, the team found. In the future, the researchers plan to explore the role other mutations might have played to help an animal virus adapt to humans.

It’s unclear when the virus acquired the T372A mutation, says Arinjay Banerjee, a virologist with the Vaccine and Infectious Disease Organization at the University of Saskatchewan in Saskatoon, Canada, who was not involved in the study. A bat coronavirus with a threonine at that spot may have infected people first and then rapidly adopted an alanine, helping the virus transmit more efficiently among people. Or it’s possible that the alanine appeared in bats or in another animal before making the jump.

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“Those questions, I think, are still outstanding,” Banerjee says.

sciencenews.org, 12 July 2021

<https://www.sciencenews.org>

### This 20-inch-tall cow may be the smallest on Earth

2021-07-15

Thousands of visitors are herding themselves to a small farm in Bangladesh to see what may be the world’s shortest cow, according to news reports.

Rani, a fully grown 23-month-old Bhutanese cow, has been drawing crowds lately despite local COVID-19 restrictions. “I have never seen anything like this in my life,” visitor Rina Begum told BBC News.

The half-size heifer, which has recently become a social media sensation, is in the process of being verified by Guinness World Records as the world’s shortest cow, according to BBC News.

Rani stands a mere 20 inches (51 centimeters) tall, meaning that, once her measurements are verified, she will easily break the record set by Manikyam, a 24-inch-tall (61 cm) Vechur cow in India who is the current Guinness World Record holder. She’s also quite the lightweight, at just 57 pounds (26 kilograms).

So why is Rani so small?

One factor in Rani’s stature is her breed. Bhutanese cows, like Vechur cows, are typically referred to as dwarf cows, as individuals of these breeds are bred to be small. Dwarf cow breeds are often produced for their ability to produce large amounts of milk without requiring much food. For dwarf cow breeds, climate can play a role in the animals’ development. According to research conducted by Kerala Veterinary and Animal Sciences University and presented at the Steps to Sustainable Livestock International Conference in 2016, Vechur cows possess so-called thermometer genes that seem to stunt their growth in hot climates. These genes are favorable among breeds living in tropical climates, as smaller size likely helps the cows withstand extreme heat.

But Rani is special for being a particularly tiny example of an especially diminutive breed, suggesting that more than her breed is at play.

Sajedul Islam, the Bangladeshi government’s chief veterinarian for the region including Charigram, the town where Rani lives, told AFP as

**“I have never seen anything like this in my life,” visitor Rina Begum told BBC News.**

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reported by France24 that Rani is a product of “genetic inbreeding” and was unlikely to become any bigger. According to Cobie Rutherford, a beef cattle associate with Mississippi State University writing in the 2015 issue of Cattle Business in Mississippi, cows are typically bred on farms through the use of a technique called line breeding, wherein one bull sires many generations of cows. While this form of inbreeding tends to preserve and accentuate desirable traits, it can also reveal some undesirable traits, such as dwarfism.

According to a 1969 study published in the New Zealand Journal of Veterinary Medicine, dwarfism is well-documented in cows and depending on the breed, dwarfism can lead to either a shortening or elongation of the face as well as reduced life expectancy in affected animals. In the 1940s and 1950s, a form of dwarfism called snorter dwarfism became common among Hereford cows in the U.S. It turned out to be an autosomal recessive trait — that is, a gene that needs to be passed on from both parents in order to be expressed in offspring — that, if carried by the breeding bull, could be silently transmitted to his calves, according to a paper published in 1950 in the Journal of Heredity. This silent transmission becomes a problem when that same bull is bred with his own daughters, as is often the practice with line breeding, according to a factsheet on cattle inbreeding for Oklahoma State University.

There’s no way to know for sure whether inbreeding wholly explains Rani’s size. Ultimately, Rani’s potentially record-setting size might very well be a result of both inbreeding and the genetics of her particular breed.

Rani’s owner, Kazi Mohammad Abu Sufian, told the Washington Post that Rani is as timid as she is adorable. When not posing for pictures with her newfound fans, she prefers to spend much of her time alone, grazing away from other cows on the farm. Otherwise, Abu Sufian reports, Rani is a perfectly happy dwarf cow that likes to run “as fast as the rabbits we have on the farm.”

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 15 July 2021

<https://www.livescience.com>

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### Missing Antarctica microbes raise thorny questions about the search for aliens

2021-07-20

Even in the harshest environments, microbes always seem to get by. They thrive everywhere from boiling-hot seafloor hydrothermal vents to high on Mt. Everest. Clumps of microbial cells have even been found clinging to the hull of the International Space Station (SN: 08/26/20).

There was no reason for microbial ecologist Noah Fierer to expect that the 204 soil samples he and colleagues had collected near Antarctica’s Shackleton Glacier would be any different. A spoonful of typical soil could easily contain billions of microbes, and Antarctic soils from other regions host at least a few thousand per gram. So he assumed that all of his samples would host at least some life, even though the air around Shackleton Glacier is so cold and so arid that Fierer often left his damp laundry outside to freeze-dry.

Surprisingly, some of the coldest, driest soils didn’t seem to be inhabited by microbes at all, he and colleagues report in the June Journal of Geophysical Research: Biogeosciences. To Fierer’s knowledge, this is the first time that scientists have found soils that don’t seem to support any kind of microbial life.

The findings suggest that exceedingly cold and arid conditions might place a hard limit on microbial habitability. The results also raise questions about how negative scientific results should be interpreted, especially in the search for life on other planets. “The challenge comes back to this sort of philosophical [question], how do you prove a negative?” Fierer says.

Proving a negative result is notoriously difficult. No measurement is perfectly sensitive, which means there’s always a possibility that a well-executed experiment will fail to detect something that is actually there. It took years of experiments based on multiple, independent methods before Fierer of the University of Colorado Boulder and his collaborator Nick Dragone, finally felt confident enough to announce that they’d found seemingly microbe-free soils. And the scientists intentionally stated only that they were unable to detect life in their samples, not that the soils were naturally sterile. “We can’t say the soils are sterile. Nobody can say that,” Fierer says. “That’s a never-ending quest. There’s always another method or a variant of a method that you could try.”

Polar microbiologist Jeff Bowman interprets the team’s findings as a false-negative. “Certainly, there were things there,” says Bowman of the Scripps

**“The challenge comes back to this sort of philosophical [question], how do you prove a negative?” Fierer says.**

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Institution of Oceanography in La Jolla, Calif. "This is Earth. This is an environment that is massively contaminated with life."

Even if there were a few undetected microbes in the soil, said Dragone, that wouldn't undermine his team's evidence that cold and aridity pose a serious challenge to life. "It's the combination of multiple very challenging environmental conditions that restricts life more than just one acting by itself," says Dragone. "It's a very different sort of restriction than, say, just high temperature."

As scientists search for evidence of life beyond Earth (SN: 7/28/20), they will inevitably be forced to walk the line between evidence of absence and absence of evidence. "What we're trying to do on Mars is kind of the reverse of what we've tried to do on Earth," says polar microbiologist Lyle Whyte of McGill University in Montreal. On Earth, claiming that an environment is lifeless is a tough scientific sell. On Mars, it will be the other way around.

sciencenews.org, 20 July 2021

<https://www.sciencenews.org>

### **Pikas survive winter using a slower metabolism and, at times, yak poop**

2021-07-19

Winter on the Qinghai-Tibetan Plateau is unfriendly to pikas. Temperatures across the barren, windy highlands routinely dip below  $-30^{\circ}$  Celsius, and the grass that typically sustains the rabbitlike mammals becomes dry and brittle. It would seem the perfect time for these critters to hibernate, or subsist on stores of grass in burrows to stay warm, like the North American pika.

Instead, plateau pika (*Ochotona curzoniae*) continue foraging in winter, but reduce their metabolism by about 30 percent to conserve energy, researchers report July 19 in the Proceedings of the National Academy of Sciences. Some pikas also resort to unusual rations: yak poop.

Camera data from four sites confirmed that pikas regularly brave the cold to forage. "Clearly they're doing something fancy with their metabolism that's not hibernation," says John Speakman, an ecophysiologicalist at the University of Aberdeen in Scotland.

Speakman and colleagues measured daily energy expenditure of 156 plateau pikas in summer and winter, and implanted 27 animals with

**Some pikas also resort to unusual rations: yak poop.**

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temperature sensors. While many nonhibernating animals keep warm in winter by using more energy, these pikas did the opposite (SN: 1/22/14). On average, pikas reduced their metabolism by 29.7 percent, in part by cooling their bodies a couple degrees overnight. The animals were also less active, relative to summertime levels.

But at sites with yaks, pikas were more abundant but even less active. That puzzled the researchers "until we found a sort of half-eaten yak turd in one of the burrows," Speakman says. Eating excrement can cause sickness. But with few options, yak poop could be an abundant, easily digestible meal that "massively reduces the amount of time [pikas] need to spend on the surface," he says.

The researchers caught pikas scarfing scat on video, and DNA evidence from stomach contents solidified that this behavior is common. Whether dining on dung has downsides remains to be seen, but clearly, not being too picky pays off for pika.

sciencenews.org, 19 July 2021

<https://www.sciencenews.org>

### **Brain signals converted into words 'speak' for person with paralysis**

2021-07-14

A man unable to speak after a stroke has produced sentences through a system that reads electrical signals from speech production areas of his brain, researchers report today. The approach has previously been used in nondisabled volunteers to reconstruct spoken or imagined sentences. But this first demonstration in a person who is paralyzed "tackles really the main issue that was left to be tackled—bringing this to the patients that really need it," says Christian Herff, a computer scientist at Maastricht University who was not involved in the new work.

The participant had a stroke more than a decade ago that left him with anarthria—an inability to control the muscles involved in speech. Because his limbs are also paralyzed, he communicates by selecting letters on a screen using small movements of his head, producing roughly five words per minute. To enable faster, more natural communication, neurosurgeon Edward Chang of the University of California, San Francisco, tested an approach that uses a computational model known as a deep-learning algorithm to interpret patterns of brain activity in the sensorimotor cortex, a brain region involved in producing speech. The approach has so far

**Because his limbs are also paralyzed, he communicates by selecting letters on a screen using small movements of his head, producing roughly five words per minute.**

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been tested in volunteers who have electrodes surgically implanted for nonresearch reasons such as to monitor epileptic seizures.

In the new study, Chang's team temporarily removed a portion of the participant's skull and laid a thin sheet of electrodes smaller than a credit card directly over his sensorimotor cortex. To "train" a computer algorithm to associate brain activity patterns with the onset of speech and with particular words, the team needed reliable information about what the man intended to say and when.

So the researchers repeatedly presented one of 50 words on a screen and asked the man to attempt to say it on cue. Once the algorithm was trained with data from the individual word task, the man tried to read sentences built from the same set of 50 words, such as "Bring my glasses, please." To improve the algorithm's guesses, the researchers added a processing component called a natural language model, which uses common word sequences to predict the likely next word in a sentence. With that approach, the system only got about 25% of the words in a sentence wrong, they report today in *The New England Journal of Medicine*. That's "pretty impressive," says Stephanie Riès-Cornou, a neuroscientist at San Diego State University. (The error rate for chance performance would be 92%.)

Because the brain reorganizes over time, it wasn't clear that speech production areas would give interpretable signals after more than 10 years of anarthria, notes Anne-Lise Giraud, a neuroscientist at the University of Geneva. The signals' preservation "is surprising," she says. And Herff says the team made a "gigantic" step by generating sentences as the man was attempting to speak rather than from previously recorded brain data, as most studies have done.

With the new approach, the man could produce sentences at a rate of up to 18 words per minute, Chang says. That's roughly comparable to the speed achieved with another brain-computer interface, described in *Nature* in May. That system decoded individual letters from activity in a brain area responsible for planning hand movements while a person who was paralyzed imagined handwriting. These speeds are still far from the 120 to 180 words per minute typical of conversational English, Riès-Cornou notes, but they far exceed what the participant can achieve with his head-controlled device.

The system isn't ready for use in everyday life, Chang notes. Future improvements will include expanding its repertoire of words and making

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it wireless, so the user isn't tethered to a computer roughly the size of a minifridge

sciencemag.org, 14 July 2021

<https://www.sciencemag.org>

### These are the 5 biggest trends in sustainability, according to AI Gore's investment firm

2021-07-14

Over the last year, as the pandemic reshaped the economy, the world also started to reach tipping points on sustainability. Renewables produced more energy than fossil fuels in Europe. There are 7 million electric vehicles on roads. The world's biggest companies are committing to net-zero emissions. A new report from Generation Investment Management, the sustainability-focused investment firm founded by former Vice President AI Gore, takes a look at the landscape, pulling from more than 200 sources. Here are a few of the trends.

#### NET-ZERO GOALS ARE BECOMING THE NORM

More than three-quarters of the global economy is now covered by national commitments to reach net-zero greenhouse gas emissions by 2050. More than 2,000 companies have committed to net zero under the Race to Zero campaign. Some companies have gone a step further, like Microsoft, which plans to offset its historical emissions. Still, there's a risk that many governments and companies won't act quickly enough. The report notes that most don't yet have credible plans with near-term goals.

#### SUSTAINABLE INVESTMENT IS GROWING

Since 2015, the amount of money flowing to environmental, social, and governance (ESG) funds has grown tenfold. Venture capital and private equity deal flow related to sustainability has doubled. Deals and investments in "natural solutions," such as regenerative agriculture and plant-based meat, are growing. Investment in renewable energy may surpass upstream oil and gas investment this year. Investment in the circular economy, including digital resale platforms for used clothing, is growing. The percentage of the market cap coming from the green economy has tripled. The Net Zero Asset Managers initiative, an international group of asset managers launched last year, now has 128 signatories and \$43 trillion in assets under management that are aligned with a goal of net-zero emissions by 2050.

**There are 7 million electric vehicles on roads. The world's biggest companies are committing to net-zero emissions.**

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### NATURE IS UNDER THREAT, BUT NATURAL SOLUTIONS ARE GETTING MORE SUPPORT

A million species of plants and animals are at risk of extinction. The World Economic Forum estimates that \$44 trillion in economic value, more than half of the world's gross domestic product, is now at risk because of threats to nature. While many companies have climate goals, fewer have biodiversity goals. Some solutions, such as protecting forests, can help on both fronts, and are getting more investment. Other solutions are growing, such as plant-based meat, which can help reduce some of the huge amounts of land used for agriculture. Beef is still the largest reason that tropical rain forests are being lost.

### THE "15-MINUTE CITY" IS STARTING TO RESHAPE URBAN PLANNING

After Paris mayor Anne Hidalgo championed the 15-minute city—the idea that it should be possible for city residents to make most everyday trips in 15 minutes on foot or by bike—politicians in other cities, like Seattle, have started pushing for the same idea, which can make urban areas more livable while it cuts emissions from commuting. During the pandemic, many cities added bike lanes or closed some streets to car traffic; some of these changes will become permanent. As more companies allow remote work post-pandemic, the number of commuters driving to work is likely to shrink.

### WE NEED TO MOVE FASTER

The world isn't on track to cut emissions in half by 2030, a key step to keeping global warming under 1.5 degrees Celsius. Deployment of wind and solar power needs to happen eight times faster than current levels. Electric vehicle sales have to speed up 10 times faster. Green hydrogen, a type of renewable energy that can be used in industry or for heating or energy storage, needs to be rolled out 20 times faster. Overall, the energy transition needs to happen five times faster to stay on track.

[fastcompany.com](https://www.fastcompany.com), 14 July 2021

<https://www.fastcompany.com>

### Viral video captures fish tumbling from planes in Utah

2021-07-15

Last week, wildlife officials in Utah yeeted thousands of fish out of a plane and into 200 high-elevation lakes across the state.

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The Utah Division of Wildlife Resources (DWR) has been dumping fish out of airplanes since 1956, Live Science previously reported. In a video that went viral this week, fish can be seen bursting from the underside of a plane, carried downwards in a plume of water; the shiny animals then careen through the air towards the water's surface. The most common species dropped during these flights are various species of trout, a hybrid trout known as splake (*Salvelinus fontinalis*) and Arctic grayling (*Thymallus arcticus*), according to Live Science.

Although this method of restocking lakes may seem violent for the young fish, because the creatures are only 1 to 3 inches (2.5 to 7.6 centimeters) long at the time of release, the wind actually carries them down quite gently — like leaves fluttering in a breeze, Phil Tuttle, the outreach manager for the southern region office of the Utah DWR, told Live Science in 2018. About 95% of the fish are expected to survive each release.

During a single flight, the plane carries hundreds of pounds of water and can drop up to 35,000 fish, Utah DWR officials wrote on Facebook. Pilots fly just above the tree line while dropping the fish, or as low as possible while considering other natural barriers like cliffs and mountains, Live Science previously reported. Before the Utah DWR began using planes, people and horses would carry the fish up to the remote mountain lakes on foot; this journey proved more stressful for fish than being tossed from a zooming plane.

If the Utah DWR didn't restock its high-elevation lakes each year, the popular fishing spots would soon be entirely depleted of fish. The fish used for restocking are raised in hatcheries, and most are bred to be sterile to prevent a sudden population boom and ensure they have a minimal impact on native wildlife species.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 15 July 2021

<https://www.livescience.com>

### Endocrine disrupting chemicals are an "under-appreciated" diabetes risk factor

2021-07-19

We've long known that aspects of modern life — eating sugary foods or sitting for long stretches in front of the tv or steering wheel, for example — contribute to diabetes.

**But evidence is mounting that another facet of contemporary life—routine exposure to endocrine-disrupting chemicals—could be worsening the diabetes epidemic.**

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But evidence is mounting that another facet of contemporary life—routine exposure to endocrine-disrupting chemicals—could be worsening the diabetes epidemic. In a review article out last month in *Advances in Pharmacology*, researchers say it's vital that doctors and policymakers take environmental health into account as they seek to stem the global rise in diabetes.

"We often attribute patient's disease risk to individual choices, and we don't necessarily think about how systems and environments play into disease risk," Dr. Robert Sargis, lead author and an endocrinologist at the University of Illinois at Chicago, told EHN.

The new review article surveyed more than 200 animal, cell, clinical, and epidemiological studies, finding that exposure to endocrine disruptors is a "novel but under-appreciated" diabetes risk factor.

### Global uptick in diabetes

Diabetes has been on the rise globally — in 1980, 108 million people around the world had diabetes; now, more than 420 million people have the disease, according to the World Health Organization. While type 1 diabetes is an autoimmune disease that occurs when our bodies don't produce enough insulin, more common type 2 diabetes occurs when we develop resistance to insulin, a hormone produced by the pancreas that helps us convert sugar into energy.

Obesity, which has tripled around the world since 1975, is a main risk factor in developing type 2 diabetes.

Dr. Carolina Solis-Herrera, assistant professor of Medicine in the Division of Diabetes at the University of Texas Health at San Antonio, told EHN that family history is another risk. "If one of your parents has type 2 diabetes, your risk of developing diabetes over time is about 30 percent," she said. "And if both of your parents have type 2 diabetes, your risk can go up to 60 percent." Other conditions — like heart disease, high cholesterol, hypertension and polycystic ovary syndrome — can also put someone more at risk for developing diabetes.

The authors of the new review say that while calorie-rich diets, lack of exercise, sleeping issues, and genetic risk factors clearly play a major role in the diabetes epidemic, those factors fail to fully account for "the dramatic rise and spread" of diabetes.

How endocrine disruptors contribute to diabetes

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Over the past couple of decades, researchers have examined what role endocrine disruptors — chemicals that impact our bodies' hormone making system — have on diabetes. We come in contact with endocrine disruptors in items like receipts, contaminated food, and cosmetics, as well as by breathing in air pollution. Researchers have found, according to Sargis, that certain endocrine disruptors such as PCBs, arsenic, and DDT can impair our ability to make insulin, make us more insulin-resistant, and, in some cases, do both. Some endocrine disruptors, like BPA, have also been linked to obesity.

Dr. Ángel Nadal Navajas, a professor of physiology at the Miguel Hernandez University of Elche in Spain who was not involved with the study, told EHN endocrine disruptors alone don't cause diabetes "but exposure to endocrine disruptors increases (one's) probability of developing type two diabetes. It's one more factor, and for some people, it's going to be a major factor."

There have been extensive human studies linking BPA, a compound used in plastics and canned food lines that mimics estrogen hormones, to diabetes. "I don't think there is any doubt the connection is there," said Nadal Navajas.

There have also been epidemiological studies showing associations between diabetes and exposure to arsenic, organochlorine pesticides, air pollution, and other endocrine disruptors, according to the review. While some of endocrine disruptors looked at, like DDT, have been banned, they don't break down readily in the environment or in our bodies. The authors call for more research into how endocrine disruptors could affect type 1 and gestational diabetes, which occurs when glucose levels rise during pregnancy and puts both mother and child at a greater risk for type 2 diabetes.

In the U.S., Indigenous, Latinx, and Black people have a greater risk of developing diabetes, and of suffering complications from the disease. Some of these populations are also exposed to more to endocrine disruptors from air pollution and other sources because of where they live and what they do for work.

While this disproportionate exposure could be contributing to the higher levels of diabetes in these communities, it's difficult to tease out the link "because people who are exposed to endocrine-disrupting chemicals are also probably the same ones who have limited access to healthy food and limited access to health care," Dr. Lisa Goldman Rosas, an assistant



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professor of epidemiology and population health at Stanford University, told EHN.

With new chemicals coming out all the time with limited federal oversight, Sargis and Nadal Navajas both said we need to come up with better ways to test chemical safety en masse. Europe has already started doing that with a recent project to develop better ways to test the hormone-disrupting effects of new chemicals before they come onto the market.

In the meantime, doctors, and the medical schools that train them, need to better take into account environmental health components that could put patients at risk for developing diabetes, or influence their disease trajectory, said Sargis.

“We (tend to) approach medicine as a one-on-one relationship with the patient and the physician, and that sort of neglects these external factors,” he said, adding that this was in part because physicians have limited environmental health training.

ehn.org, 19 July 2021

<https://www.ehn.org>

### Lakes of liquid water at Mars' southern ice cap may just be mirages

2021-07-16

Maybe hold off on that Martian ice fishing trip. Two new studies splash cold water on the idea that potentially habitable lakes of liquid water exist deep under the Red Planet's southern polar ice cap.

The possibility of a lake roughly 20 kilometers across was first raised in 2018, when the European Space Agency's Mars Express spacecraft probed the planet's southern polar cap with its Mars Advanced Radar for Subsurface and Ionosphere Sounding, or MARSIS, instrument. The orbiter detected bright spots on radar measurements, hinting at a large body of liquid water beneath 1.5 kilometers of solid ice that could be an abode to living organisms (SN: 7/25/18). Subsequent work found hints of additional pools surrounding the main lake basin (SN: 9/28/20).

But the planetary science community has always held some skepticism over the lakes' existence, which would require some kind of continuous geothermal heating to maintain subglacial conditions (SN: 2/19/19). Below the ice, temperatures average  $-68^{\circ}$  Celsius, far past the freezing point of water, even if the lakes are a brine containing a healthy amount of salt,

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which lowers water's freezing point. An underground magma pool would be needed to keep the area liquid — an unlikely scenario given Mars' lack of present-day volcanism.

“If it's not liquid water, is there something else that could explain the bright radar reflections we're seeing?” asks planetary scientist Carver Bierson of Arizona State University in Tempe.

In a study published in the July 16 *Geophysical Research Letters*, Bierson and colleagues describe a couple other substances that could explain the reflections. Radar's reflectivity depends on the electrical conductivity of the material the radar signal moves through. Liquid water has a fairly distinctive radar signature, but examining the electrical properties of both clay minerals and frozen brine revealed those materials could mimic this signal.

Adding weight to the non-lake explanation is a study from an independent team, published in the same issue of *Geophysical Research Letters*. The initial 2018 watery findings were based on MARSIS data focused on a small section of the southern ice cap, but the instrument has now built up three-dimensional maps of the entire south pole, where hundreds to thousands of additional bright spots appear.

“We find them literally all over the region,” says planetary scientist Aditya Khuller, also of Arizona State University. “These signatures aren't unique. We see them in places where we expect it to be really cold.”

Creating plausible scenarios to maintain liquid water in all of these locations would be a tough exercise. Both Khuller and Bierson think it is far more likely that MARSIS is pointing to some kind of widespread geophysical process that created minerals or frozen brines.

While previous work had already raised doubts about the lake interpretation, these additional data points might represent the pools' death knell. “Putting these two papers together with the other existing literature, I would say this puts us at 85 percent confidence that this is not a lake,” says Edgard Rivera-Valentín, a planetary scientist at the Lunar and Planetary Institute in Houston who was not involved in either study.

The lakes, if they do exist, would likely be extremely cold and contain as much as 50 percent salt — conditions in which no known organisms on Earth can survive. Given that, the pools wouldn't make particularly strong astrobiological targets anyway, Rivera-Valentín says. (SN: 5/11/20).

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Lab work exploring how substances react to conditions at Mars' southern polar ice cap could help further constrain what generates the bright radar spots, Bierson says.

In the meantime, Khuller already has his eye on other areas of potential habitability on the Red Planet, such as warmer midlatitude regions where satellites have seen evidence of ice melting in the sun. "I think there are places where liquid water could be on Mars today," he says. "But I don't think it's at the south pole."

sciencenews.org, 16 July 2021

<https://www.sciencenews.org>

### What would happen if the moon were twice as close to Earth?

2021-07-18

In the 2003 Jim Carrey movie "Bruce Almighty," Carrey's character suddenly acquires God-like powers, and uses those powers to lasso the full moon and pull it closer to Earth to woo his beloved. Later in the movie, background shots show TV news reports about massive, unprecedented flooding around the world.

While the film is obviously fantastical, it does raise a question: What would happen if the moon were twice as close to Earth than it is today?

In fact, the flooding scenario from the movie isn't far from what might actually happen if the moon were suddenly much closer to Earth, said Neil Comins, a physicist at the University of Maine. The best-known effect of the moon is its gravitational pull on Earth's oceans, which results in two high tides and two low tides every day.

But if the moon were half the distance from Earth as it is now, the tides would be eight times higher, Comins told Live Science. Some islands would be completely underwater for much of the day, and populated coastlines would likely become uninhabitable because of the high tides, he added.

PLAY SOUND

But higher ocean tides wouldn't be the only result of a closer moon. The moon also has a tidal effect on Earth's land, Comins said.

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If the moon were suddenly twice as close to Earth, the effect would be like hitting a gong with a mallet, Comins said: Waves of energy would reverberate through the planet due to the sudden increased strength of the moon's gravitational pull.

And that sudden whack of gravity "would actually impact the Earth's crust, which means it might trigger more earthquakes, might trigger more volcanic eruptions," said Jazmin Scarlett, a historical and social volcanologist at the Queen Mary University of London.

Take, for example, Jupiter's moon Io, the most volcanically active world in the solar system, Scarlett said. Io's volcanism results from the push and pull from the gravity of Jupiter and two of its other moons. Earth might see a similar fate if the moon were suddenly half as close.

Along with all the sudden buckling of the planet's crust, Earth's spin would slow over time. This is because, as the moon's gravity pulls the oceans, the resulting friction between the ocean floor and water slows Earth's spin. Today, Earth's rotation is slowing by about one-thousandth of a second per century, Comins said. If the moon were half the distance away, Earth's rotation would slow even more, dragging out our days and nights.

If we were to survive the sudden earthquakes, volcanic eruptions, lengthening of days and nights, and higher tides, at least we'd get to see more frequent solar eclipses. Because the moon would cover a larger area of the sky, it would be more likely to pass in front of the sun from our perspective, Comins said. We'd even still be able to see the sun's corona (outer atmosphere) shining around the dark silhouette of the moon, but not as clearly, he added. Otherwise, the moon and its phases would look about the same, only bigger in the sky.

And what if the moon were to slowly spiral toward Earth, rather than just moving suddenly? The planet's crust and tides would shift more gradually, hopefully letting life adjust, Scarlett said. The longer days and nights could change our climate and drive evolutionary changes in multiple ways, Scarlett said. Animals would have to adapt to a brighter moon at night. For example, prey might have to learn how to hide better at night, as predators might have more light when hunting.

While a superpower-bestowing Morgan Freeman won't be the cause of an Earth-moon shake-up, could anything natural cause the moon to drift closer to Earth?

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This is wild speculation of course, but Comins decided on an answer: "If a sufficiently massive object passed close to the Earth-moon system, and the moon was in the right place of its orbit as this thing went by, this thing could potentially take energy from the moon, and that would cause it to spiral in closer to us," Comins said.

So it would take a massive asteroid whizzing by Earth at the exact right place at the exact right time to possibly push the moon toward us like a ball circling a drain. Of course, even if that did happen, it would still take many, many years for the moon to get half the distance away as it is now, so Earth wouldn't feel the effects right away.

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[livescience.com](https://www.livescience.com), 18 July 2021

<https://www.livescience.com>

### Will COVID-19 change science? Past pandemics offer clues

2021-07-13

Sixteen pandemic months have felt disorienting and arduous—but along the arc of human history, COVID-19 marks just another inflection point. Epidemics have punctuated humanity's timeline for centuries, sowing panic and killing millions, whether the culprit was plague, smallpox, or influenza. And when infections abate, their imprints on society can remain, some short-lived and some enduring.

In a series of news articles over the coming months, Science will consider how a new normal is emerging in the scientific world. Of course, COVID-19 is still with us, especially outside the minority of countries now enjoying the fruits of widespread vaccination. Still, as the pandemic enters a different phase, we ask how research may be changing, how scientists are navigating these waters, and in what directions they are choosing to sail.

Although the past may not presage the future, epidemic history illuminates how change unfolds. "Historians often say that what an epidemic will do is expose underlying fault lines," says Erica Charters, a historian of medicine at the University of Oxford who is studying how epidemics end. But how we respond is up to us. "When we ask, 'How does the epidemic change society?' it suggests there's something in the disease that will guide us. But the disease doesn't have agency the way humans do."

**And when infections abate, their imprints on society can remain, some short-lived and some enduring.**

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Past epidemics have spurred scientists and physicians to reconsider everything from their understanding of disease to their modes of communication. One of the most studied, the bubonic plague, tore through Europe in the late 1340s as the Black Death, then sporadically struck parts of Europe, Asia, and North Africa over the next 500 years. Caused by bacteria transmitted via the bites of infected fleas, the plague's hallmarks included grotesquely swollen lymph nodes, seizures, and organ failure. Cities were powerless against its spread. In 1630, nearly half the population of Milan perished. In Marseille, France, in 1720, 60,000 died.

Yet the mere recording of those numbers underscores how medicine reoriented in the face of the plague. Until the Black Death, medical writers did not routinely categorize distinct diseases, and instead often presented illness as a generalized physical disequilibrium. "Diseases were not fixed entities," writes Frank Snowden, a historian of medicine at Yale University, in his book *Epidemics and Society: From the Black Death to the Present*. "Influenza could morph into dysentery."

The plague years sparked more systematic study of infectious diseases and spawned a new genre of writing: plague treatises, ranging from pithy pamphlets on quarantines to lengthy catalogs of potential treatments. The treatises cropped up across the Islamic world and Europe, says Nükhet Varlık, a historian of medicine at Rutgers University, Newark. "This is the first disease that gets its own literature," she says. Disease-specific commentary expanded to address other conditions, such as sleeping sickness and smallpox. Even before the invention of the printing press, the treatises were apparently shared. Ottoman plague treatises often contained notes in the margins from physicians commenting on this or that treatment.

Plague and later epidemics also coincided with the rise of epidemiology and public health as disciplines, although some historians question whether the diseases were always the impetus. From the 14th to 16th centuries, new laws in the Ottoman Empire and parts of Europe required collection of death tolls during epidemics, Varlık says. Plague also hastened the development of preventive tools, including separate quarantine hospitals, social distancing measures, and, by the late 16th century, contact-tracing procedures, says Samuel Cohn, a historian of the Middle Ages and medicine at the University of Glasgow. "All of these things that a lot of people think are very modern ... were being devised and developed" back then. The term "contagio" took off, as officials and physicians sought to ascertain how plague was spread.

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Cholera, caused by a bacterium in water, devastated New York and other areas in the 1800s. It gave rise not only to new sanitation practices, but also to enduring public health institutions. “Statistics had proven what common sense had already known: In any epidemic, those who had the faintest chance of surviving were those who lived in the worst conditions,” historian of medicine Charles Rosenberg, now an emeritus professor at Harvard University, wrote in his influential book *The Cholera Years: The United States in 1832, 1849, and 1866*. To improve those conditions, New York City created its Metropolitan Board of Health in 1866. In 1851, the French government organized the first in a series of International Sanitary Conferences that would span nearly 90 years and help guide the founding of the World Health Organization in 1948. Cholera “was the stimulus for the first international meetings and cooperation on public health,” Rosenberg says now.

Meanwhile, efforts to decipher disease continued: Although physicians who eyed germs as culprits remained a minority in the mid-1800s, disease “was no longer an incident in a drama of moral choice and spiritual salvation,” but “a consequence of man’s interaction with his environment,” Rosenberg wrote. Fleas were identified as the carrier of plague during a global pandemic in the late 1800s and early 1900s, and the concept of insects as vectors of disease has influenced public health and epidemiology ever since.

A curious mix of remembering and forgetting trails many epidemics. Some quickly vanish from memory, says David Barnes, a historian of medicine at the University of Pennsylvania. The 1918 flu, which killed an estimated 50 million people worldwide but was also overshadowed by World War I, is a classic example of a forgotten ordeal, he says. “One would expect that that would be a revolutionary, transformative trauma, and yet very little changed” in its wake. There was no vast investment in public health infrastructure, no mammoth infusion of money into biomedical research. Although the 1918 pandemic did help spur a new field of virology, that research advanced slowly until the electron microscope arrived in the early 1930s.

In contrast, the emergence of HIV/AIDS in the 1980s left a potent legacy, Barnes says. A new breed of patient-activists fought doggedly for their own survival, demanding rapid access to experimental treatments. They ultimately won the battle, reshaping policies for subsequent drug approvals. But, “It wasn’t the epidemic per se—the damage, the death toll of AIDS—that made that happen,” Barnes says. “It was activists who were

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organized and persistent, really beyond anything our society had ever seen.”

It’s through this lens of human agency that Barnes and other historians contemplate COVID-19’s potential scientific legacy. The pandemic, like its predecessors, cast light on uncomfortable truths, ranging from the impact of societal inequities on health to waste in clinical trials to paltry investments in public health. Questions loom about how to buttress labs—financially or otherwise—that were immobilized by the pandemic.

In COVID-19’s wake, will researchers refashion what they study and how they work, potentially accelerating changes already underway? Or will what Snowden calls “societal amnesia” set in, fueled by the craving to leave a pandemic behind? The answers will come over decades. But scientists are beginning to shape them now.

[sciencemag.org](https://www.sciencemag.org), 13 July 2021

<https://www.sciencemag.org>

### Would dogs return the favor if you gave them treats? It’s complicated

2021-07-14

Dogs may not be inclined to return favors to people, at least when it involves food.

The result, published July 14 in *PLOS ONE*, is somewhat surprising since a previous study showed dogs will return favors in the form of food to other dogs. In other studies, dogs helped their owners when the people appeared to be trapped, and canines were able to distinguish between helpful and unhelpful people. So it seems reasonable to think dogs might reciprocate good deeds by humans.

To find out, comparative psychologist Jim McGettrick and colleagues at the University of Veterinary Medicine, Vienna trained pet dogs how to use a button to get food from a nearby dispenser. Each dog was then paired with a human, visible in an adjacent enclosure, who pressed the button to dispense food in the dog’s enclosure. On separate occasions, the dog was also paired with another human who didn’t press the button. When it was the dogs’ turn to offer food to their human partners, the canines were no more likely to press the button to provide food for the helpful human than for the stingy one.

**So it seems reasonable to think dogs might reciprocate good deeds by humans.**

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Why didn't dogs return the humans' food favors? It may be that they aren't willing to, or perhaps aren't able to form this sort of complicated tit-for-tat social contract with humans. Or, there's another possibility, the study authors note: The dogs simply may not have understood what was being asked of them, which could come down to how the experiment was designed.

Science News talked to McGetrick about the challenges of testing whether animals like dogs are capable of complex social behaviors. His answers have been edited for clarity and length:

SN: What aspects of the experiment may have influenced why a dog didn't return the favor for a human?

McGetrick: One possible explanation is the fact that dogs don't provide humans with food. We feed them all the time, but it's not something natural that they do. At the same time, dogs have been shown to reciprocate the receipt of food with other dogs [even though] adult dogs also don't normally provide food to other adult dogs. So, if one applies the argument that this is an unusual setup because dogs don't provide food to humans, I think one also needs to explain why it would be normal for a dog to provide food to another dog.

SN: If trading food wasn't the problem, what else could have been at play?

McGetrick: Another possible explanation for why they didn't reciprocate is that the setup is very abstract. In a lot of previous reciprocity studies, there were very clear physical mechanisms: You pull a rope which pulls a tray, or a box opens if you press a lever. The dog's physical connection with the mechanism is very obviously connected to the outcome, so that could be way easier for dogs to understand. In our case, we used the food dispenser where the connection was not that obvious. Having said that, the dogs all learned to press the button and get the food. What they understand about it is another question.

SN: Are there other elements of the experiment that the dogs might not have understood?

McGetrick: I'm not sure that the dogs understood that another individual was helping them. It seemed they certainly saw the human. But even if the dogs look, they might see the human's face, they might see the human's hand pressing the button, but they might never register that, "Oh, that's how I'm getting the food," or "Oh, the human is doing something for me." It's very difficult to know what they understand about the situation.

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SN: Do you plan to follow up on any of these possible explanations?

McGetrick: At the moment, we're running basically the same study but using dogs as the partners [rather than humans]. You can boil our result down to two possibilities. One is that there were methodological issues. Or this is just the answer to the question: Will dogs reciprocate help received from humans? And one way to really answer that is to test them with other dogs with this setup. With the same setup, we should see reciprocity with other dogs. And if we don't see reciprocity with other dogs as partners, then it would point more towards methodological issues.

SN: How difficult is it to settle on a design for an experiment?

McGetrick: These are very artificial setups where you're just trying to get at something real, something that reveals something about nature and reality. And there are maybe 100 of these tiny decisions you make along the way, and so many of them are just intuition. And those minor decisions you make could be the difference between a positive result or a negative result.

SN: Publishing negative results is somewhat uncommon. Why do you think it's important?

McGetrick: My feeling is that it's becoming more common, particularly in the field that I work in. If a study is designed well, structured well and addresses a question, there's no reason for it not to be published regardless of the result. And it is a big problem if results aren't published because they're negative; it hides a lot of important information. The result is the result. You can explain the reasons why you might have gotten that result, but it shouldn't really matter either way.

sciencenews.org, date

<https://www.sciencenews.org>

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Is cadmium a risk factor for breast cancer - results from a nested case-control study using data from the Malmö Diet and Cancer Study