

# Bulletin Board

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

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### ASIA PACIFIC

#### E-waste recycler under pressure from EPA before fire erupted

2020-08-12

The e-waste recycling centre in Melbourne's north that erupted in a massive toxic blaze earlier this week was under investigation by the environmental regulator for allegedly amassing an illicit stockpile of batteries and electronic equipment.

The Campbellfield premises of MRI e-cycle solutions, one of the state's largest e-waste operators, caught fire in the early morning hours on Sunday and burned for more than a day, sparking explosions heard kilometres away and spewing toxic smoke across the northern suburbs.

[Full Article](#)

The Age, 12 August 2020

<https://www.theage.com.au/national/victoria/e-waste-recycler-under-pressure-from-epa-before-fire-erupted-20200812-p55l2z.html>

22 October 2019

#### Australia releases extra guidance on categorizing chemicals at the nanoscale under AICIS

2020-08-07

The Australian Industrial Chemicals Introduction Scheme (AICIS) took effect on July 1, 2020. Under AICIS, companies that import or manufacture (including introduce) industrial chemicals, or products that release industrial chemicals, into Australia for commercial purposes should first check whether the industrial chemical is listed on the Inventory. If the chemical is on the Inventory and the introduction meets the terms of Inventory listing, the introduction is automatically categorized as a "listed" introduction. If the chemical is not listed, it must be categorized into one of five categories. On August 3, 2020, Australia published additional guidance for the introduction of industrial chemicals (and products that release industrial chemicals) with at least one external dimension in the nanoscale. Australia notes that if the chemical is a nano form of a chemical that is listed on the Inventory, "then it is only considered to be on our Inventory[] if the nano form has the same [Chemical Abstracts Service (CAS)] number as the bulk form of the chemical." The guidance

**The e-waste recycling centre in Melbourne's north that erupted in a massive toxic blaze earlier this week was under investigation by the environmental regulator for allegedly amassing an illicit stockpile of batteries and electronic equipment.**

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addresses what is a chemical at the nanoscale; whether the introduction is exempted, reported, or assessed; introductions of chemicals for use in research and development; introductions categorized using steps four through six of the categorization guide; and categorization outcomes.

The guidance states that nanoscale means the particle size range of one to 100 nanometers (nm). The introduction is a “specified class of introduction” if it is of a chemical that:

- Is introduced as a solid or is in a dispersion; and
- Consists of particles in an unbound state or as an aggregate or agglomerate, at least 50 percent (by number size distribution) of which have at least one external dimension in the nanoscale.

The guidance states that Australia has “an increased level of concern” for specified classes of introductions due to a greater potential for particular hazards or high levels of human or environmental exposure. According to the guidance, Australia’s increased level of concern for chemicals at the nanoscale “is because of uncertainty about the risks of some of these chemicals due to their potentially different properties, such as chemical reactivity, relative to the non-nanoscale forms of the chemicals.” This uncertainty requires either assessment by Australia or increased reporting or recordkeeping requirements. The guidance outlines the additional or different requirements arising from these concerns.

Nanotech.lawbc.com, 7 August 2020

<https://nanotech.lawbc.com/2020/08/australia-releases-extra-guidance-on-categorizing-chemicals-at-the-nanoscale-under-aicis/>

## AMERICA

### US EPA to regulate 1-bromopropane—Carcinogenic solvent poses risk to consumers and workers, agency concludes

2020-08-12

Within the next 2 years, the US Environmental Protection Agency will regulate certain uses of the carcinogenic solvent 1-bromopropane, the EPA says.

This follows the Aug. 11 release of the agency’s final risk assessment of 1-bromopropane which finds that the chemical poses unreasonable risk to the health of workers, consumers, and bystanders in more than a dozen

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of its uses. The conclusions are essentially the same as the EPA’s 2019 draft assessment.

New regulations under the Toxic Substances Control Act could involve restrictions or a ban on manufacture, processing, uses, or disposal of the chemical, the EPA says.

Most commercial uses of the chemical, in vapor degreasing, dry cleaning, adhesives, cleaners, and automotive care products, pose an unreasonable risk to workers through inhalation, the EPA says. At risk are workers who are in direct contact with 1-bromopropane as well as those who work nearby.

Consumers can inhale 1-bromopropane or absorb it through their skin when using products containing the chemical. These include aerosol spray degreasers and cleaners, adhesives uses in crafting, spot and stain removers, and automotive care products such as air conditioning system cleaners, the EPA says. People who aren’t using the product but are nearby can also be exposed via inhalation.

Environmental advocates fault the final risk assessment for failing to consider 1-bromopropane exposures and risks to the general public, such as through environmental contamination, a point that the EPA’s science advisers also raised.

[Full Article](#)

Chemical & Engineering News, 12 August 2020

<https://cen.acs.org/policy/chemical-regulation/US-EPA-regulate-1-bromopropane/98/i31>

### OEHHA proposes amendment to Proposition 65 on Exposures to Listed Chemicals in Cooked or Heat Processed Foods

2020-08-12

On August 4, 2020, the Office of Environmental Health Hazard Assessment (OEHHA) gave notice of their proposal to amend the Safe Drinking Water and Toxic Enforcement Act of 1986 (“Prop 65” or “the Act”) by adopting Section 25505 Exposures to Listed Chemicals in Cooked or Heat Processed Foods.

Under the existing regulation for naturally occurring chemicals in foods, a chemical is naturally occurring only to the extent that the chemical “did

**Currently, chemicals in food created by cooking or heat processing are not considered to be naturally occurring in Section 25501.**

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not result from any known human activity.” Currently, chemicals in food created by cooking or heat processing are not considered to be naturally occurring in Section 25501. However, this proposed amendment draws a distinction between exposures to listed chemicals in food that result from cooking or heat processing that cannot be feasibly avoided and those that can be feasibly avoided.

In its initial statement of reasons, OEHHA states that some degree of formation of listed chemicals in many foods is unavoidable when the foods are cooked or otherwise processed with heat and that the chemicals are byproducts of the processing, as opposed to being the intended result. Although OEHHA acknowledges that certain amounts of these chemicals are unavoidable, OEHHA added that in many circumstances, the level of the chemical formed can be lowered by optimizing certain practices.

The proposed amendment states that “a person who is otherwise responsible for an exposure to a listed chemical in food does not ‘expose’ an individual within the meaning of Section 25249.6 of the Act, to the extent that the chemical was created by cooking or other heat processing if the producer, manufacturer, distributor, or holder of the food has utilized quality control measures that reduce the chemical to the lowest level feasible.” As a result, the proposed amendment establishes maximum concentration levels for listed chemicals in foods that are produced by cooking or heat processing that are deemed by OEHHA to be the lowest levels currently feasible. Concentrations of a chemical at or below the level identified for the specified products would not require a warning.

Notably, the proposed amendment includes concentration levels for acrylamide in products, like bread, cookies, crackers, potato products, prune juice, and waffles, that are deemed to comply with the proposed amendment. We note that these levels do not relate to exposures that are below the safe harbor levels for these compounds. In addition to acrylamide, OEHHA also notes that it could add other foods or chemicals in future rulemaking.

The proposed amendment would not apply to parties to an existing court-ordered settlement or final judgment establishing a concentration of acrylamide in a specific product covered in that settlement or judgment. OEHHA is accepting comments on the proposed amendment until October 6, 2020.

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Full Article

National Law Review, 12 August 2020

<https://www.natlawreview.com/article/oehha-proposes-amendment-to-proposition-65-exposures-to-listed-chemicals-cooked-or>

**Utilities want to use EPA chemicals law to protect drinking water**

2020-08-10

A pair of water associations are teaming up to urge the EPA to use all its regulatory tools to safeguard drinking water as it decides whether to allow new chemicals into U.S. commerce.

The Association of State Drinking Water Administrators (ASDWA), which represents state, tribal, and territorial water agency officials, recently joined the Association of Metropolitan Water Agencies, which represents publicly owned metropolitan drinking water suppliers, to routinely flag their concerns about new chemicals to the Environmental Protection Agency.

The entry of public water officials into debates on the EPA’s decisions about new chemicals—ones that have never been made in or imported into the U.S.—is spurred by the growing recognition of the Toxic Substances Control Act’s (TSCA) potential to affect public health, the environment, numerous industries, and the economy. States are also wrestling with emerging contaminants like 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS), which get into drinking water sources.

The two water groups have met with the EPA’s chemicals office, which has responded to some of their requests to make it easier to find some of the agency’s environmental and other analyses, said Wendi Wilkes, ASDWA’s regulatory and legislative affairs manager. The EPA uses such analyses to decide whether a new chemical can be made or imported, and if, for example, its releases to water should be restricted or banned.

“We’re mostly trying to start a conversation,” said Stephanie Hayes Schlea, director of regulatory and scientific affairs for metropolitan water group known as AMWA.

The groups’ goal is to protect source water, senior staff from both associations said in a recent joint interview. Keeping problematic new chemicals out of water would help avoid higher water bills for ratepayers,

**States are also wrestling with emerging contaminants like 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS), which get into drinking water sources.**

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caused when water companies have to upgrade technologies to remove new kinds of pollutants, Schlea said.

Perspectives from groups like AMWA and ASDWA are a valuable part of the agency's efforts to improve its new chemicals program, EPA spokeswoman Molly Block said.

### Full Article

Bloomberg Law, 10 August 2020

<https://news.bloomberglaw.com/environment-and-energy/utilities-want-to-use-epa-chemicals-law-to-protect-drinking-water>

## EUROPE

### Scotland's environment could be 'seriously harmed' by plans for UK internal market

2020-08-13

Tough regulations which protect the quality of Scotland's water could be diluted by plans for a UK internal market, environmental campaigners have claimed.

The quality of Scotland's water could be hampered by UK Government plans for an internal market, a group of environmental charities has warned.

Boris Johnson wants to implement a uniform single market across the four UK nations to avoid internal trade barriers and simplify trade talks when Britain stops following EU regulations from next year.

But environmental experts have warned plans for an internal market could seriously harm Scotland's natural environment by "dragging down standards".

They claim Westminster proposals appear to be aimed at removing regulation and forcing all four nations to adopt the same rules.

### Full Article

Daily Record, 13 August 2020

<https://www.dailyrecord.co.uk/news/politics/scotlands-environment-could-seriously-harmed-22515099>

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### Shipping companies' bet on LNG as fuel is now reflected in environmental stats

2020-08-13

Shipping's emission of noxious greenhouse gas methane has increased by 150 percent in just six years. The increase is caused by the fact that more shipping companies use liquefied natural gas, LNG, as fuel. The shipping companies have been duped, says critic.

### Full Article

Shipping Watch, 13 August 2020

<https://shippingwatch.com/regulation/article12338785.ece>

## INTERNATIONAL

### Rotterdam convention committee to consider listing PFOA and decaBDE

2020-08-13

Experts will meet next month to discuss proposals to add perfluorooctanoic acid (PFOA) and decabromodiphenyl ether (decaBDE) to the UN's Rotterdam Convention, a move that government and NGO actors say would generate important data about the international trade of the substances.

The Convention's chemical review committee will consider the two substances at its 16th meeting, to be held virtually from 8-11 September.

Both PFOA and decaBDE were recommended for inclusion at the committee's last meeting in October 2019. However, at the time, there was debate about the scope of the listing of PFOA regarding how many and which of its salts and compounds should be included. Norway, whose notification along with Canada's prompted the committee to consider listing the substance, has since expanded its domestic regulations to include more PFOA-related substances. The committee will discuss the country's since-submitted expanded notification.

Discussions on decaBDE will centre on comments from committee members and other stakeholders about the draft recommendation that was agreed in October.

**The shipping companies have been duped, says critic.**

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Joe DiGangi, senior science and technical adviser for NGO network Ipen, said he expects the committee to recommend both substances for inclusion and for countries to agree to their addition to the Convention's Annex III at the next conference of parties in July 2021.

### Important trade

Chemicals listed in Annex III of the Rotterdam Convention are subject to the prior informed consent (Pic) procedure, meaning receiving countries must be informed of their import and are able to refuse them.

Both decaBDE and PFOA are already listed under the UN's Stockholm Convention on persistent organic pollutants (POPs), which requires countries to phase out their manufacture and use globally.

However, a number of exemptions are permitted for both of these substances. A listing in the Rotterdam Convention "could thus give valuable information about trade until these exemptions are no longer available," according to an official from the Norwegian Environment Agency.

Mr DiGangi agreed, adding that the "Rotterdam Convention is underutilised as a means to report and obtain information about chemical regulation and trade ... a listing in Annex III provides a prior informed consent procedure to enable countries to control their own borders – something that seemingly every country desires".

Exemptions to the Stockholm Convention usually last five years, Mr DiGangi said, but both decaBDE and PFOA have been granted "extraordinary" exemptions. For PFOA, use by a pharmaceutical company of one of its related substances – perfluorooctyl iodide – may not expire until 2036. And an exemption for decaBDE's presence in spare parts of vehicles will either expire at the end of the service life of existing vehicles or in 2036, whichever comes earlier.

In addition to the exemptions, Mr DiGangi pointed out that while Stockholm listings automatically apply to most countries that are a party to the Convention, some have an agreement that they must opt-in to the listing for it to apply to them.

### Full Article

Chemical Watch, 13 August 2020

<https://chemicalwatch.com/14399>

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### UN appoints new special rapporteur on toxics and human rights

2020-08-13

The UN Human Rights Council has appointed a new expert to monitor the impacts of toxic pollution on human rights around the world.

Marcos Orellana, a law professor and legal advisor, has taken over the position of special rapporteur on human rights and toxics. The mandate of the previous rapporteur, Baskut Tuncak, ended on 31 July.

Dr Orellana has worked as senior legal advisor to the presidency of the 25th conference of parties for the UN's framework convention on climate change, held by his home country, Chile. He has also advised UN agencies and governments on issues related to the Basel and Minamata Conventions and was the inaugural director of Human Rights Watch's environment and human rights division.

As special rapporteur, he plans to "underscore how exposure to dangerous substances is a fundamental human rights issue of massive implications worldwide," Dr Orellana told Chemical Watch. He will focus on "the plight of vulnerable groups. Those who are marginalised in society often receive the brunt of the impact from exposure to dangerous chemicals and wastes".

He cited as examples:

- children who have been "robbed of their youth as a result of disabilities";
- workers exposed to dangerous chemicals despite their company's knowledge of the substances' hazards; and
- the "environmental racism" of hazardous wastes dumped on the lands of indigenous peoples.

Dr Orellana will also push for a rights-based approach to implementing international treaties on chemicals, which have "so far ... offered a limited and rather timid response to the scale of the global threat posed by dangerous chemicals and wastes".

The chemicals industry has a role to play as well and "should realise its business is not sustainable unless it upholds its human rights responsibilities to prevent harm to human health and the environment".

"It is high time for governments and businesses to respect the rights to life, health, physical integrity and a healthy environment," he said.

**He will focus on "the plight of vulnerable groups."**

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Mr Tuncak, the previous rapporteur, will continue to work on issues of toxics and human rights as an attorney and technical consultant in the US and UK, he said. He will help governments “strengthen human rights-based approaches for environmental and occupational threats”, as well as “working with communities to secure access to justice and remedy for toxic exposures by foreign businesses”.

Four final reports from Mr Tuncak’s mandate, including one that will look at the progress made in the 25 years since the rapporteur’s position’s inception, will be available in the next few months.

### Full Article

Chemical Watch, 13 August 2020

<https://chemicalwatch.com/143767>

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## REACH Update

AUG. 21, 2020

### **Mandatory updating of REACH dossiers**

2020-08-12

In an article published on August 11, 2020, by the regulatory news provider *Chemical Watch*, editor Luke Buxton informed that “the European Commission is set to adopt new EU-wide deadlines on updates to REACH registrations in the autumn, meaning that “for the first time, industry is legally obligated to add any new relevant information to their dossiers within a set time period.”

The implementing regulation was drafted following “persistent issues with dossier non-compliance” (FPF reported). It was unanimously approved by member states on July 28, 2020, and its adoption “does not require scrutiny by the European Parliament and the Council of Ministers.” The regulation sets specific deadlines of up to 12 months to complete the updates. Deadlines are assigned depending on 13 reasons for updating as defined in the regulation.

### Full Article

Food Packaging Forum, 12 August 2020

<https://www.foodpackagingforum.org/news/mandatory-updating-of-reach-dossiers>

### **ECHA Consultation**

2020-08-14

We have launched a consultation on six applications for authorisation covering 11 uses of chromium trioxide and bis(2-methoxyethyl) ether (Diglyme). #EUHaveYourSay by 7 October.

ECHA, 14 August 2020

<https://t.co/zPj4U91FkR?amp=1>

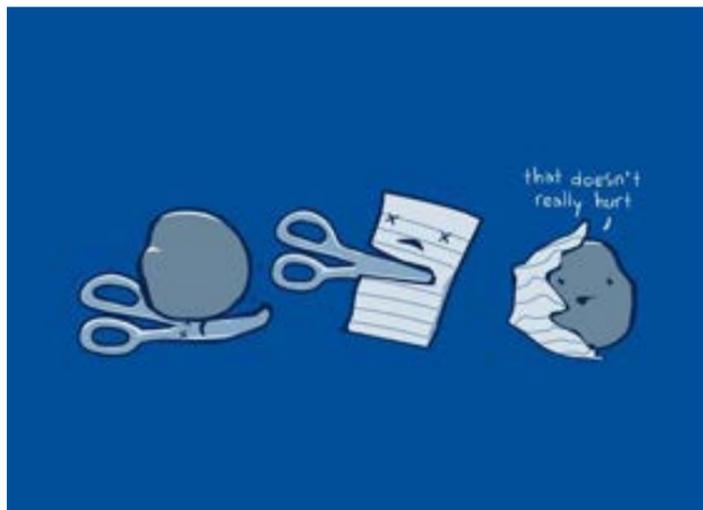
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## Janet's Corner

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### Rock Paper Scissors

2020-08-21



<https://www.pinterest.com.au/pin/546342998548613015/>

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## Hazard Alert

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### Asbestos

2020-08-21

Asbestos is the name given to a group of fibrous minerals that are heat and corrosion resistant, and do not conduct electricity. They are all naturally occurring and include amosite, chrysotile, crocidolite, tremolite, actinolite, and anthophyllite. Chrysotile (aka white asbestos), is the most common form of commercial asbestos. Asbestos is a known human carcinogen (category 1A), as classified by the EPA, the International Agency for Research on Cancer (IARC), and the U.S. Department of Health and Human Services (HHS). (1,2,3,4)

#### USES [2,3]

Asbestos is used in a wide range of applications. Asbestos is mainly mined for building materials, fiction products, and heat-resistant fabrics. Due to its significant negative health effects, the EPA banned all new uses of asbestos in 1989, however it can still be found in many buildings. It was also used for insulation (of hot water pipes, boilers and steam pipes), roofing, sound absorption, clutch pads, and in floor tiles, paints, adhesives and plastics.

#### ROUTES OF EXPOSURE [4]

- The main route of exposure for asbestos is inhalation.
- This is due to the asbestos fibres becoming airborne.
- Low levels of the fibres are present in the air, water, and soil. However, these do not usually affect people.
- Occupations, such as removing asbestos from buildings, can result in high levels of exposure to the fibres.

#### HEALTH EFFECTS

Asbestos poisoning affects a range of systems, including the respiratory system.

#### Acute Effects [3,4]

Severity of symptoms depend on the level and type of exposure.

Currently most asbestos-related diseases are caused by longer term exposure to the airborne fibres. However, mesothelioma can be caused by a shorter term exposure to asbestos. Symptoms may not show for decades

**Asbestos is the name given to a group of fibrous minerals that are heat and corrosion resistant, and do not conduct electricity.**

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after exposure, so if any of the symptoms develop, contact a medical professional: pain or tightening in the chest, weight loss, fatigue or anaemia, persistent cough that gets worse over time, shortness of breath, hoarseness, or blood in the sputum.

### Chronic Effects [4]

Asbestos is toxic to multiple body systems. Long term exposure to the airborne fibres can result in pleural plaques, progressive pleural effusion, and transpulmonary brands. It can also cause rounded atelectasis and asbestosis. Chronic effects of asbestos exposure also include cancer and malignant mesothelioma of the pleura and peritoneum.

### SAFETY

#### First Aid Measures [5]

- Ingestion: DO NOT INDUCE VOMITING. If a large amount of fibres are swallowed, get immediate medical attention.
- Skin contact: Immediately rinse affected areas with plenty of water, followed by soap and water for at least 15 minutes. Remove all contaminated clothing, footwear and accessories. Do not re-wear clothing until it has been thoroughly decontaminated. Contact a doctor immediately.
- Eye contact: Flush eyes (including under the eyelids), with water for at least 15 minutes. Get medical attention immediately.
- Inhalation: Take victim to the nearest fresh air source and monitor their breathing. Keep the victim warm. If the victim is not breathing, and you are qualified, you may perform CPR with a one-way valve or protective mask. Immediately contact a medical professional.
- General: Never administer anything by mouth to an unconscious, exposed person.

#### Exposure Controls/Personal Protection [5]

- Engineering controls: Emergency eyewash fountains and safety showers should be accessible in the immediate area of the potential exposure. Ensure there is adequate ventilation. Use a local exhaust ventilation (with a HEPA-filter dust collection system), or process enclosure, to limit the amount of asbestos fibres in the air.
- Personal protection: Safety glasses, protective and dustproof clothing, gloves, an apron and an appropriate mask or dusk respirator. For

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specifications regarding other PPE, Follow the guidelines set in your jurisdiction.

### REGULATION [5]

#### United States:

The Occupational Safety and Health Administration (OSHA) has set an 8-hour time weighted average (TWA) concentration limit for asbestos of 0.1 fibres/cc (cubic centimetre).

#### Australia [4]

Safe Work Australia has set an 8-hour time TWA for asbestos of 0.1f/mL.

### REFERENCES

1. <https://www.osha.gov/SLTC/asbestos/>
2. <http://www.home-air-purifier-expert.com/asbestos-msds.html#What%20is%20asbestos>
3. <https://www.cancer.gov/about-cancer/causes-prevention/risk/substances/asbestos/asbestos-fact-sheet>
4. [https://www.safeworkaustralia.gov.au/system/files/documents/2002/health\\_monitoring\\_guidance\\_-\\_asbestos.pdf](https://www.safeworkaustralia.gov.au/system/files/documents/2002/health_monitoring_guidance_-_asbestos.pdf)
5. <https://www.conncoll.edu/media/website-media/offices/ehs/envhealthdocs/Asbestos.pdf>

## Bulletin Board

## Gossip

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**The fertilizer that might have caused the Beirut explosion is all over the U.S. It's unevenly regulated**

2020-8-05

A powerful explosion that ripped through Beirut on Tuesday and killed more than 130 people may be the latest example of the danger posed by a common fertilizer stored in communities throughout the U.S.

As investigators work to find the official cause of the blast, Lebanon President Michel Aoun said it was fueled by an estimated 2,750 metric tons of ammonium nitrate that was stored unsafely in a warehouse.

Ammonium nitrate, used by farmers as fertilizer, has been a key component of catastrophic industrial accidents and terrorism, including the 2013 blast at an agricultural-products retailer that killed 15 and injured 260 people in Texas, and the 1995 bombing of the Alfred P. Murrah Federal Building in Oklahoma City that killed 168.

A 2020 Center for Public Integrity investigation found uneven oversight of the chemical in the United States, even after efforts to strengthen federal rules.

In Beirut this week, the explosion touched off a towering mushroom cloud and injured about 5,000. The death toll may rise: Emergency responders are still scouring the rubble for survivors.

"I lost my hearing for a few seconds, I knew something was wrong, and then suddenly the glass just shattered all over the car, the cars around us, the shops, the stores, the buildings. Just glass going down from all over the building," eyewitness Hadi Nasrallah told the BBC.

The 2013 explosion in Texas forced U.S. authorities to re-examine federal rules meant to prevent such accidents. Then-President Barack Obama released an executive order that pushed officials to reduce the risks of hazardous chemicals, but agricultural businesses lobbied to block broad amendments to the U.S. Environmental Protection Agency's risk management program.

When the EPA finally released its Chemical Disaster Rule, it didn't add ammonium nitrate to the list of "highly hazardous" chemicals. Many safety advocates said the regulations were too soft on chemical manufacturers and users, but conceded the changes were at least a slight improvement from previous rules.

**A 2020 Center for Public Integrity investigation found uneven oversight of the chemical in the United States, even after efforts to strengthen federal rules.**

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When President Donald Trump took office, his administration weakened the oversight with a "reconsideration rule" that removed third-party audits and safer-technologies assessments — a move the EPA said would save industry \$88 million.

Bottom of FormThe estimated damage from the Texas explosion: \$200 million.

The Trump administration has also tried to eliminate the agency that investigates industrial accidents like that one. Though President Donald Trump has not been able to persuade Congress to defund the Chemical Safety and Hazard Investigation Board, he's kept it from releasing its reports by not filling the board's four vacant seats, Public Integrity reported.

Federal laws say the public has a "right to know" if ammonium nitrate and other dangerous chemicals are stored in their community. But exercising that right is sometimes impossible, complicated by a wildly inconsistent patchwork of state laws.

The same information that's publicly available in Nebraska is a state secret in Texas. In Iowa, the public can get a list of ammonium nitrate facilities on a government website. In Kentucky? Nothing.

In states withholding the information, the rationale is to keep terrorists from finding out where the operations are located. But that means firefighters and other members of the public are also in the dark.

[publicintegrity.org](https://www.publicintegrity.org), 5 August 2020

<https://www.publicintegrity.org>

**This was the largest conventional explosion America ever set off**

2020-08-06

The massive explosion at the Port of Beirut in Lebanon yesterday quickly drew comparisons to a nuclear bomb going off, especially due to the huge shockwave and mushroom cloud it produced, despite those being characteristics of any large detonation. In fact, the United States and others have used very large amounts of conventional explosives over the years to simulate the effects of a nuclear weapon without the complexities and environmental concerns associated with actually setting one off.

**The 4,744 tons of ANFO, placed inside a fiberglass dome and detonated at ground level, produced a blast equivalent to just over four kilotons of TNT.**

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The largest of these – which was the biggest single deliberate conventional explosive detonation ever – was a test on June 27, 1985, called Minor Scale, that involved detonating 4,744 tons of ammonium nitrate/fuel oil (ANFO) explosive at the Permanent High Explosive Testing Grounds (PHETG), situated within the U.S. Army's White Sands Missile Range in New Mexico. For comparison, Lebanese authorities say that around 2,750 tons of pelletized ammonium nitrate was a key contributor to the blast in Beirut, which, as Hans Kristensen, the Director of the Nuclear Information Project at the Federation of American Scientists noted, is less than two thirds the basic weight of the explosive pile assembled for Minor Scale.

The Defense Nuclear Agency (DNA), which eventually morphed into the present-day Defense Threat Reduction Agency (DTRA), conducted Minor Scale to gather data on how a nuclear explosion might affect various pieces of military hardware, including the Hard Mobile Launchers for the then-in-development MGM-134A Midgetman intercontinental ballistic missile.

The 4,744 tons of ANFO, placed inside a fiberglass dome and detonated at ground level, produced a blast equivalent to just over four kilotons of TNT. DNA's intent was to roughly simulate the effects of a nuclear warhead with an eight kiloton yield air-bursting over the target area.

The previous record-holder for largest planned single explosive detonation had been an event nicknamed the "British Bang" in Germany's Heligoland archipelago in the North Sea, which the U.K. government had gained control of following the end of World War II. Evacuated of its residents during the war and used primarily as a bombing range immediately after, the Royal Navy disposed of approximately 4,000 tons of surplus munitions by blowing them up on one of the islands on April 18, 1947. The force of the blast was roughly equal to 3.2 kilotons of TNT and created a large crater dubbed the Mittelland. The United Kingdom returned the islands to Germany in 1952.

The Minor Scale test was only one of a number of conventional explosions used to simulate nuclear weapons effects that the United States, as well as Canada and Australia, carried out starting the 1950s. These included the Sailor Hat tests that the U.S. Navy executed between November 1964 and June 1965.

The first of these was Sailor Hat Alpha, an underwater detonation in the Pacific Ocean near San Clemente Island off the coast of Southern California, which used a charge that produced the same blast effect as 20

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tons of TNT. The remaining three tests all involved explosive piles, each one of which with an approximate yield of 500 tons of TNT, on land at Smuggler Cove on the Hawaiian island of Kaho'olawe.

After the Minor Scale test, the Defense Nuclear Agency had said it did not intend to carry out any future detonations that would involve a larger explosive pile. "Future tests are not expected to get bigger than Minor Scale," a 1986 report on the test said. «There are no plans for a test called Major Scale.»

However, this kind of testing did still continue after Minor Scale. Another particularly large Defense Nuclear Agency test, called Misty Picture, took place at the PHETG at White Sands on May 17, 1987. This involved the detonation of 4,685 tons of ANFO and produced a blast equivalent to just under 4 kilotons of TNT.

One of the last planned such explosive tests was one known as Divine Strake, which DTRA, the Defense Nuclear Agency's successor, planned to carry out in 2006. This was to involve setting off 700 tons of ANFO inside a tunnel at the Department of Energy's Nevada Test Site ostensibly to help in the development of deep-penetrating conventional weapons to defeat facilities involved in the production and storage of weapons of mass destruction.

The agency insisted that the event was not related in any way to nuclear effects testing, despite the obvious potential value in the development of bunker-busting nuclear weapons, as highlighted in a number of press reports at the time. In 2007, DTRA formally canceled the test in the face of controversy over its intended purpose and concerns that it could launch radioactive dust, leftover from previous nuclear testing at the Nevada Test Site, into the atmosphere.

"I have become convinced that it's time to look at alternative methods that obviate the need for this type of large-scale test," then-DTRA Director Dr. James Tegnalia said in a statement on Feb. 22, 2007. «This decision was not based on any technical information that indicates the test would produce harm to workers, the general public, or the environment,» an accompanying DTRA press release said.

No matter what Divine Strake's actual intended purpose might have been, it, along with Minor Scale and these other tests, all remind us of the

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immense destructive power that conventional explosives can produce, as was on full display during the recent tragic events in Beirut.

thedrive.com, 6 August 2020

<https://www.thedrive.com>

### Dogs can be 'early-warning systems' for toxic chemical exposure at home

2020-06-10

More than 10,000 years of domestication have made dogs strikingly similar to humans, from their ability to read facial our expressions to our closely related genomes. Now, a new study reveals that dogs and humans carry the same toxic chemicals in their bodies—a discovery that could possibly improve human health.

Many everyday items, from food packaging to cosmetics, contain harmful substances, such as pesticides; flame retardants; and phthalates, which are used to soften plastic. Long-term, chronic exposure to these three common chemical groups has been linked to diseases in people, including several types of cancer.

Since dogs are much like us, and share the same living space, scientists conducted the first investigation into how industrial chemicals impact humans and pet dogs living in the same household.

Using silicone wristbands and collars—a relatively new technology for detecting chemical exposure—the team found remarkable similarities between dogs and their owners' chemical loads, according to the study, published recently in the journal *Environmental Science and Technology*.

These results are encouraging, says study leader Catherine Wise, because they show dogs can act as early-warning systems for human health, providing valuable clues about the detrimental effects of these exposures. ([Read more about the chemicals inside our bodies.](#))

It often takes decades for chemical-related diseases to manifest in people, but the impact on pets may only take several years, says Wise, a Ph.D. candidate at North Carolina State University. So, for example, if scientists found that phthalates consistently led to cancer in dogs, they could offer guidance for people to be more vigilant in their exposure to plastics.

**Long-term, chronic exposure to these three common chemical groups has been linked to diseases in people, including several types of cancer.**

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Wise adds that her research is particularly relevant now, due to the coronavirus pandemic.

"When most of us are stuck at home with our dogs a lot longer," she says, the importance of "our shared environment has never been so great as it is today."

### Canine in the coal mine

That chemical exposures would affect our pets isn't all that shocking, but what no one knew was how closely correlated these exposures were, nor how they played out over a pet's life span, says study co-author Matthew Breen, an expert in canine cancer at North Carolina State.

"Dogs have very similar cancers, so would it not make sense that also the dogs could be in this situation because they also share the same environment?" Breen says. "A dog breathes the same air and drinks the same water, and when we throw a ball across the park, a dog runs across the same herbicide-treated grass."

For the study, Breen and Wise mailed silicone wristbands and collar tags to 30 human-dog pairs in New Jersey and North Carolina, and asked the study subjects to wear them for five days in July 2018. The participants then mailed the items back to Wise and Breen, who soaked the wristbands and tags in a chemical solvent to extract the collected compounds.

The pollutant levels were alike in dogs and humans; for instance, the scientists found a type of polychlorinated biphenyl (PCB) in 87 percent of human wristbands and 97 percent of dog tags. These chemicals were once widely used as electronic coolant fluids and in a variety of industrial processes before the U.S. government banned their use in 1979. ([Learn about PCB contamination in orcas.](#))

The silicone is so effective because it passively absorbs chemicals in a similar manner to human cells, giving scientists an idea not only of the chemicals a person contacts while they wear the bracelet, but also how much. Previously, scientists could only measure chemicals found in blood and urine, says Kim Anderson, an environmental toxicologist at Oregon State University, who developed the wristband technology.

"You and I can be exposed to the exact same thing at the exact same time and that will appear in our urine very differently," Anderson says, making it hard to understand just how much of a chemical a person was exposed to.

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But Anderson cautions that these types of studies can't prove that a particular compound causes a specific outcome: They can only show associations.

### Chemical connections

Such research builds on previous work in other animals, including horses and cats. In 2019, Anderson found an association between flame retardants and a disease in cats known as feline hyperthyroidism. That may be because cats like to rest on upholstered furniture, which often contains flame retardants.

Anderson has also adapted the silicone wristband into a necklace for horses, and published a study in April showing a strong link between sick foals and chemicals released by a nearby hydraulic fracturing operation in Pennsylvania.

Now that Wise and Breen have established this connection in dogs, they plan to use the same method to study how chemicals are connected to bladder cancer in dogs. Previous research has found links between a dog's exposure to lawn herbicides and developing bladder cancer.

That is, once lab work starts up again. Right now, Wise is still at home chasing after her rescue dog, Simbaa. "She does keep me company and makes cameos in Zoom meetings, although she has to compete for the spotlight with our two cats, Loki and Nebula."

[nationalgeographic.com](https://www.nationalgeographic.com), 10 June 2020

<https://www.nationalgeographic.com>

### Extreme droughts in central Europe likely to increase sevenfold

2020-08-07

Extreme droughts are likely to become much more frequent across central Europe, and if global greenhouse gas emissions rise strongly they could happen seven times more often, new research has shown.

The area of crops likely to be affected by drought is also set to increase, and under sharply rising CO2 levels would nearly double in central Europe in the second half of this century, to more than 40m hectares (154,440 sq miles) of farmland.

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Central Europe suffered its biggest and most damaging drought on record in 2018 and 2019, which had two of the three warmest summer periods ever recorded on the continent. The summers were also much drier than average, and more than half of the region suffered severe drought conditions.

Rivers and watercourses dried up, some crops were ruined and wildfires increased during these two years of extreme drought. The only other drought on record to come close, in 1949 and 1950, affected a land area about a third smaller.

By comparing the conditions with weather records dating back to 1766, and using computer models of climate change, researchers from UFZ-Helmholtz Centre for Environmental Research in Leipzig, Germany, were able to forecast that moderate reductions in greenhouse gases from their current levels would halve the likelihood of such extreme droughts, and shrink the affected land area by nearly 40%.

Rohini Kumar, one of the authors of the study, told the Guardian the findings were concerning. "The findings indicate that introducing measures to reduce future carbon emissions may lower the risk of more frequent consecutive drought events across Europe. On the one hand, we need to step up our efforts to reduce greenhouse gases worldwide, and at the same time deal with strategies to adapt to climate change."

Strong reductions in greenhouse gases would reduce the frequency of such extreme droughts to "a very negligible number", said Kumar.

The paper is published on Thursday in the journal *Scientific Reports*.

The study adds to an increasing body of research showing the impacts of global heating on Europe. Previous studies have suggested that southern and central Europe will experience more drought, with one study projecting that European cities will become much hotter, with London forecast to have a climate more like Barcelona by 2050 and southern and central European cities seeing more extreme levels of heat.

Constantin Zohner, of the Crowther Lab at the Swiss Federal Institute of Technology in Zurich, who was not involved in the research, said the study showed the consequences of failing to curb greenhouse gas emissions.

"[These] findings are an important warning to the world that continued emissions will strongly exacerbate future drought events, threatening ecosystems, agriculture and human wellbeing," he told the Guardian. "The study, once more, highlights the urgent need for climate action in order

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to maintain the functionality of ecosystems and ensure water supply to future generations.”

theguardian.com, 7 July 2020

<https://www.theguardian.com>

### The end is nearer for ‘forever chemicals’ in food chemicals

2020-08-07

THE CONTAINERS THAT hold your takeout dinner may harbor an invisible threat: fluorinated compounds that persist in our bodies long after we ingest them. They are among almost 5,000 perfluoroalkyl and polyfluoroalkyl substances, or PFAS, a class of chemicals that have been associated with health hazards that include liver damage, birth defects, cancer, and impaired immunity.

PFAS repel grease, oil, and water—properties that have come in handy for a wide range of uses since the chemicals were first created in the 1940s. For decades, they have kept food from sticking on pans, hot oil from burning a hole in the microwave popcorn bag, and grease from leaking out of pizza boxes and burger wrappings. The bond between chains of carbon and fluorine atoms is extraordinarily sturdy, which means the compounds persist in the environment and can accumulate in humans and animals. PFAS have been found in the blood of nearly every American tested, according to the Centers for Disease Control and Prevention.

Last week, the US Food and Drug Administration announced a voluntary agreement with three manufacturers of chemical products used in food packaging to phase out a PFAS called 6:2 fluorotelomer alcohol, or 6:2 FTOH. (A fourth manufacturer joined the agreement but had already stopped selling the products.) The move comes as food retailers face growing pressure to switch to PFAS-free packaging. Companies as varied as Taco Bell and Whole Foods have vowed to be proactive in seeking wrappings and containers without the chemicals.

“This action follows new analyses of data that raised questions about potential human health risks from chronic dietary exposure—findings that warrant further study,” FDA commissioner Stephen Hahn and Susan Mayne, director of the FDA’s Center for Food Safety and Applied Nutrition, wrote in a statement. “This phase-out balances uncertainty about the potential for public health risks with minimizing potential market

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disruptions to food packaging supply chains during the Covid-19 public health emergency.”

Earlier this year, FDA scientists published rodent studies showing that 6:2 FTOH breaks down into a metabolite that persists in blood plasma and body tissues. FDA scientists also analyzed toxicity data and found evidence of liver, kidney, immune, and reproductive effects related to the compound in rodents. The new findings contradict some previous assumptions about how 6:2 FTOH acts in the body, the scientists wrote, and previous assessments “may significantly underestimate the risk to human health.”

The FDA doesn’t consider all PFAS to be hazardous, and there’s no immediate health risk from the existing products, agency spokesperson Peter Cassell told *WIRED*. The phase-out will take up to five years. Beginning in January 2021, manufacturers have three years to wind down production, and then existing products can still be used for another 18 months. The FDA will monitor the progress in reducing the use of 6:2 FTOH and will continue to study PFAS.

The FDA action received muted praise from environmental health advocates and scientists. “I’d say it’s better than nothing. It’s a step in the right direction,” says Linda Birnbaum, a toxicologist and former director of the National Institute of Environmental Health Sciences.

Removing these “forever chemicals” from the food supply has long been a goal of consumer and environmental health advocates. Their pervasiveness became clear through a 2017 study led by environmental chemist Laurel Schaidler at Silent Spring Institute in Newton, Massachusetts, a research group that focuses on environmental health risks. Her study involved tests of about 400 fast-food containers from around the US. The scientists detected fluorine, an indicator of the presence of PFAS, in 38 percent of sandwich and burger wrappers and 56 percent of bread and dessert wrappers.

But it isn’t just the likelihood that people could be exposed to these chemicals through eating fast food that concerns Schaidler. “Those chemicals live on. They go into a landfill. They have the potential to end up in the environment,” she says.

The FDA has previously rolled back the use of PFAS. The agency took a similarly negotiated approach in 2011 when it worked with manufacturers of food packaging substances to voluntarily stop using a kind of PFAS with chains of eight carbon atoms or more—a version thought to be more

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hazardous to health. At the time, agency officials noted [in a statement](#) that “studies indicate that these C8 compounds persist in the environment and can have toxic effects on humans and animals.”

Schaider and colleagues found evidence of that persistence last year when [they analyzed data on blood levels](#) of certain long-chain forms of PFAS and linked them to dietary information. The data came from the US National Health and Nutrition Examination Survey, which conducts lab tests and surveys of 5,000 people each year. People who reported [eating microwave popcorn](#) every day had 39 percent to 63 percent higher blood levels of the five types of PFAS studied, and PFAS levels dropped progressively as people reported eating more home-cooked meals.

PFAS are widespread in part because they’ve had so many uses, including in stain-resistant carpeting, upholstery, and table cloths. In an emailed statement to *WIRED*, the Alliance for Telomer Chemistry Stewardship, a global organization that represents manufacturers of products that contain certain types of PFAS such as those in food packaging, notes that C6 fluorotelomer-based products—a type of short-chain PFAS—are used in first-responder gear and medical garments, among other critical products. The “fluorotelomer products ... have undergone rigorous testing and analysis for potential effects on both human health and the environment,” read a statement from the alliance emailed to *WIRED*.

“The specific products being phased out of food packaging have been reviewed by FDA prior to authorizing their use in the US, and are supported by an extensive body of health, safety, and exposure data,” the statement continued. Recently, after reviewing data from rodent studies, the FDA requested further study, which the alliance, in its statement, said underscores the rigor of the regulation of food packaging products. “As a result of FDA’s continuous oversight of these products, the Agency concluded that newly available data raised questions regarding an already evaluated potential trace-level impurity that may be found in these products—6:2 fluorotelomer alcohol (6:2 FTOH),” the statement continues. “Specifically, FDA questioned whether the existing body of scientific studies regarding certain health effects is complete with respect to this 6:2 alcohol. In response to these questions, the member companies worked proactively with FDA. It is important to emphasize that FDA did not conclude that the products at issue are unsafe. The agency only raised questions about whether additional studies are warranted.”

Some consumer advocates and toxicology and environmental health researchers have called the FDA’s approach a “whack-a-mole” process

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of studying and addressing health concerns of just certain types of PFAS—only to find new problems with another group of PFAS.” Are the substitutes just going to be unfortunate substitutes?” asks Birnbaum, who also headed the National Toxicology Program. “Are we going to move from one short chain [PFAS] to another short chain until we find out that one has a problem?”

Covid-19 adds a new dimension to those concerns. Most of the immune studies on PFAS have involved long-chain forms known as PFOA and PFOS. In an [extensive 2016 review](#) of more than 150 studies, the National Toxicology Program concluded that these two forms are “presumed to be an immune hazard to humans” and cited “a high level of evidence” of suppression of the antibody response from animal studies and “a moderate level of evidence from studies in humans.”

While other PFAS haven’t been as well-studied, that isn’t the same as giving them a green light. FDA scientists who [analyzed industry data](#) on 6:2 FTOH and its metabolites reported signs of immune effects in rodents. This summer, the Agency for Toxic Substances and Disease Registry, a part of the CDC, issued a [“statement on potential intersection between PFAS and Covid-19.”](#) The agency noted that “little is known” about how PFAS exposure could affect the risk of infection with Covid-19 and that research is needed. “CDC/ATSDR recognizes that exposure to high levels of PFAS may impact the immune system. There is evidence from human and animal studies that PFAS exposure may reduce antibody responses to vaccines and may reduce infectious disease resistance,” the statement read.

It’s an important research question, says Birnbaum, who notes that scientists who have measured PFAS in groups of people as part of environmental health studies could track them during the pandemic and compare them to a less-exposed cohort. “We know some of the PFAS do suppress the immune system in humans,” she says.

Meanwhile, some political pressure is building to speed up the removal of PFAS from food wrappers. Last month, the [New York state legislature voted to ban PFAS](#) in food packaging, joining [Washington state](#), [Maine](#), and the cities of [San Francisco](#) and [Berkeley](#), which impose similar restrictions. [Whole Foods](#), [Trader Joes](#), and [Taco Bell](#) are among other companies that have already pledged to avoid buying food packaging that contains PFAS.

And on Thursday, those efforts got a boost from the advocacy campaign Mind the Store and environmental health nonprofit Toxic-Free Future,

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which seek to influence retailers, policymakers, and public opinion on matters of chemical safety. The groups released [an online report](#) showing that PFAS turn up in some food wrappers provided by well-known chains. The study, which has not been peer reviewed or published in a journal, is part of a broader campaign by advocates to push for a ban on these chemicals in food packaging.

Inspired in part by the Silent Spring Institute study of fast-food containers, staff members from the advocacy groups requested unused wrappers from the three leading fast-food burger chains and three healthy food chains, at a total of 16 locations in New York City, Maryland, Seattle, and Washington, DC. They collected 38 samples, including some duplicates so they could compare the same wrappers from different geographic regions and make sure the results from wrappers from the same locations were consistent.

They placed the wrappers in sealed plastic bags, then turned them over to Galbraith Laboratories in Knoxville, Tennessee, an independent lab that performed tests on them to determine fluorine content. (Because PFAS are fluorinated compounds, detecting fluorine is an indicator of their presence.) The lab used a testing threshold of 100 parts per million of fluorine, a cutoff similar to the one used by compost certifiers who want to exclude items with PFAS. These levels don't indicate a risk of incurring any particular health problem; they're simply considered a reliable indicator of the chemicals' presence.

Overall, the lab found levels above the 100 ppm threshold in two of nine sandwich wrappers (from five different restaurant chains), in all the small paper bags they tested from the three fast-food chains, and in all molded fiber bowls they tested from the healthy food chains CAVA, Sweetgreen, and Freshii.

In particular, they found that a Big Mac clamshell box and McDonald's fry and cookie bags exceeded the 100 ppm threshold of fluorine, although other wrappers for burgers, Egg McMuffin, and McChicken sandwiches did not. Cardboard boxes for McNuggets or fries also had low or undetectable fluorine levels. At Burger King, one Whopper wrapping out of three tested above that threshold for fluorine; bags for chicken nuggets and cookies also tested positive, although paperboard boxes did not. Only a cookie bag exceeded the screening level at Wendy's. Ironically, the healthier outlets fared worse, as all the molded fiber bowls for grains or salad showed levels of fluorine that were higher than any levels detected in the fast-food wrappers.

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The report drew immediate results—of just the type desired by the advocates. On the eve of its release, officials from the Mediterranean fast-casual restaurant chain CAVA announced that they would eliminate PFAS in their food packaging within a year. “At CAVA, we care about our impact on our communities and on the world at large,” a CAVA spokesperson wrote in an email to WIRED. “As part of our ongoing environmental and social responsibility efforts we are actively working to ensure our sustainable packaging continues to be responsibly sourced, compostable, functional, and now PFAS free. We are pledging to eliminate PFAS from our food packaging by mid-2021, and will publicly share progress on this commitment in the year ahead.”

Freshii, a healthy fast-casual chain, also says they will move toward alternatives. Veronica Castillo, Freshii's vice president for marketing, told WIRED in an email: “Freshii is in the final stages of transitioning its 16- and 32-ounce pulp bowls to a version that is fully PFAS-free. Freshii intends to roll out these PFAS-free bowls in the early part of 2021, if not before.”

Even before it was included in the Mind the Store and Toxic-Free Future analysis, officials from the salad restaurant Sweetgreen had announced that they would eliminate PFAS from bowls by the end of this year. “We originally introduced compostable containers to make a positive impact on the food ecosystem, however, given recent concerns around PFAS, we started working with new and existing suppliers as well as an independent safety expert to find a more sustainable and compostable solution,” read a Sweetgreen statement emailed to WIRED. “This past January, we partnered with [Footprint](#) to pilot compostable, PFAS-free bowls in our San Francisco stores with a goal of rolling out this new packaging nationwide by the end of 2020 at which time they'll also be made domestically and out of post-industrial recycled paperboard.» (Footprint is a technology firm focused on creating sustainable packaging and alternatives to single-use plastic.)

Burger King officials also responded to the report and the FDA's announced phase-out by promising to seek alternatives. “We are looking forward to extending our [safe ingredients policy](#) to include the removal of the short-term PFAS recently identified by the FDA,” a spokesperson for Restaurant Brands International, Burger King's parent company, wrote in an email. “We will work with our suppliers to remove them from all packaging by or, where feasible, earlier than the three years recommended by the FDA.”

A spokesperson for McDonald's, the world's largest burger chain, responded to a query from WIRED by touting the company's commitment

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to eliminating PFAS but didn't offer specifics: "The safety and well-being of our communities is our top priority. We've eliminated significant subset classes of PFASs from McDonald's food packaging across the world. We know there is more progress to be made across the industry, and we are exploring opportunities with our supplier partners to go further."

Representatives from Wendy's did not respond to a request for comment from WIRED.

While lauding the commitments announced by the healthy fast-casual chains, Mike Schade, director of the Mind the Store campaign, still criticized other fast-food leaders. "We're extremely disappointed by the lack of action by the burger chains," he says. "These are three of the largest fast-food chains in the US. With the pandemic, more and more people have been getting takeout, and these companies could play a big role in reducing our exposure to these hazardous chemicals."

As more states ban the chemicals and some chain restaurants avoid them, manufacturers of food packaging may feel compelled to find other ways to keep the juice and grease from leaking out, says Laurel Schaider of Silent Spring. "There's going to be more momentum," she predicts.

For people who need a break from the kitchen or want to support their local restaurants, Schaider says to pay attention to the takeout containers. In her research, she found that thicker paperboard boxes were less likely to contain PFAS; likewise, none of the paperboard cartons used for fries or desserts that were tested by Mind the Store and Toxic-Free Future met the threshold indicating they contained PFAS.

But if concerned consumers want to do more to avoid the "forever chemicals," her advice is simple: Skip the takeout altogether. "We all know eating more fresh foods is better for our health," Schaider says. "It's yet another reason to eat more fresh foods when we can."

wired.com, 7 July 2020

<https://www.wired.com>

### Microplastics have moved into virtually every crevice on Earth

2020-08-07

The Maldives archipelago in the Indian Ocean includes 1,192 islands. In 1992, the government added one more—an artificial construct that serves as a landfill, where 500 tons of trash are dumped every day.

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Two truisms of island-living everywhere are especially true in the Maldives: Most consumer goods must be shipped in, and most waste is produced by tourists. In the Maldives, a developing nation that lacks much local manufacturing, a single tourist produces almost twice as much trash per day as a resident of the capital city of Malé, and five times as much as residents of the other 200 populated islands, according to government statistics. Consequently, the tiny island nation was ranked last year as the world's fourth largest producer per capita of mismanaged waste.

Now marine scientists at Flinders University, near Adelaide, Australia, have added another, predictable statistic to the Maldives' trash horror story: The island chain, renowned for its rich marine biodiversity, is also home to the world's highest levels of microplastics on its beaches and in the waters near shore.

Across 22 sites on Naifaru, the most populous island, the Flinders team counted high concentrations of microplastics in beach sand and shallow coral reef waters. Aside from the sheer volume, the team made an even more discouraging discovery. Most of the particles were the same size as prey consumed by various marine life on the reef.

That was not good news for a tropical marine ecosystem that supports more than 1,100 species of fish and 929 other species, ranging from amphipods to whales, as well as 170 species of sea birds. Of 71 trigger fish collected by the researchers, all had plastic in their bellies, on average eight fibers per fish.

"The size of the microplastics is extremely important because they get into the smallest fish and invertebrates, which are then consumed by larger fish," says Flinders conservation biologist Karen Burke Da Silva, the senior author of the study.

The findings in the Maldives, published August 2 in the journal Science of the Total Environment, are part of an impressive body of scientific literature published so far this year that adds new understanding of this plastic scourge—and that may aid efforts to combat it.

#### The microplastic cycle

"In order to understand how to mitigate plastic pollution, we have to know the flux," says Chelsea Rochman, a marine ecologist at the University of Toronto. "It's one thing to know it's there, and now we need to know the rate at which it gets to places. To hot spots, and what happens to it as it moves through ecosystems."

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While most of the early research focused on the larger plastics found on beaches and floating on the surface, less visible and more pervasive plastic bits have spread into virtually every crevice on Earth, from the deepest sea trenches to the highest alpine mountains. Some microplastics are so tiny they are part of the dust that blows around the planet, high in the atmosphere.

In recent years, scientists have tracked microplastics to thousands of locations. The new research marks a shift toward figuring out what Rochman calls the “microplastic cycle”—how microplastics travel, where they accumulate, and how they are transformed en route.

The term microplastics refers to plastic particles that measure less than five millimeters. There are two basic kinds.

Primary microplastics, such as microbeads used in personal care products or the pellets used in plastics manufacturing, are intentionally manufactured small. Secondary microplastics are the consequence of one of plastic’s most valued assets: its durability. They begin as discarded products that are broken down in the oceans by sunlight and wave action. Over time, the fragments become smaller and smaller. They will presumably survive for centuries.

Scientists are still sorting out the central question underlying the research: What harm does ingesting microplastics cause to human health? Microplastics have been detected in drinking water, salt, and other food. So far, no harm has been demonstrated. But for fish and other marine and freshwater wildlife, studies find that microplastics disrupt reproductive systems, stunt growth, diminish appetite, cause tissue inflammation and liver damage, and alter feeding behavior.

#### Ocean numbers get bigger

In 2015, the yearly flow of plastic waste into the oceans from the world’s coastal regions was estimated to average 8.8 million tons. Last month, in a new report by the Pew Charitable Trusts and Systemiq, a London-based environmental think tank, scientists concluded that about 11 percent of that flow into the seas—about 1.4 million tons—includes four prime sources of microplastics: tires, production pellets, textiles, and microbeads.

If the “tap” into the oceans were turned off tomorrow, microplastics would continue to accumulate for generations from trash already in the sea. That continual fragmentation makes it hard to calculate how many microplastics are floating in the ocean today. Most counts estimate what’s

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on the surface. Counts modeled in 2014 put the figure between 5.25 and 50 trillion pieces. New research this year found those estimates to be far too low.

A team from the Plymouth Marine Laboratory, the University of Exeter, and King’s College in the U.K. and the Rozalia Project in Vermont, which supplied the boat, sampled coastal waters on both sides of the Atlantic. The researchers used smaller-mesh nets to collect [RK7] smaller nanoplastics and fibers that resemble prey that earlier counts had missed. Their estimate, published in Environmental Pollution, puts the global microplastic total at between 12.5 and 125 trillion particles—at least twice as high as the earlier figure.

“We’ve been vastly underestimating how many microplastics are out there using traditional sampling methods,” says Matthew Cole, a Plymouth marine ecologist and co-author of the study. “With small enough nets, it is possible to reveal this hidden, otherwise invisible map within the oceans. And this is just the surface. What sinks to the bottom is not included in these global calculations.”

Scientists have long recognized the global seafloor as a major sink for microplastics. But little was known about their concentration and distribution there. A team from Germany, France, and the U.K. has now discovered that powerful bottom currents play a crucial role in concentrating microplastics in specific hot spots—seafloor versions of the floating “garbage patches” that collect inside ocean-current gyres at the surface.

Scouring the Mediterranean seafloor west of Italy, the team found accumulations of microplastics in higher amounts than have ever been recorded, even in deep sea trenches. A single square meter (10.8 square feet) held a thin layer of up to 1.9 million microplastics.

Distressingly, these hotspots are also key habitats for sponges, cold corals, and ascidians or “sea squirts,” which are especially vulnerable to microplastics because they are filter-feeders.

#### The land isn’t spared

Researchers also are hunting down microplastics in fresh water and soil, all the while charting potential entry points into the food web.

At 15 river sites in South Wales, scientists combing through the droppings and regurgitations of white-throated dippers discovered that the birds, which feed on freshwater invertebrates that ingest plastics, were eating

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about 200 pieces of plastic a day—creating opportunity, the scientists concluded, for plastic to move up the food web. Their findings were published in the journal *Global Change Biology*.

Scientists at the *Chinese Academy of Agricultural Sciences* found that the farming practice of plastic mulching could pose a long-term threat to crop yields. The technique involves spreading plastic sheets over fields to conserve moisture, control weeds, and boost soil temperatures, which in turn can increase crop yields on average between 25 and 42 percent. The practice is widely used on small farms in China, which make up about 13 percent of China's total cropland. Its use is increasing in China and around the world as drought worsens in semi-arid and arid regions.

The most commonly used plastic sheets are easily torn and break down over time. In research published in *Global Change Biology*, the team concluded that the practice could be safe if the sheets are collected after harvest. But 66 percent of the Chinese farmers surveyed told the scientists they don't do that. The researchers estimate that more than half a million tons of plastic have accumulated in Chinese soils.

Plastic fragments alter the structure and chemistry of the soil; additives, such as *phthalates*, have been linked to soil contamination. Crops grown in soil containing plastic debris have lower yield, height, and root weight. The study found that plastic pollution has already decreased cotton yields in China.

**In the air, everywhere**

Research on how microplastics get around the world used to focus on the oceans. The movement of global dust had been studied for decades, Rochman says, but scientists only recently discovered that dust carries "substantial amounts of microplastics."

*Janice Brahney*, a scientist at Utah State University, stumbled onto plastics while she was studying how winds spread nutrients like nitrogen and phosphorus across the western U.S. "I study dust and how it transports nutrients to remote ecosystems," she says.

But as she examined samples collected from 11 national parks and wilderness areas under the microscope, she was shocked to find tiny plastic fibers.

"At first, I thought I had contaminated my sample," Brahney says. "Then I realized we should not have been surprised."

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She concluded that more than 1,000 tons of microplastics a year drift down on the wilderness areas and national parks of the American West. Her analysis, published in the journal *Science*, found that microplastics traveled at different levels through the atmosphere. Larger particles are deposited in wet weather and most likely come from nearby. Tiny, lightweight fibers travel long, cross-continental distances, becoming part of the global movement of dust, before settling to the ground, usually in dry weather.

"Plastic is falling out of the sky into everything," Brahney says. "What should be imprinted on the broader public view is although we're only noticing this problem now, it is not a new problem. It's going to get worse before it gets better. There's so much that we don't know, it's really difficult to fully comprehend the implications of plastics that are absolutely everywhere."

[nationalgeographic.com](https://www.nationalgeographic.com), 7 August 2020

<https://www.nationalgeographic.com>

**A new survey links vaping to higher Covid-19 risk**

2020-08-11

SINCE THE PANDEMIC started to hit the US in full force in March, speculation about the [link between vaping and Covid-19](#) has flourished. The *Food and Drug Administration* and the *National Institute on Drug Abuse* both issued warnings. [Anecdotal reports](#) of young vapers coming down with severe coronavirus infections began to crop up. But there was very little research to support a connection.

Now, a [study published today](#) in *The Journal of Adolescent Health* finally offers data that shows a relationship between e-cigarette use and Covid-19 risk. Researchers from Stanford University show that teenagers and young adults ages 13 to 24 who use e-cigarettes are five times more likely to be diagnosed with Covid-19 than their non-vaping peers. Those who are dual users—people who smoke both traditional and electronic cigarettes—are seven times more likely to test positive for the virus, the researchers found.

"I knew there would be a relationship," says coauthor Bonnie Halpern-Felsher, a professor of pediatrics at Stanford University who studies youth tobacco use. "I did not expect it to be this strong of a relationship."

[Studies](#) have already [linked smoking with higher susceptibility to severe Covid-19 infections](#), but previously no population-based studies had examined the link between e-cigarette use and Covid-19 in teenagers and

**Researchers from Stanford University show that teenagers and young adults ages 13 to 24 who use e-cigarettes are five times more likely to be diagnosed with Covid-19 than their non-vaping peers.**

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young adults. The question researchers wanted to answer was two-fold: Were e-cigarette smokers more likely to get tested for SARS-CoV-2? And were they more likely to test positive? “The answer is soundly yes” to both parts of the question, says Halpern-Felsher.

The researchers gathered their data through an online survey posted on spaces like social media and gaming sites. Over 4,000 teens and young adults from all 50 states responded, completing the roughly 15-minute survey. Researchers then weighted the samples to reflect the racial and ethnic, gender, LGBTQ status, and age makeup of the United States population.

The survey, which was sent out in early May, asked respondents whether they had ever used regular or electronic cigarettes; whether they had used them in the last 30 days; whether they had been tested for Covid-19; and whether their test results came back positive. The researchers also controlled for other Covid-19 risk factors like whether the respondents lived near a coronavirus hotspot; whether they were under- or overweight, which can affect lung function; and for their socio-economic status, which can affect how well people can socially distance. Ultimately, the researchers determined that dual users who had smoked in the last 30 days were not only more likely to test positive, but they were also nine times more likely to get tested in the first place.

The survey did not explore why users decided to get tested. It’s possible that users confused the effects of vaping—extra phlegm, coughing, or shortness of breath—with Covid-19 symptoms. But the high rate of positive test results may indicate that vapers are more vulnerable to the virus itself.

That said, this study simply illustrates a correlation between e-cigarette and cigarette use and positive Covid-19 diagnoses. As the authors explain in the paper, their findings “show that e-cigarette use and dual use of e-cigarettes and cigarettes are significant underlying risk factors for COVID-19 that has previously not been shown.” But on its own, this paper can’t prove whether they may be more biologically susceptible to infection in the first place, or if they are more likely to have severe infections.

Still, Halpern-Felsher has a few theories for why this overlap might exist. Smokers may have more lung damage, making them more susceptible to the virus. Or they might be touching their hand to their mouth more often than other people, or sharing vapes, increasing their likelihood of being exposed in the first place. Or it could be that the virus is being spread

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through the aerosols vapers exhale. “Those are all hypotheses,” she says. “Someone needs to follow it up.”

already studies that link smoking tobacco with a higher risk of Covid-19. A study published in March in the *European Respiratory Journal* found that smokers and those with chronic obstructive pulmonary disease had greater expression of ACE2, the protein SARS-CoV-2 uses to enter cells. In a meta-analysis of 19 papers published in May in the journal *Nicotine and Tobacco Research*, scientists from UC San Francisco found that tobacco use nearly doubled a person’s risk of severe Covid-19 infection. Another study by a separate group of researchers at UCSF published in the *Journal of Adolescent Health* in July found that smoking also doubled the risk of Covid-19 infection for young adult ages 18 to 25.

“I’m not at all surprised” by the results of the Stanford survey, says Sharon Levy, director of the Adolescent Substance Use and Addiction Program at Boston Children’s Hospital, who was not involved in the study. She points out that nicotine can inhibit the immune system and e-cigarettes can affect a lipid layer in the lungs that traps viruses, bacteria, and other foreign particles, as well as the macrophages that clear those threats away. It can also decrease the number of hair-like projections called cilia that help clear pathogens out of the lungs. “We’re appreciating more and more that vaping is associated with lung injury,” says Levy. When the lungs are injured, she says, they’re less likely to be able to fend off infections.

More and more evidence shows that e-cigarettes make the lungs more vulnerable to a variety of different infections, which could potentially provide a mechanistic explanation for the relationship the Stanford study shows. “There’s been a consensus that vaping and the use of e-cigarettes causes a suppression of respiratory immune responses,” says Ilona Jaspers, a pediatrician, toxicologist, and deputy director of the University of North Carolina’s Center for Environmental Medicine, Asthma, and Lung Biology, who was not involved in the study. She says that models in both mice and in human lung tissue show that e-cigarettes reduce the host’s ability to respond to viral and microbial threats.

Alicia Casey, a pulmonologist also at Boston Children’s Hospital who works with kids and teens and was not part of this study, says she’s seen similar problems in healthy teens who couldn’t fight off other viral infections. “We definitely saw this with the flu this year,” she says. “Why are these teenagers having so much trouble with the flu? An otherwise-healthy high school athlete should not have trouble and shouldn’t have chronic respiratory problems either.” Casey says that vaping is associated with damage to

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the lower respiratory tract, so it makes sense that vapers with underlying damage to their respiratory system would have trouble fighting off an infection to that system.

Casey adds that the Stanford paper is particularly concerning given that data from a [2019 national survey](#) indicates that more than a quarter of high school students use e-cigarettes. “We may have a lot of young people struggling with this,” she says, especially as states begin to reopen and kids go back to school or start to see their friends more often.

Levy points out that some risk factors may also be behavioral. “The way I see it, nicotine vaping is a marker for other kinds of behaviors that all may increase risk,” she says. Like Halpern-Felsher, she notes that teens and young adults who vape may share vape pens, that smoking involves a lot of hand-to-mouth contact, and that it creates aerosols, all of which could increase the risk of passing the virus. Plus, people may also be vaping marijuana or drinking—if they’re feeling less inhibited, they may forget to follow protocols like wearing a mask or social distancing. “That’s why it’s so frightening,” Levy says. “They’re more likely to behaviorally get themselves into trouble, and then they’re also more likely to experience worse outcomes.”

But while the exact mechanism of how vaping and Covid-19 are correlated is still unknown, there’s already political pressure on legislators to act. Representative Raja Krishnamoorthi, chairman of the House Subcommittee on Economic and Consumer Policy, cited the study in a [letter to the FDA](#) published today, asking the agency to take e-cigarettes off the market during the pandemic, writing that it is “evident that the youth vaping epidemic has combined forces with the Coronavirus pandemic, creating a much deadlier foe that demands FDA action.”

Halpern-Felsher says both physicians and young e-cigarette users should pay attention to the survey findings. “We’re hoping there’s a prevention message out there: Adolescents, young adults, take note that this is going to put you at risk,” she says. She also urges healthcare providers to regularly ask young people about their vaping and smoking habits. That will help determine who is at risk. Meanwhile, being able to track the number of people who both use e-cigs and come in for Covid-19 testing and treatment will also help researchers figure out whether vaping

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contributes to more severe coronavirus infections. “We definitely need more data,” she says.

wired.com, 11 August 2020

<https://www.wired.com>

### US groups invest billions in industrial Ag in Africa. Experts say it’s not ending hunger or helping farmers

2020-08-11

With more than half the population living below the poverty line, Malawi is one of the world’s poorest countries—and the majority of its people operate small farms. So, for more than a decade, non-profits and governments have focused on reducing poverty and hunger in the country by helping farmers there increase productivity in their fields, using the same monocropping techniques embraced by commodity corn and soy growers in the U.S.

Between 2007 and 2018, the [Alliance for a Green Revolution in Africa](#) (AGRA) invested \$22.5 million in projects that included [training agro-dealers](#) to sell commercial seeds, fertilizers, and pesticides. Meanwhile, Malawi’s government provided around \$50 million per year in subsidies for synthetic fertilizer.

The result? Yields for dietary staple crops, especially corn, have [increased by 50 percent](#). But the poverty rate is [still over 50 percent](#), and the prevalence of moderate or severe food insecurity [has increased slightly](#), to 82 percent of the population.

“These are the failed policies of the past, with no real acknowledgment that science and history have moved forward,” says Timothy A. Wise, who conducted years of research on agriculture in Africa [for his book \*Eating Tomorrow\*](#). “We should have learned from this and at least be funding a wider range of practices.”

Top of Form

That sentiment is at the core of two new reports that shed light on how billions of dollars from public institutions and private foundations continue to flow to “Green Revolution” strategies like those employed in Malawi, despite what critics say is mounting evidence of their failure.

The first [report](#), from the International Panel of Experts on Sustainable Food Systems (IPES), charts how funds spent on “agricultural research for

**Meanwhile, Malawi’s government provided around \$50 million per year in subsidies for synthetic fertilizer.**

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development” in sub-Saharan Africa primarily support research focused on industrial agricultural principles. And the second report, focused specifically on AGRA, produced by a coalition of organizations, presents data that shows the organization is failing to meet its own stated goals throughout the continent.

Bill Gates, one of the world’s most prominent philanthropists and thinkers, is at the center of both narratives. The reports both take a critical look at the Bill and Melinda Gates Foundation, which is by far the biggest funder of agricultural research and development in Africa, and the primary funder of AGRA. The foundation, they report, is committed to the idea that farmers in Africa will benefit from an input- and market-intensive approach, and may therefore be hampering efforts to encourage and support agroecology, a solution many point to as an important lever for reducing hunger and addressing climate change in that part of the world.

#### *The Green Revolution vs. Agroecology*

High-yield crop systems are often traced to Norman Borlaug, an agronomist who pioneered a variety of wheat that became a model for growing more crops on less land. The seeds and the technologies used to grow them were then exported to countries including India, Mexico, and Brazil.

In India, where farmers widely adopted the Green Revolution, rice and wheat yields increased in the 1960s and ‘70s, and historians credit those increases with a significant decrease in hunger; Borlaug won the Nobel Peace Prize in 1970 in recognition of his contributions. Similar strategies to bring hybrid seeds and chemical fertilizers to smallholder farmers in developing countries are still embraced by many agricultural and hunger relief organizations.

But critics say this approach to food production relies on expensive inputs, and that a lack of attention to environmental impact has gradually limited its successes. In India, many farmers went into debt because of the high cost of seeds, fertilizers, and pesticides, and a farmer suicide crisis followed. The crop systems also depleted groundwater, destroyed soil fertility, and polluted ecosystems and communities. In one state, the negative effects led to so much backlash that it resulted in what may be the first state-wide ban on all pesticides.

Many of those same critics point to agroecology, a holistic approach in which farmers work with ecological systems to minimize environmental

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impact, as the counterpoint to the industrial system. Agroecology also increasingly takes into account farmer culture and agency.

“The bedrock of agroecology is food sovereignty”—the ability for communities to feed themselves—says Million Belay, the general coordinator for the Alliance for Food Sovereignty in Africa (AFSA), which was established in 2013. In Belay’s opinion, agroecology “works for Africa” because it recognizes that focusing on productivity alone—without considering other factors such as protecting soil and water quality and building resilience to climate change—is shortsighted. AFSA conducted an analysis of 50 agroecology case studies from 22 African countries, and found that the projects had multiple positive impacts on 10 of the 17 United Nations’ Sustainable Development Goals (SDGs).

And a growing body of research suggests that while farmers’ yields may decrease during the initial transition to agroecological practices, the environmental and social benefits do not come at the expense of long-term yields. One of the largest studies of 286 agroecology projects, covering more than 91 million acres in 57 countries, found an average 79 percent increase in crop yield.

Research like that is causing a shifting paradigm in many global development agencies, including the United Nations Food and Agriculture Organization (FAO), toward an emphasis on agroecology, especially as a strategy for confronting the climate crisis.

“Agroecology is seen more and more as the most viable alternative to industrialized food systems,” says Molly Anderson, a food studies professor at Middlebury College who was involved in producing the IPES report.

For example, the FAO’s expert panel on food security at the end of June released its analysis of how food systems need to transform in order to meet the second U.N. SDG—ending hunger by 2030. It identified agroecology as one of the policy and innovation shifts that had the potential to address all of the varied dimensions of food insecurity at once.

Meanwhile, the FAO calls agroecology “a key tool in the transition to sustainable food systems,” and has identified data that shows it can contribute to progress on multiple SDGs, from eliminating poverty and hunger to reducing inequality and furthering climate action.

And yet despite the evidence, Anderson said the IPES report shows that “the money that’s being spent [on agriculture in Africa] is not going to the right kinds of food systems.”

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*Research Funding, Mapped*

The IPES report maps the complex landscape of agricultural research funding in sub-Saharan Africa and shows that the vast majority of money from foundations and governments is spent on projects that lean towards industrial agriculture.

The report found that a few countries, such as France, Germany, Belgium, and Switzerland, have increasingly supported agroecology projects, while the U.S. and U.K. primarily fund industrial agriculture research.

Most notably, among private foundations, the report found that the Gates Foundation is far and away the biggest contributor to agriculture research in sub-Saharan Africa. In 2015, it invested more than \$400 million, which was almost three times the total investment of all of the other major foundations' investments combined.

"The amount that's being spent by philanthro-capitalists like the Bill and Melinda Gates Foundation just swamps the amount of money being spent by governments," says Anderson.

Researchers found that 85 percent of the projects the Gates Foundation invested in were focused solely on supporting and increasing the efficiency of industrial agriculture strategies. Only 3 percent of the projects had components that could be linked to agroecological principles; none mentioned agroecology specifically. About a quarter of the projects funded included a focus on increasing sustainability, but that attention to environmental impact was primarily in the context of making industrial ag more efficient, by doing things like improving livestock vaccines and plant varieties.

A representative of the Gates Foundation declined Civil Eats' request for an interview. Instead, the foundation sent an email statement that read, in part:

Our agricultural development investments seek to make smallholder crops and livestock more productive, improve nutrition, and help empower women farmers. Over the past decade, we have worked closely with national partners in sub-Saharan Africa and South Asia, to identify and support a wide range of innovations, investments, and policies that empower farmers with the tools they need to improve their livelihoods and lift their communities out of poverty.

Yields on farms in this region already are far below what farmers elsewhere in the world achieve, because African farmers often lack access to

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improved seed varieties and extension services. Like farmers in wealthier countries, we believe smallholders should be able to choose from a range of innovations that can help them adapt to stressful conditions like high temperatures, droughts, floods, pests, and diseases

However, the report on AGRA, which is based primarily on research conducted by Wise, disagrees with the foundation's assessment. In fact, it asserts that AGRA has failed on its own measure of increasing yields.

*Evaluating AGRA*

The Alliance for a Green Revolution in Africa launched in 2006, and over time developed a public goal of doubling incomes and productivity for 30 million farm families by 2020. That goal is no longer listed on the organization's website and AGRA did not respond to requests for comment. In July, it released a statement that criticized Wise's research methods and approach and stated the organization could not comment on the report "because we have not been informed on their approach, data sources, and analysis."

Wise told Civil Eats he asked AGRA if it would provide data on its progress but that a representative from the organization went silent after extended communication and failed to produce the data. Instead, his research team used public data on hunger, poverty, and agricultural productivity in the 13 countries AGRA works in to see how numbers had changed since the group began its work.

Overall, the data showed little evidence of significant increases in incomes or food security for people in AGRA's target countries and some evidence that AGRA's emphasis on just a few crops, including hybrid corn, have depleted soil and moved land use away from traditional crops like millet and cassava, which are more nutritious.

The data also showed that yields for staple crops in AGRA's target countries rose by an average of 18 percent, with corn at 29 percent over the 12-year time span covered. That's compared to the goal of 100 percent, and that increase was the same as the average annual growth rate in the years before AGRA.

"Our report shows that it's not working," says Wise, "and we're not talking about two years, we're talking about 14 years and a billion dollars of not working."

While poverty rates in sub-Saharan Africa have decreased since 1990, the actual number of people living in poverty has increased significantly, due

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to population growth. And rates are still much higher there than anywhere else in the world: about 40 percent, as of 2015, compared to 10 percent globally. Recent evidence also suggests that some countries that had seen declining poverty rates in recent years may now be trending upward instead.

Meanwhile, after many years of decline, hunger has now been rising in the region for several years. A recent FAO report showed that after a decade-long decrease, undernourishment rates ticked back up in 2016 and 2017, with 237 million hungry people, compared to 177 million in 2005. The COVID-19 pandemic is now also contributing to rising poverty and hunger.

Increasingly, global organizations see those trends and point to agroecology as the best solution. "After working on these topics for 25 years or so, I have seen real shifts in the global narrative and people's understanding of what's causing food insecurity," says Anderson. So questions remain as to why the investment is not shifting.

#### *Turning the Ship on Ag Investment?*

Alliance for Food Sovereignty in Africa members are now working in 50 of Africa's 55 countries, on proven practices such as implementing crop rotations and System of Rice Intensification, but funding is an ongoing challenge, and the organization's budget is less than \$1 million per year. Compared to other organizations, "what we get is minute," says Belay.

At A Growing Culture, Loren Cardeli supports farmers and groups in Africa as they incubate agroecological solutions that work for their communities—including traditional seed preservation techniques and innovations to collect and reuse runoff water in Kenya. He said it's particularly difficult to get funders to consider socioeconomic factors and the importance of preserving culture within agricultural communities.

"I've been doing this for 10 years, and I can't get that to translate to most donors," he says. "I scream from the mountaintops, and they think I'm crazy."

According to IPES, the institutions heading up the research are a big factor when it comes to attracting global investment. And while projects led by African research institutions often had a more systemic focus, those institutions were the main funding recipient in just 9 percent of Gates Foundation projects. "Research institutions based in the Global North continue to lead on the majority of AgR4D [agricultural research for

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development] projects, and to attract larger sums of funding," according to the IPES report.

In a qualitative analysis of the Gates Foundation, the report also found that the group expressed a persistent belief that industrial strategies were more practical than agroecological ones.

"There is widespread institutional support for the hypothesis that technological fixes will increase farm-level returns, thereby lifting more people out of poverty," the authors wrote. On the other hand, "the perceived longer timeframe for agroecological practices to deliver returns in incomes or yields vis à vis industrial practices is seen as a drawback." This probably wouldn't surprise anyone who has heard Bill Gates publicly express his belief that the Green Revolution was a success and that more technological innovation that prioritizes productivity is needed.

Wise says that since the international food crisis of 2007-2008 (which caused major price spikes for staple foods) hit soon after the Gates Foundation started its work in agriculture, that timing might have solidified the foundation's position as leading the charge to solve hunger on the continent.

"Everyone rightly responded to [the crisis] in a good way by saying, 'Wow, countries need to grow more of their own food and their small-scale farmers need to be the ones to do it.' I was very encouraged by that kind of reopening of the narrative about the role of small-scale farmers and self-sufficiency in developing countries," says Wise. "And here was the Gates Foundation, telling them exactly how to do it. . . . And with so much money on the table and African governments completely strapped for cash and investment, it captured not just the narrative, but the policy space."

AFSA's Belay agrees. "They want to take the continent onto a path where farmers will be used to using fertilizers, using chemicals," he says. "Then there are markets for seeds, agrochemicals . . . [and other] technologies." The Gates Foundation sees the opening of those markets as a good thing that will lead to increased incomes for farmers, but Belay sees it as way for multinational companies to make money on the backs of African farmers.

Those farmers are struggling even more due to the pandemic. And while Belay says that he is worried about the impact of COVID-19 on efforts to curb hunger and build sustainable food systems throughout Africa, he also sees it as a potential driver to shift thinking around resilience. For example,

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some farmers have had trouble accessing seeds because of border closures and supply chain disruptions.

"If they had their own seeds, they could have planted them, but now they are dependent on those companies to provide them," he says. Similarly, he thinks some farmers will also be reminded of the value of building their soil, rather than relying on synthetic nitrogen fertilizers. "If you have killed your soil, you have killed your agricultural system," Belay adds.

In Malawi, one project has been taking a different tack since 2012. After identifying a local, bright orange variety of corn that was naturally high in Vitamin A, a nutrient important in undernourished communities, the Malawi Farmer-to-Farmer Agroecology Project used peer education models to help locals plant the corn in diverse crop rotations to build healthy soil and diversify diets.

"They got amazing results, with higher productivity . . . than any of the commercial seed varieties on small-scale farms. And they were growing sweet potatoes, cassava, cow peas, pigeon peas, and soybeans," says Wise. One study found that participation in the project led to a significant increase in household wealth and a decrease in food insecurity for families.

If projects like this had more funding, Wise said, the impact could be massive, since the solutions themselves are low-cost. "On my book tour," he says, "the most consistent question I get is: 'Does Bill Gates realize this?'"

civileats.com, 11 August 2020

<https://www.civileats.com>

### Past evidence supports complete loss of Arctic sea-ice by 2035

2020-08-10

High temperatures in the Arctic during the last interglacial -- the warm period around 127,000 years ago -- have puzzled scientists for decades. Now the UK Met Office's Hadley Centre climate model has enabled an international team of researchers to compare Arctic sea ice conditions during the last interglacial with present day. Their findings are important for improving predictions of future sea ice change.

During spring and early summer, shallow pools of water form on the surface of Arctic sea-ice. These 'melt ponds' are important for how much sunlight is absorbed by the ice and how much is reflected back into space. The new Hadley Centre model is the UK's most advanced physical

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representation of the Earth's climate and a critical tool for climate research and incorporates sea-ice and melt ponds.

Using the model to look at Arctic sea ice during the last interglacial, the team concludes that the impact of intense springtime sunshine created many melt ponds, which played a crucial role in sea-ice melt. A simulation of the future using the same model indicates that the Arctic may become sea ice-free by 2035.

Joint lead author Dr Maria Vittoria Guarino, Earth System Modeller at British Antarctic Survey (BAS), says:

"High temperatures in the Arctic have puzzled scientists for decades. Unravelling this mystery was technically and scientifically challenging. For the first time, we can begin to see how the Arctic became sea ice-free during the last interglacial. The advances made in climate modelling means that we can create a more accurate simulation of the Earth's past climate, which, in turn gives us greater confidence in model predictions for the future."

Dr Louise Sime, the group head of the Palaeoclimate group and joint lead author at BAS, says:

"We know the Arctic is undergoing significant changes as our planet warms. By understanding what happened during Earth's last warm period we are in a better position to understand what will happen in the future. The prospect of loss of sea-ice by 2035 should really be focussing all our minds on achieving a low-carbon world as soon as humanly feasible."

Dr David Schroeder and Prof Danny Feltham from the University of Reading, who developed and co-led the implementation of the melt pond scheme in the climate model, say:

"This shows just how important sea-ice processes like melt ponds are in the Arctic, and why it is crucial that they are incorporated into climate models."

The work is funded by NERC, grant number NE/P013279/1 and is part of the TiPES project (<https://www.tipes.dk/>), which has received funding from the European Union's Horizon 2020 research and innovation programme.

sciencedaily.com, 10 August 2020

<https://www.sciencedaily.com>

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**The fastest star in our galaxy moves at 8 per cent the speed of light**

2020-08-14

Astronomers have spotted the fastest star ever, moving at 8 per cent of the speed of light. The star, called S4714, orbits close to the supermassive black hole at the centre of the Milky Way and could be the best place in the galaxy to test Albert Einstein's theory of general relativity.

It is hard to spot stars orbiting Sagittarius A\*, the Milky Way's central black hole, because the galaxy gets increasingly crowded the closer you get to its middle. Florian Peissker at the University of Cologne in Germany and his colleagues used the Very Large Telescope (VLT) in Chile to observe the galactic centre and the stars there.

They spotted five new stars orbiting close to Sagittarius A\*, including S4714. It is more extreme than the others: its elliptical orbit takes it to a distance from the black hole that is just 12.6 times the size of the space between Earth and the sun. It moves at a speed of nearly 24,000 kilometres per second – 8 per cent the speed of light – which makes it the fastest-moving star we have ever seen.

The view from such a star would be extreme. "The night sky would be awash with bright nearby stars, the whole sky just filled with stars," says Jessica Lu at the University of California, Berkeley. "Even Sagittarius A\* wouldn't look like a big black hole, it would just look like a bright star because of all the material being accreted."

You would be able to see not only the colossal black hole and the bright disk of matter falling into it, but also the strange effects of light stretching and warping around it, says Peissker.

These occur because of general relativity, a theory that describes the inner workings of gravity. The area near Sagittarius A\* is the best place in the Milky Way to test that theory because the black hole's gravity is so powerful. S4714 gets closer than any other star, making it an ideal laboratory for such tests, says Peissker.

However, some of these will have to wait for the next generation of more powerful telescopes, says Lu. "With the next generation of telescopes, it might be a player, but I think right now it's just too faint."

newscientist.com, 14 August 2020

<https://www.newscientist.com>

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**The ocean's 12 megaprovinces**

2020-08-05

Determining the borders of the ocean's ecological regions is challenging. On land, different ecoregions such as rainforest or tundra can be classified by the species of animals and plants and their abundances, but in the ocean, most species are microscopic, and their movements mean boundaries are ever-changing.

Typically, scientists studying the distribution of life in the sea use satellite images to measure a region's chlorophyll levels—a chemical compound made by photosynthesizing phytoplankton—to get an idea of how much life is in an area. But these measurements don't differentiate between species of phytoplankton, some of which support specific combinations of animal and plant life.

New research led by Maike Sonnewald, a physical oceanographer at Princeton University in New Jersey, outlines a new way to classify marine ecosystems. She says that the ocean can be broken down into 100 different ecoprovinces, which together make up 12 main megaprovinces with similar balances of animal and plant species.

These megaprovinces are all distinctive, with most being shaped by landmasses such as trenches or continents, or by oceanographic processes, such as where upwelling brings cold water to the surface. One megaprovince, which the scientists simply called H, spans most of the equatorial area of the Indian Ocean and has a mix of phytoplankton that allows it to support a rich assemblage of life. The K megaprovince is found only in the high Arctic Ocean and supports fewer species, but the physically larger phytoplankton that reside there make the total biomass about the same as in H. A chlorophyll-based detection method would make these two areas look more similar than they actually are.

Sonnewald says that having a deeper understanding of the different ecoprovinces, which were calculated through a machine learning approach that parsed huge sets of ocean data, including information on 51 phytoplankton species, could allow oceanographers to better measure marine health. Recognizing the different zones might also make it easier for scientists to track changes in species abundance or diversity, which would help with understanding the effects of climate change or be valuable to commercial interests like fisheries.

"The ocean and its biomass are changing together with the rest of the climate," Sonnewald says. "Even though some are of greater socioeconomic

**She says that the ocean can be broken down into 100 different ecoprovinces, which together make up 12 main megaprovinces with similar balances of animal and plant species.**

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interest than others, keeping track of overall changes can be very valuable.”

To make the work possible, the researchers developed a machine learning algorithm, the Systematic AGgregated Eco-province (SAGE). They trained SAGE using data from the Massachusetts Institute of Technology’s Darwin Project, which compiles data on wind, current, temperature, and phytoplankton populations around the world. The algorithm took the model’s dense and interconnected data and found that some ocean regions had common characteristics. These clusters of similarity became the ecoprovinces.

Orhun Aydin, a researcher at Esri, a geographic information system software company, says that even with large data collection efforts like the Darwin Project there is still plenty of data researchers would like to have about the ocean that is currently unavailable. Machine learning offers a way.

“We need models that can extrapolate beyond things we can observe right now,” Aydin says. “[Machine learning] could be invaluable going forward.”

Sonnewald says she hopes to find more uses for SAGE and is collaborating on a project about ocean acidification to see if the tool can localize and compare similar provinces of acidification.

“The topic is quite different, but the SAGE method is letting us discover similarities and differences that could otherwise be obscured,” Sonnewald says.

[hakaimagazine.com](https://www.hakaimagazine.com), 5 August 2020

<https://www.hakaimagazine.com>

### These are the 12 ways you can drastically cut your dementia risk

2020-07-30

Almost half of all dementia cases could potentially be prevented or delayed by adopting 12 health measures, a major review has found.

The review identified the biggest known risk factors for dementia as smoking, excess alcohol consumption, high blood pressure, obesity, diabetes, head injury, depression, hearing

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loss and exposure to air pollution, as well as lack of exercise, education and social contact.

Minimising these 12 risks could potentially prevent or delay up to 40 per cent of dementia cases globally, according to the review of the latest evidence by 28 leading dementia experts from around the world.

“People who have family members with dementia often ask me, ‘Is there anything I can do to prevent myself from getting it?’” says David Ames at the University of Melbourne in Australia, who was one of the authors of the review. “There are certainly some things you can do that might make a difference.”

For example, the review finds that individuals can partially protect themselves by not smoking, drinking less than 21 units of alcohol per week, maintaining a systolic blood pressure of less than 130 mmHg, avoiding activities that could lead to head injuries, using hearing aids if needed, eating a healthy diet, and exercising and socialising regularly.

Even older people can delay or possibly even prevent dementia by taking steps to improve their lifestyles, says Ames. “It’s never too early and it’s never too late to think about reducing your risk,” he says.

In addition to making recommendations for individuals, the review calls on governments to protect their populations from dementia by providing primary and secondary education for all children, improving air quality, promoting healthy behaviours, and discouraging smoking and heavy drinking.

In some higher-income countries, including the UK, US and France, dementia rates in older people have fallen in recent decades, possibly due to improvements in education, nutrition and health care. This suggests that preventative health measures can have an impact on dementia, in the same way they have helped to reduce rates of lung cancer and deaths from heart disease in many higher-income countries, says Ames.

Two-thirds of dementia cases currently occur in lower-income and middle-income countries, where education is often less accessible and rates of smoking, obesity and diabetes are relatively high. “The higher prevalence of dementia risk factors means an even greater proportion of dementia is potentially preventable than in higher-income countries,” says review co-author Adesola Ogunniyi at the University of Ibadan in Nigeria.

That means government interventions like increasing education and introducing anti-smoking campaigns could have an even bigger impact

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in lower and middle-income countries, says Ogunniyi. In Latin America, for example, it's estimated that 56 per cent of dementia cases could be prevented or delayed by targeting the 12 risk factors.

However, there is a limit to how much you can prevent dementia with lifestyle interventions, because the brain inevitably starts to shut down in very old age, especially in people who live past 100, says Ames. "We've become very good at keeping people from dying of things like childhood diarrhoea, and that means we now have a high life expectancy," he says. "If you hang around long enough, something eventually has to catch you, and dementia is one of those diseases."

newscientist.com, 30 July 2020

<https://www.newscientist.com>

### AI invents new 'recipes' for potential COVID-19 drugs

2020-08-07

As scientists uncover drugs that can treat coronavirus infections, demand will almost certainly outstrip supplies—as is already happening with the antiviral remdesivir. To prevent shortages, researchers have come up with a new way to design synthetic routes to drugs now being tested in some COVID-19 clinical trials, using artificial intelligence (AI) software. The AI-planned new recipes—for 11 medicines so far—could help manufacturers produce medications whose syntheses are tightly held trade secrets. And because the new methods use cheap, readily available starting materials, licensed drug suppliers could quickly ramp up production of any promising therapies.

"If you are going to supply a drug to the world, your starting materials have to be cheap and as available as sugar," says Danielle Schultz, a chemist at Merck. The new method, posted as a preprint this week, "is really solid," she says. "I am impressed by the speed at which [the researchers] were able to find new solutions for making existing drugs."

Patents give pharmaceutical companies the right to be the sole supplier of a new drug in a given country, usually for 20 years. Once a drug goes off patent, other companies can produce and sell it as a generic. The method to make the drug is often secret to discourage competition even after patents expire. But COVID-19 has changed all that, Schultz says. "We are at a time when it's all hands on deck."

Only two medicines—remdesivir and dexamethasone—are currently proven to fight COVID-19. That has led to supply shortages for both. On

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4 August, attorneys general from 34 U.S. states wrote federal officials, calling remdesivir supplies "dangerously limited," and urging states be given "march-in rights" to violate owner Gilead Sciences' patents. Such rights would allow states to work with third-party manufacturers to make additional supplies of the drug.

To prevent future supply crunches, University of Michigan chemist Timothy Cernak and colleagues turned to a commercial drug synthesis AI program called Synthia. The software can help pharmaceutical manufacturers find the most efficient and cost-effective strategy for synthesizing medicines, most of which are fairly complex molecules that can be built in myriad ways—much as an artist can apply brush strokes in infinite combinations to paint the same landscape. "It's more options than the human mind can comprehend," Cernak says.

Cernak and his colleagues scoured the research and patent literature for ways to synthesize 12 medications now being tested as COVID-19 therapies, including remdesivir. They then programmed Synthia to search for new synthetic solutions. They limited their search to options that used cheap, abundant starting materials, didn't require expensive catalysts or equipment, and could produce kilogram-scale amounts of drug.

In the end, the software found novel solutions for making 11 out of the 12 compounds, including generic antivirals umifenovir and favipiravir, the researchers report this week in a non-peer-reviewed preprint on ChemRxiv. The AI program came up with four different ways to synthesize umifenovir, for example, in one case with cheaper starting materials than those currently in use. "For the same amount of money [or less], we can make these drugs from different starting materials," Cernak says. The one miss was remdesivir: The software was unable to come up with a solution for making it other than the way than Gilead does, he says.

Cernak says he and his team filed patents on all of their new synthetic routes. But their goal isn't to make a profit. Instead, they want to license their manufacturing approaches to one or more pharmaceutical companies to ensure adequate supplies and low prices.

Now, he adds, they wait and see whether any of the drugs prove effective in clinical trials.

sciencemag.org, 7 August 2020

<https://www.sciencemag.org>

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### How to hug people in a coronavirus-stricken world

2020-08-05

IF THE pandemic has left you craving a cuddle, you aren't alone. Some 60 per cent of people in the US reported feeling touch-deprived during the first month of lockdown, suggests a new study, even though only a fifth of those surveyed lived alone.

Tiffany Field at the University of Miami in Florida and her colleagues surveyed 260 adults and found that those reporting touch deprivation scored higher on scales measuring anxiety, depression, fatigue, sleep issues and post-traumatic stress.

Touch deprivation was more common in people living alone, but also affected those living with family or friends. "Only 33 per cent of people said they were touching their partner a lot, and as many as 37 per cent said they weren't touching them at all," says Field (*Medical Research Archives*, in press).

A separate study of more than 1000 US adults found that those who frequently hugged, kissed or met up with friends and family in lockdown were 26 per cent less likely to report symptoms of depression and 28 per cent less likely to report loneliness, regardless of whether they were married or cohabiting. Regular video chats didn't show the same benefits ([medRxiv, doi.org/d5hf](https://doi.org/10.1101/2020.07.29.20161111)).

"We saw stronger mental health benefits from types of contact that involved touch, which aligns well with the benefits we know come from close touching, like decreased heart rate, higher levels of oxytocin and lower levels of cortisol," says Molly Rosenberg at the Indiana School of Public Health in Bloomington, who led the work.

Given these benefits, is a quick hug out of the question? Rosenberg stresses the importance of limiting contact with non-household members to prevent the spread of the coronavirus, and most governments continue to advise people to maintain a distance of at least 1 metre from others.

But proximity isn't the only factor. "Because most hugs are just a brief encounter – and the short time is really key here – I think there are ways to lower the risks to what is, to me, an acceptable level, especially given the benefits of hugging," says Linsey Marr at Virginia Tech in Blacksburg.

Avoiding face-to-face contact is key. Marr recommends face coverings, pointing faces in opposite directions and not touching the other person's

**Touch deprivation was more common in people living alone, but also affected those living with family or friends.**

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face or clothing with your face. "This is not a spontaneous act: you have to plan, and you should ask consent," she says.

"Most hugs are just a brief encounter, and there are ways to lower the risks"

"It would also be prudent to wash your hands before and after you hug, and maybe not exhale," says Margaret Hosie at the University of Glasgow, UK.

Experts emphasise hugging isn't risk free and shouldn't be routine. It should also be avoided by those in high risk groups or showing any symptoms of illness. Even so, "I believe we are at a stage of the pandemic in which we should all be able to make our own risk assessment, based on what is now known about the virus and its transmission patterns, and then act accordingly", says David Heymann at the London School of Hygiene & Tropical Medicine.

[newscientist.com](https://www.newscientist.com), 5 August 2020

[https://www.newscientist.com/article/mg24732944-300-how-to-hug-people-in-a-coronavirus-stricken-world/?utm\\_source=NSNEW&utm\\_campaign=48dcf53e47-nsnew\\_060820&utm\\_medium=email&utm\\_term=0\\_e65fab71ff-48dcf53e47-378549783](https://www.newscientist.com/article/mg24732944-300-how-to-hug-people-in-a-coronavirus-stricken-world/?utm_source=NSNEW&utm_campaign=48dcf53e47-nsnew_060820&utm_medium=email&utm_term=0_e65fab71ff-48dcf53e47-378549783)

<https://www.newscientist.com>

### Should a study on pesticides affect our use of them?

2020-08-10

With summer here and more people choosing to escape their coronavirus prisons into yards, parks, woods and streets, a recent study suggests yet another potential health risk, albeit one far less concerning than the virus: exposure to pyrethroids, a major group of insecticides widely used to protect against everything from malaria parasites and West Nile virus to bed bugs and ticks, as well as a host of agricultural and garden pests.

The study, which found a link between pyrethroids and deaths from heart disease, is itself a cautionary tale, one that can help you better understand the implications and limitations of epidemiological research.

Pyrethroids, as leading components of both indoor and outdoor insecticides, are the second most widely used pesticides in the world, after chlorpyrifos. They are generally considered harmless to people and pets in the concentrations needed to protect them from disease-carrying critters

**Pyrethroids, as leading components of both indoor and outdoor insecticides, are the second most widely used pesticides in the world, after chlorpyrifos.**

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with six or eight legs. They are derived from compounds called pyrethrins, found naturally in the flowers of chrysanthemums.

But just because the origin of pyrethroids is natural doesn't necessarily mean they're safe, especially if people are chronically or repeatedly exposed to them. Almost any substance can be a potential hazard — the dose does indeed make the poison.

In laboratory studies, pyrethroid doses far greater than people would normally encounter have caused inflammation, DNA damage and oxidative stress. These effects may or may not happen in people, but they suggest the new findings could be biologically plausible. Also, limited studies in people have found links to impaired neurological development, reproductive health and major diseases like diabetes, Parkinson's disease and cardiovascular disease.

With such possible risks in mind, a team of epidemiologists at the University of Iowa College of Public Health examined the long-term effects on mortality of pyrethroid exposure among a nationally representative sample of 2,116 American adults who participated in the National Health and Nutrition Examination Survey, known as NHANES, from 1999 to 2002.

This ongoing study gathers extensive questionnaire data from participants, all of whom are interviewed in person. It includes health examinations and collects blood and urine samples for laboratory tests. The samples are frozen and can be used to provide data for studies years later.

By the end of 2015, 246 of the participants in the Iowa study had died. The research team, led by Dr. Wei Bao, reported in *JAMA Internal Medicine* that, compared with those least exposed, participants found to have the highest levels of exposure to pyrethroid insecticides were three times more likely to die of heart disease and one-and-a-half times more likely to die of any cause during the follow-up period.

Exposure was assessed by measuring urinary levels of a metabolite of pyrethroids called 3-PBA, found in two-thirds of the people studied. These chemicals are normally rapidly excreted, so finding them in so many individuals indicates that most people are chronically or repeatedly exposed to pyrethroids.

But before you toss out your personal supply or refrain from stocking up on pyrethroid-containing products to protect yourself, your family and your pets from hazardous pests, consider the full implications and

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limitations of the new findings and the trade-offs involved in avoiding these valuable insecticides.

In a [commentary in the journal](#), two experts at the Columbia University Mailman School of Public Health cautioned against overinterpreting the results of the new study and leaping to potentially unwarranted conclusions about the long-term safety of pyrethroids. Steven D. Stellman, an epidemiologist, and his wife Jeanne Mager Stellman, a health policy expert, pointed out that the participants were relatively young — aged 20 to 59 — when they entered the study and supplied samples of their blood and urine. When the study ended, they were, on average, 57 years old, a rather young age for measuring cardiovascular deaths, the commentators noted.

"Other than cigarette smoking, few, if any, chemical exposures are known to trigger a threefold increase in the risk of death from heart disease, especially in persons younger than 60 years," the doctors wrote, adding that other, as yet unknown, factors could account for the increased risks the study found.

Indeed, many public health scares from observational studies have turned out to be false leads when studied more thoroughly. A classic example was an alarming report in the 1990s of an increased incidence in breast cancer among women living on Long Island, N.Y., that some blamed on exposure to persistent environmental chemicals like DDT and PCBs.

However, Dr. Steven Stellman told me, about 30 subsequent and more thorough studies found no evidence that linked the chemicals to breast cancer on Long Island. "It's important to know if the scientists reporting the results of observational studies have an agenda," he said.

Dale Sandler, epidemiologist at the National Institute of Environmental Health Sciences, said the pyrethroid report is intriguing and should prompt other researchers to look into their own data. "But the study was small, it couldn't account for a lot of possible factors like where people lived, the participants were young, and only one biomarker was measured, so the findings are difficult to interpret," Dr. Sandler said in an interview.

In other words, one study does not a fact make, not then, now or in the future. The Iowa team itself concluded, "Further studies are needed to replicate the findings and determine the underlying mechanisms." It is possible, they wrote, that "pyrethroid exposure occurs simultaneously with exposure to other common pesticides" or that other unmeasured or unrecognized factors account for the findings.

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There was an observational study that by itself cannot prove cause and effect. Rather, such studies can generate leads or raise new questions that warrant a closer look. But they don't prove that pyrethroids, as currently used, are a health risk to people.

"You need a lot of studies to establish that an exposure actually causes a human health problem," Dr. Steven Stellman said. As thorough as the Iowa researchers tried to be, he explained, "There are thousands of variables that were not measured, including psychological factors, that could influence the risk of coronary heart disease. The research is limited by the questions that were asked in NHANES 20 years ago."

Furthermore, Dr. Stellman added, even if some risk to cardiovascular health might result from pyrethroid exposure, that does not mean the chemicals should be abandoned without considering other health benefits, like their "enormous potential to save lives from malaria and West Nile disease. In the grand scheme of things, there's not enough known to make a definitive pronouncement of risk."

nytimes.com, 10 August 2020

<https://www.nytimes.com>

### Alpacas help researchers in fight against COVID-19

2020-08-13

In the race to find a vaccine against COVID-19, scientists have found an unlikely inspiration — the alpaca.

At the heart of Australia's coronavirus outbreak in Melbourne, researchers and scientists are examining an immunity curiosity from alpacas that, along with other members of the camelid family, create two types of antibodies.

Senior principal scientist from the Australian Synchrotron Michael James said the alpaca's unusual immune response had already been used in research for other viruses, such as HIV, around the world.

"Alpacas and animals like them actually create two different types of antibodies. One is similar to the type we [humans] make, but they also create these things called nanobodies," Dr James said.

"It's these nanobodies the researchers are seeking to use to see if we can fight the COVID-19 virus."

#### How it works

**"It's these nanobodies the researchers are seeking to use to see if we can fight the COVID-19 virus."**

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Researchers from the Walter and Eliza Hall Institute are injecting alpacas at a research facility in Gippsland with a small protein of the virus to generate their nanobody response.

"We've all seen the pictures of the SARS-COVID virus, the spiky bit on the outside, that's called the viral spike proteins, they're the bit that helps the virus infect our cells," Dr James said.

"So they then collect the antibodies from the blood of the alpaca, and they process the nanobodies and bind them to part of the viral spike protein that they've also isolated."

The researchers then team with scientists at the Australian Synchrotron in Melbourne to study the proteins at an atomic level.

Dr James hoped the research would lead to a better understanding of how to guard against the virus.

"If our cells are something like a lock, and the viral spike protein is a key, that's how the virus gets into our cells, by unlocking a path into our cells," he explained.

"With the nanobody from the alpaca, you can basically think of it as araldite so that it will gum up the lock, so that the key can't get into the lock, and the virus can't get into our cells."

#### Searching for a vaccine in an outbreak

The Australian Synchrotron, a technology and innovation hub in south-east Melbourne, is currently in stage 4 lockdown, with 90 per cent of staff working remotely.

"Our facility at the Australian Synchrotron is pretty much closed, except we're able to continue to operate it in order to do COVID research," Dr James said.

"Most of our staff are working from home, but we have a dedicated team on site continuing to operate the facility to enable researchers to come and do their work."

Despite the challenges imposed by the restrictions, Dr James said they were happy to help keep case numbers down.

"It's great to feel useful, but at the same time staying at home to stay out of everyone's way," he said.

#### When will vaccinations be available?

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Dr James said much more research needed to be done before a vaccine would be available.

"It's not this year, and it may not be next year," he said.

The nanobodies still needed to be understood on a molecular level, whether they were effective and safe before it could be trialed to be an effective drug.

"Because these nanobodies are new, you have to test them very, very rigorously in a laboratory and then in clinical trials before you're able to use it, and clinical trials often take a year or two to run through," Dr James said.

"If it's a drug that's already approved and on the market, they can short circuit that process between doing the sort of work we're doing at the moment and getting to a drug that people can use because it's already been approved by the TGA [Therapeutic Goods Administration.]"

[abc.net.au](http://abc.net.au), 13 August 2020

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

### Mindfulness and meditation can worsen depression and anxiety

2020-08-14

Mindfulness and other types of meditation are usually seen as simple stress-relievers – but they can sometimes leave people worse off.

About one in 12 people who try meditation experience an unwanted negative effect, usually a worsening in depression or anxiety, or even the onset of these conditions for the first time, according to the first systematic review of the evidence. "For most people it works fine but it has undoubtedly been overhyped and it's not universally benevolent," says Miguel Farias at Coventry University in the UK, one of the researchers behind the work.

There are many types of meditation, but one of the most popular is mindfulness, in which people pay attention to the present moment, focusing on either their own thoughts and feelings or external sensations. It is recommended by several National Health Service bodies in the UK as a way of reducing depression relapses in people who have experienced the condition several times.

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Enthusiasm for meditation may partly stem from a growing awareness of the side effects of antidepressant medicines and the difficulties some people report in stopping taking them. There have been some reports of people experiencing worse mental health after starting meditation but it is unclear how often this happens.

Farias's team combed through medical journals and found 55 relevant studies. Once the researchers had excluded those that had deliberately set out to find negative effects, they worked out the prevalence of people who experienced harms within each study and then calculated the average, adjusted for the study size, a common method in this kind of analysis.

They found that about 8 per cent people who try meditation experience an unwanted effect. "People have experienced anything from an increase in anxiety up to panic attacks," says Farias. They also found instances of psychosis or thoughts of suicide.

The figure of 8 per cent may be an underestimate, as many studies of meditation record only serious negative effects or don't record them at all, says Farias.

Katie Sparks, a chartered psychologist and a member of the British Psychological Society, says the figure could have been pushed up by people trying out meditation because of undiagnosed anxiety or depression. "Meditation has been found to help people to relax and refocus and help them both mentally and physically," she says.

But sometimes when people are trying to still their thoughts, the mind can "rebel", she says. "It's like a backlash to the attempt to control the mind, and this results in an episode of anxiety or depression," she says.

This doesn't mean people should stop trying the technique, she says, but instead should opt for guided meditation sessions, led by a teacher or an app with a recorded narration, which she believes is safer. "The current study could stop people participating in something which can be of benefit in the right context," she says.

[newscientist.com](http://newscientist.com), 14 August 2020

<https://www.newscientist.com>

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### Five easy ways to lower your household carbon emissions

2020-08-12

While the world wrestles with the COVID-19 pandemic, there's another important global issue that's not going away: climate change.

It's a daunting problem and requires global solutions and actions.

But just as we've seen with flattening the COVID-19 curve, if enough people make a change it starts to add up to something significant.

So we've created the [ABC Science Carbon Counter](#) to show the savings in CO2 emissions that can come from individuals making simple changes, and the cumulative impact if all Australian households did the same.

There are some easy wins here and some might surprise you — here are the top five.

#### Shower less

OK, we are NOT saying you should shower less often! But a few tweaks to your showering habits are a simple way to reduce your carbon footprint.

The biggest savings for the least effort comes from cutting your shower time if you have long showers, say, for thinking, relaxing or waking up.

**Cutting your daily shower from eight minutes to four minutes saves up to 350 kilograms of CO2 a year.**

If we all did this, we could cut Australia's emissions from household energy use by 8 per cent.

Another easy win, if you haven't done it already, is to **install a water-saving shower head**.

These reduce the amount of water hitting you each minute in your shower — by around 40 per cent on average — so they save water and therefore the energy required to heat it.

#### Tweak your electricity use

Buying energy-saving appliances and changing to LED lighting are important steps towards reducing your household emissions. But there are also a couple of simple things you can do with your existing appliances.

**But just as we've seen with flattening the COVID-19 curve, if enough people make a change it starts to add up to something significant.**

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No-one wants to be too hot or cold at home, but would you notice if the **temperature setting on your air conditioner was changed by just one degree?**

Probably not, but that one-degree difference **cuts your air conditioner's energy use by about 10 per cent**. So dial it up a degree in summer, down a degree in winter.

Based on the figures for an average air conditioner in Australia — being used for six hours a day for 180 days a year — you could save over 200kg of CO2 a year. And if all households in Australia made the same change it would be equivalent to a 5 per cent reduction in household electricity emissions.

Another easy win around the house is **turning off a second fridge**, as they're often older models that aren't as energy efficient as today's fridges.

A typical 15-year-old fridge releases about 400kg of CO2 per year — and that's what you could save if you got rid of it, or switched it off when not in use.

Of course, if you're keen to do something bigger, [installing solar panels](#) will mean that a sizeable proportion of your energy is generated from the Sun. Plus you could also be feeding renewable energy into the grid for others to use.

#### Give kangaroo a try

Beef and lamb are the greenhouse gas heavy-hitters in many people's diets, because of the methane that cattle and sheep produce.

We're often told to eat less red meat as a way of [reducing our footprint](#) (and for [health reasons](#) as well).

Swapping from beef or lamb to another source of protein such as chicken, pork, duck, fish or eggs will reduce your food footprint.

**If you like your meat but want to reduce your emissions try kangaroo.** Despite being a red meat, it has just one fifth of the emissions of beef and a quarter of that from lamb.

This is because the kangaroo's stomach produces very little methane (a greenhouse gas 20 times more potent than CO2) in comparison to cattle and sheep.

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**Swapping to lentils or plant-based meat alternatives will reduce it even more.**

### Don't waste food

Australians throw out about 118kg of food at home each year, on average.

When it breaks down in landfill, that food waste creates about 250kg of greenhouse gas.

So making the effort to ensure that nothing goes to waste is an easy way to reap greenhouse gas savings.

And this is especially important if you live in a smaller town, where none of that greenhouse gas is captured. (In places with more than around 50,000 people, about half of the greenhouse gas is captured at the tip).

Anything you can do to put less food in the bin will cut your emissions, and there are plenty of options to get more organised and efficient.

These include: **planning meals**; checking the pantry before shopping; making a shopping list; and using the freezer to manage leftovers or other ingredients before they go off.

The overall goal is not to waste food. But if you do, then **composting food waste is a great idea as it only results in 2 to 4 per cent of the emissions it would create in landfill.**

### Drive less and fly less

Driving and flying are significant sources of carbon emissions.

But **even just walking to the local shops instead of hopping in the car can make a difference.**

If all car owners in Australia walked five times a week instead of driving one kilometre to the local shops we'd save over 2 million tonnes of CO<sub>2</sub> a year.

And this year because of COVID-19 many of us have been doing a lot less driving!

If you've been working from home instead of driving to work then your savings could be even more significant.

Say your commute used to be 10km one way, five days a week. **If you're working from home, you're now saving 1344kg of CO<sub>2</sub> per year.**

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If every car owner in Australia made a similar change we'd reduce our emissions from transport by 44 per cent. (Not everyone can work from home but this gives an idea of the impact we can have if we work collectively.)

And as for flying — this year has taken our travel plans and dumped them on their head. While it's no compensation for cancelled travel plans, you can see how much CO<sub>2</sub> you've saved by NOT flying this year by using the [ABC Science Carbon Counter](#).

While you're there, find how much you could save with some other simple changes like showering less, composting more and tweaking that air conditioner setting.

abc.net.au, 12 August 2020

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

### Robots can now give full-body personalised massages at home

2020-08-17

You can now get a massage without having to rely on another human being or leave your home, thanks to newly developed robot masseurs.

French company Capsix Robotics and researchers at the University of Plymouth in the UK have both created robots that can give personalised massages.

The Capsix model has a [robotic arm](#) with sensors and a camera that allow it to adapt to the individual user's body shape. It has been programmed with a range of massage protocols developed by physiotherapists, and users can adjust the firmness of the massage.

François Eyssautier at Capsix, who engineered the robot, says over 4000 people have tried it and most have enjoyed it. Some people are a bit unsure at first, but "after 3 or 4 minutes they forget it's a robot and just relax," he says.

The advantage of having a robot masseur is that "you don't have to have contact with any other person," says Eyssautier. This is useful in the covid-19 era when close contact with others is not recommended, he says. "Also, sometimes we don't want to be touched by other people, we just want to relax on our own," he says.

**French company Capsix Robotics and researchers at the University of Plymouth in the UK have both created robots that can give personalised massages.**

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The University of Plymouth robot works in a similar way to the Capsix one but can be customised even further. Instead of being limited to pre-programmed massage protocols, users can teach the robot to perform the exact movements they like by physically guiding its arm in a training session. "People can teach the massaging activities to the robot, then the robot will learn them and play them back," says Chunxu Li, who co-designed the robot.

However, there is a long way to go before robot masseurs can be as good as human ones, says Shane Kertanegara, a physiotherapist at Optimi Health in Sydney, Australia. "A human physiotherapist can feel where someone is tight and concentrate on that spot, but a robot can't get that sensory feedback and adjust its manual therapy accordingly," he says.

Moreover, because the robot hands don't have fingers, they can't perform the same fine manipulations as human therapists, says Kertanegara. "Although I'm sure that technology will improve over time," he says.

The Capsix robot is currently available to rent but not to buy. The University of Plymouth robot is still in the research phase, but Li says he hopes it will one day be available for people to purchase for home use.

newscientist.com, 17 August 2020

<https://www.newscientist.com>

### As Victoria's second wave slows, here's what's next for lockdowns and Stage 4 restrictions?

2020-08-16

Cases of coronavirus in Victoria are slowly declining and Stage 4 restrictions are due to end in less than a month, but there are several things that need to happen before Melbourne can begin to open up again.

Chief health officer Brett Sutton said he was looking for key figures before he started thinking about Stage 3 and beyond.

He said it was still too early to make a call on how well Stage 4 restrictions were working, but the data was promising.

New outbreaks have dropped to four or five a day from a peak of up to 30 a few weeks ago.

While cases linked to health care and aged care were still "far, far, far" too high, Professor Sutton said, they were "beginning to stabilise".

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So what else do health authorities have to see before they think about loosening Melbourne's lockdown?

### Where are coronavirus cases still cropping up?

Workplaces remain the settings where cases continue to rise, Professor Sutton said.

He said while activity within essential workplaces had been "pared back" and much had been done to stop people going to work sick, it was difficult to stop people transmitting the virus if they were contagious while asymptomatic.

"Our efforts have to focus now on those tricky settings where transmission is hard to control – those essential workplaces," Professor Sutton said.

### Reproduction number must drop to at least 0.6

Professor Sutton's most concrete indication the state was on the right track was the virus's effective reproduction number, also known as Reff.

Reff indicates how many people, on average, someone with the virus will infect.

It dropped below one about a week ago and is lingering at 0.96, but Professor Sutton said it needed to drop to at least 0.6 before he would start to relax.

"A Reff at 0.6 means we are doing very well. If it's 0.8, it's too slow. It means we are not doing enough," he said.

New daily cases also need to keep dropping, he said.

"If we are in the 300s for all of next week, that would be too slow for my liking.

"If it's mostly community transmission across all of Melbourne and Victoria, that would be even more concerning."

But he said if a spike in cases could be attributed to an outbreak health authorities had under control, it would give him more confidence the Stage 4 strategy was working.

### People are staying away from work, supermarkets and parks

Professor Sutton said publicly available data from Google and Facebook showed Victorians were staying at home much more.

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"We know from people's mobile phones ... how much time they are spending at home, how often they are asking for pedestrian directions, how often they are asking for driving directions, and we can get that mobility data at a population level, which tells us very much how restrictive we have been in our activity," he said.

"It is looking like it is as good as it was in the middle of April when we were at our very best, previously. So that is encouraging."

Data provided by Google as of August 11 showed a steep decline in people moving around their communities.

Compared to a normal five-week period before the pandemic, Victoria had a 77 per cent drop in public transport use and a 25 per cent increase in people staying at home.

The data also showed:

A 50 per cent drop in people travelling to work;

A 56 per cent drop recorded in people going to retail, hospitality and entertainment venues;

A 26 per cent drop in people going to supermarkets and pharmacies;

A 45 per cent drop in people going to parks and beaches.

### Will Stage 4 restrictions end in September?

Premier Daniel Andrews would not be drawn on what would happen on September 13, when Melbourne's Stage 4 restrictions are due to end.

He said it was too difficult to extrapolate the data out that far.

"It depends on how hard we all work right now to get to that point. It's one day at a time," Mr Andrews said.

He said as long as Victorians stuck to the rules, the current "intense period of quite some pain" could lead to "enormous gain".

"The modelling gets better every day you have Stage 4 data. The seven, eight, 10-day averages are coming down," he said.

The Premier warned a vaccine for coronavirus was likely "a long way off" and said 2021 would be "at best, a COVID-normal year".

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Mr Andrews asked people to remember that while it was tempting to go outside more as the weather warmed up, some families were burying loved ones.

"Keep perspective," he said.

### Which restrictions will be eased first?

Professor Sutton sympathised with the public and said he knew everyone wanted to know what would happen in September.

"It's really difficult to say. We have to see what the data says," he said.

"It may mean we can ease up in areas we know are not contributing to transmission."

He said any easing of restrictions would take into account the "profoundly challenging" psychological toll of isolation on many people.

"I am very mindful of the fact that [isolation] is a burden everyone is carrying and some people will be really struggling with it.

"It's a fine balancing act. We may move to a point where people can have visitors, but we need to balance that with transmission risk.

"We won't be jumping to 10 people in a home."

### Will the AFL grand final public holiday still go ahead?

On that one, it's a yes.

Mr Andrews said there was no reason to cancel the holiday just because the grand final would be held in another state.

"I reckon Victorians may well have earned that," he said.

"If there is a bunch of people who want to criticise me for that, go do it, fine. If that makes you feel better, fine.

"We made a commitment. It is not universally popular, but we made the commitment and we honour our commitments. That day is there and I have no plans to change that."

thenewdaily.com.au, 16 August 2020

<https://www.thenewdaily.com>

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## Technical Notes

AUG. 21, 2020

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

### CHEMICAL EFFECTS

Long-term exposure of high concentration heavy metals induced toxicity, fatality, and gut microbial dysbiosis in common carp, *Cyprinus carpio*

Safe use of chemicals and risk communication among dentists and dental students in Greece

Removal of microplastics from secondary wastewater treatment plant effluent by coagulation/flocculation with iron, aluminum and polyamine-based chemicals

### ENVIRONMENTAL RESEARCH

Foamed polystyrene in the marine environment: Sources, additives, transport, behavior, and impacts

### OCCUPATIONAL

Progression of coal workers' pneumoconiosis absent further exposure

Occupational Exposure to Mycotoxins-Different Sampling Strategies Telling a Common Story Regarding Occupational Studies Performed in Portugal (2012-2020)

Referral to radioisotope examination as a source of additional radiation exposure for staff

### PHARMACEUTICAL/TOXICOLOGY

Serum Perfluoroalkyl Substances, Vaccine Responses, and Morbidity in a Cohort of Guinea-Bissau Children

Toxicity prediction and effect characterization of 90 pharmaceuticals and illicit drugs measured in plasma of fish from a major European river (Sava, Croatia)

Smoking Prevalence, Knowledge and Perceptions on Tobacco Control Among Healthcare Professionals: A Survey in an Italian Cancer Center