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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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Regulatory Update

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ASIA PACIFIC

Preventing psychological injury at work during COVID-19

2020-10-09

Dealing with the COVID-19 pandemic has been a stressful time for all Australians. While employers might not be able to help the stress workers are facing at home, they must eliminate or minimise the risk to psychological health and safety at work as far as is reasonably practicable.

Safe Work Australia has published a **Preventing psychological injury at work during COVID-19** information sheet which provides information about work-related psychosocial hazards that may have been introduced or increased due to COVID-19, how to prevent psychological injury at work during COVID-19 and links to useful resources.

Recognise **World Mental Health Day** on 10 October by promoting this information sheet within your workplace. You can also:

- download the **work-related psychological health and safety guide** which provides a step-by-step process for managing work-related psychological health and safety
- share the **National Safe Work Month mental health case studies** which provide examples of best practice work health and safety for COVID-19, and
- participate in **National Safe Work Month virtual events and initiatives in your region** during October.

For more information, see Safe Work Australia's **COVID-19 information on mental health** which includes links to support services.

Learn more about National Safe Work Month at **safeworkmonth.swa.gov.au**.

Together, we can create safer workplaces for everyone.

Safe Work Australia, 9 October 2020

<https://www.safeworkaustralia.gov.au/doc/preventing-psychological-injury-work-during-covid-19-information-sheet>

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Product and label variations that do not require APVMA notification

2020-10-07

The Australian Pesticides and Veterinary Medicines Authority (APVMA) has provided advice to product holders on the types of product or label updates that can be made by a product holder without requiring APVMA application or notification.

These are variations that do not affect the relevant particulars or conditions of registration of a product or label, and include:

- corrections to typographical errors and spelling mistakes
- updating a Mode of Action group
- updating reference to a product holder on a label if this has changed (for example, in the resistance management strategy)
- compatibility statements (this excludes 'incompatibility' statements that have been required by the APVMA)
- changes to packaging material
- changing from one source of approved active constituent to another.

Further information about minor variations is available on our website.

While these variations have always been permitted, this update aims to clearly communicate this variation type to stakeholders.

We are seeking feedback on this information from stakeholders. Please email any comments on the information in relation to variations that can be made without notifying the APVMA to enquiries@apvma.gov.au with the subject header 'Variations that can be made without notifying the APVMA'.

We are grateful for comments by 7 December 2020.

For more news and updates from the Australian Pesticides and Veterinary Medicines Authority (APVMA), visit our website.

APVMA, 7 October 2020

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

The Australian Pesticides and Veterinary Medicines Authority (APVMA) has provided advice to product holders on the types of product or label updates that can be made by a product holder without requiring APVMA application or notification.

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AMERICA

Experts want new health standard for likely carcinogen in NJ drinking water

2020-10-08

Environmental activists welcomed a new recommendation by state scientists to regulate a toxic chemical, calling it the latest evidence of New Jersey's efforts to curb contaminants in drinking water.

The Drinking Water Quality Institute, a panel of scientists and water company executives that advises the Department of Environmental Protection, has recommended one of the nation's strictest standards for 1,4 dioxane, which is commonly used in solvents, paint strippers, pharmaceuticals and cosmetics. The chemical is unregulated by the federal government even though the U.S. Environmental Protection Agency calls it a "likely" carcinogen.

The panel said DEP should set a Maximum Contaminant Limit (MCL) of 0.33 parts per billion (ppb) in drinking water as the upper limit for safe consumption by humans. The standard is based on the risk of one person in a million getting cancer if exposed to 0.35 parts per billion over a lifetime.

If confirmed, the proposed regulation would require water companies to keep their supplies below that level, if necessary installing technology that would control the chemical. DEP Commissioner Catherine McCabe asked the water quality panel in December 2018 to develop a recommendation for that maximum limit.

Limits on other chemicals

It was the latest action by the panel which in the last six years has recommended tough limits on three kinds of PFAS chemicals, which are also linked to cancer, as well as immune system disorders and other health conditions. All the earlier recommendations have been accepted by DEP and are now the basis of regulations that have established New Jersey as a national leader in protecting public health from the chemicals.

The latest proposal is a "really important recommendation," said Tracy Carluccio of the environmental group Delaware Riverkeeper Network and a long-time campaigner for tighter regulation of chemicals in drinking water. She said the proposed limit is stricter than in most of the 13 states

The chemical is unregulated by the federal government even though the U.S. Environmental Protection Agency calls it a "likely" carcinogen.

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that already have a drinking water or groundwater health standard for the chemical.

But she urged the DEP to act quickly on the proposal to minimize the time that consumers are exposed to the chemical. Its recent regulation of PFAS chemicals has taken as much as three years to be finalized after the initial recommendation by water quality panel.

"We don't want there to be a delay in the DEP rulemaking and the adoption of a MCL because we've got to get this very dangerous material out of people's drinking water," Carluccio said.

EPA tests in 2013-2015 found the chemical at above the proposed health limit in 17.2% of New Jersey's public water systems, or almost three times the national rate, according to data presented to the water quality panel's meeting on Sept. 30. It has been found at any level in 110 water systems.

Humans are mostly exposed to 1,4 dioxane through drinking water that's contaminated by the output of wastewater treatment plants and from spills or leaks, according to data from the DWQI's health effects subcommittee. The chemical is released in air, water and soil from facilities where it is made or used but it degrades in the atmosphere so is not a concern there, the panel said in a [presentation](#).

Full Article

NJ Spotlight, 8 October 2020

<https://www.njspotlight.com/2020/10/14-dioxane-new-standard-urged-nj-drinking-water-likely-carcinogen/>

Childhood lead poisoning prevention bill signed into law

2020-09-30

Through the combined efforts of Assemblymember Rudy Salas (D-Bakersfield), Assemblymember Cristina Garcia (D-Bell Gardens), Assemblymember Eloise Reyes (D-San Bernardino) and Assemblymember Bill Quirk (D-Hayward), Assembly Bill (AB) 2276 was passed, which will improve the rate of blood lead level testing and lead poisoning prevention for children.

"With the passage of AB 2276, children throughout California will be better protected against the harmful effects of lead poisoning," Salas said in a released statement. "Millions of children are at risk of lead poisoning and

"Millions of children are at risk of lead poisoning and need to be tested..."

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need to be tested. I am pleased that the Governor signed this legislation which will ensure that we are taking the steps to protect our most vulnerable kids from lead poisoning and providing the help they need.”

AB 2276 will increase blood lead screening testing for vulnerable children by requiring Medi-Cal managed care plans to identify every child without a record of completing the blood lead screening tests and will remind health care providers of those children of the requirement to perform blood lead screening tests.

AB 2276 also requires the Childhood Lead Poisoning Prevention Program (CLPPP) operated by the California Department of Public Health (CDPH) to add risk factors such as a child’s residency in a high risk zip code and a child’s proximity to current or former lead-producing facilities, that will require blood lead level testing for children.

Full Article

The Sentinel, 30 September

https://hanfordsentinel.com/news/childhood-lead-poisoning-prevention-bill-signed-into-law/article_6390fc8f-e245-591b-8dbb-2ef55f6b65a0.html

OEHHA’s DARTIC will discuss titanium dioxide nanoparticles at December meeting

2020-10-05

The Developmental and Reproductive Toxicant Identification Committee (DARTIC) of California’s Office of Environmental Health Hazard Assessment (OEHHA) will meet on **December 10, 2020**, to discuss the prioritization of 22 chemicals or chemical groups, including titanium dioxide nanoparticles. DARTIC will provide OEHHA with advice on the prioritization of these chemicals for listing consideration at future meetings. No listing decisions will be made at the meeting. According to OEHHA’s [prioritization document](#) for these chemicals, in the most recent application of the [prioritization process](#), OEHHA applied both a human and an animal data screen to candidate chemicals in its tracking database. OEHHA identified 22 chemicals or chemical groups for DARTIC discussion, advice, and consultation. The prioritization document presents information on the identified chemicals or chemical groups. For each, OEHHA presents an initial, abbreviated appraisal of the scientific information identified through the screening-level literature search and the preliminary toxicological evaluation.

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Full Article

Nano and other emerging chemical technologies blog, 5 October 2020

<https://nanotech.lawbc.com/2020/10/oehhas-dartic-will-discuss-titanium-dioxide-nanoparticles-at-december-meeting/>

Public invited to comment on PFAS chemical action plan

2020-10-08

The Washington Department of Ecology is asking the public to provide input on a draft Chemical Action Plan (CAP) that addresses per- and polyfluoroalkyl substances (PFAS), a class of highly persistent chemicals that do not break down in the environment. Those interested can review and comment on the plan through Dec. 7, 2020.

Exposure to these substances can lead to negative health outcomes, and PFAS have already contaminated some drinking water systems in Washington. The plan’s recommendations offer pathways for protecting people, wildlife, and the environment from PFAS exposure. The CAP also comprehensively assesses the impacts of PFAS chemicals in Washington, and recommends strategies to reduce or mitigate those impacts.

CAPs are advisory in nature, so the plan does not create new regulations or restrictions. Ecology is specifically seeking feedback on the following recommendations outlined in the CAP:

- Ensuring drinking water is safe
- Managing environmental PFAS contamination
- Reducing PFAS in products
- Understanding and managing PFAS in waste

Members of the public, business and industry representatives, non-governmental organizations, local governments, state agencies, tribal nations, and others can submit comments through Ecology’s online comment form or by emailing ChemActionPlans@ecy.wa.gov. Interested parties can also register to attend an upcoming public comment meeting (Nov. 12, 18, or 19) on the PFAS CAP website. Ecology will review comments and use the feedback to develop the final CAP, expected in 2021.

Those interested can review and comment on the plan through Dec. 7, 2020.

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Full Article

Washington State Department of Ecology, 8 October 2020

https://www.einnews.com/pr_news/528005813/public-invited-to-comment-on-pfas-chemical-action-plan

ACI pilots new data for cleaning product ingredient safety initiative

2020-09-29

Environmental data on 200+ chemicals in the U.S. consumer cleaning product supply chain are now available, in pilot phase, through the American Cleaning Institute's Cleaning Product Ingredient Safety Initiative database.

"The environmental data available in ACI's Cleaning Product Ingredient Safety Initiative makes public screening level risk assessment summaries for both human health and environmental health, which can be used to meet regulatory requirements," said Kathleen Stanton, ACI Associate Vice President, Technical & International Affairs. "The expansion represents a continued commitment to transparency for the cleaning product supply chain."

In addition to developing a quantitative estimate of environmental exposure, ACI published on its website a description of each ingredient, including:

- the types of products in which it is used
- the form of those products
- the ingredient's function within each of those products
- the typical concentration range among the products
- the most relevant routes of exposure associated with the use of those products.

This database was designed to characterize ingredients that are contained in household cleaning products using a risk-based approach in an aquatic environment. The results can be used to determine if environmental risks are anticipated to be negligible or if additional data are required to make a more realistic assessment. It will be most useful to regulators, researchers, and cleaning product industry formulators and suppliers looking for detailed information on ingredients used in consumer cleaning products.

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ACI's goal is to complete screening level environmental assessments for all ingredients in the database.

The environmental data is in addition to the comprehensive human health assessments already available on the ACI website (www.cleaninginstitute.org/CPISI) for 588 ingredients.

Full Article

American Cleaning Institute, 29 September 2020

<https://www.cleaninginstitute.org/newsroom/releases/2020/aci-pilots-new-data-cleaning-product-ingredient-safety-initiative>

EUROPE

Sweden allocates 3.8 million Euros to Bosnia and Herzegovina to fight air pollution

2020-10-07

Swedish Environmental Protection Agency is implementing a three-year project in BiH worth € 3.8 million to fight air pollution – "IMPAQ"

Bosnia and Herzegovina needs to improve its air quality and air quality management before it can meet requirements for entry to the EU. According to the WHO, Bosnia and Herzegovina is one of Europe's most polluted countries and has some of the worst air quality in the world. A WHO study shows that the country faces 79.8 premature deaths per 100 000 population due to poor air quality. In other countries, for example in Sweden, the death rate is much lower, with a corresponding figure of 7.2 premature deaths per 100 000 people.

With the aim to help BiH to fight air pollution and improve air quality assessment and management systems in accordance with EU standards, since 2019 the Environmental Protection Agency (SEPA), with financial support from Embassy of Sweden, is implementing a three-year project "Improving air quality and air quality management in Bosnia and Herzegovina – IMPAQ".

This year, as part of the IMPAQ project, the beta version of the latest generation of the European Environment Association's (EEA)'s air quality data management and reporting system, Raven, was installed in BiH. The system is developed by the Norwegian Institute for Air Research (NILU) with the help from the IMPAQ project partner the Swedish Meteorological

"The expansion represents a continued commitment to transparency for the cleaning product supply chain."

A WHO study shows that the country faces 79.8 premature deaths per 100 000 population due to poor air quality.

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and Hydrological Institute (SMHI). The system includes, among other things, a central database for air quality measurements and functions for reporting data to the EEA.

“By the end of this month, Bosnia and Herzegovina will prepare an annual report for 2019 for the EEA using the new version of Raven. The difference compared to the previous versions is that it can also be used as a database, data visualizations have been improved, and some other operations used in data management have been facilitated”, says Enis Omerčić Senior Associate in Environmental sector of Hydro-meteorological Institute of Federation of BiH.

Full Article

Sarajevo Times, 7 October 2020

<http://www.sarajevotimes.com/sweden-allocates-3-8-million-euros-to-bosnia-and-herzegovina-to-fight-air-pollution/>

Public consultation begins on SCCS scientific advice on safety of nanomaterials in cosmetics

2020-10-07

The European Commission’s (EC) Scientific Committee on Consumer Safety (SCCS) began a public consultation on October 5, 2020, on a preliminary opinion entitled *Scientific Advice on the Safety of Nanomaterials in Cosmetics*. The EC requested that SCCS determine the nanomaterials, as published in the 2019 catalogue of nanomaterials, for which specific concerns can be identified and justified to establish a priority list of nanomaterials for risk assessment (Article 16(4) Reg. 1223/2009). The EC asked that SCCS provide a description of the specific concerns that have been identified.

Full Article

Nano and other emerging technologies blog, 7 October 2020

<https://nanotech.lawbc.com/2020/10/public-consultation-begins-on-sccs-scientific-advice-on-safety-of-nanomaterials-in-cosmetics>

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INTERNATIONAL**On children’s environmental health day: A checklist for defending science and protecting kids**

2020-10-08

Today is Children’s Environmental Health Day— a day organized by the Children’s Environmental Health Network and supported by a long list of organizations committed to advocating for policy change that prioritizes children. Earlier this year, our report *Endangering Generations* outlined some of the policy decisions made in recent years that have ignored the science and walked back progress in protecting children’s environmental health and wellbeing.

As we look toward 2021, the Center for Science and Democracy has issued recommendations for government decision makers on how to improve scientific integrity, transparency, public participation, and equity in policy. Here are some ways that our government can take action to improve the lives of children and future generations

Promoting science-based decision making

We need agencies to ensure science guides its decisions on dangerous pollutants to protect children. The EPA has issued a draft rule on ozone that retains the status quo, based on a flawed and expedited process that EPA political leadership rushed with only minimal scientific input. It failed to form an Ozone Review Panel—a group of two dozen experts that should have helped to ensure a robust review of the science. The ozone standard is especially important for more sensitive groups, including children, outdoor workers, asthmatics, and the elderly, which the Clean Air Act requires EPA to protect. As my colleague Dr. Gretchen Goldman described in her public comment, “some 124 million Americans live in areas with ozone pollution levels that exceed the current standard, with serious public health consequences for many, including those with lung diseases such as asthma, children, and the elderly.” And the only scientist advising the EPA on ozone with direct expertise on health effects of ozone told the agency that he didn’t think the current standards protected asthmatic kids. Yet, the administration is moving forward anyway.

Strengthening scientific integrity

We need agencies to ensure scientific integrity policies are strengthened to prevent political interference in the science decisionmaking process. During a White House coronavirus taskforce

Today is Children’s Environmental Health Day— a day organized by the Children’s Environmental Health Network and supported by a long list of organizations committed to advocating for policy change that prioritizes children.

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briefing, Vice President Mike Pence ordered the Centers for Disease Control and Prevention (CDC) to rewrite their school opening guidelines for reasons that appeared to be primarily political. Under this pressure, the CDC issued new school guidelines that emphasized the importance of in-person learning while downplaying the potential health risks associated with catching or spreading the novel coronavirus. According to one federal official, the Department of Health and Human Services (HHS) officials that wrote up the new guidelines cut off direct communication with CDC experts during the process because they did not agree with what the CDC experts were saying. Guidelines from our public health agency should be based on the science, rather than suiting a political agenda.

Enforcing transparency

We need agencies to focus on improving transparency and making decisions more open to the public, rather than coopting the term to censor science. EPA is attempting to finalize a so-called transparency rule that will restrict the use of important epidemiological and medical studies, the underlying data for which can't be made public because of private information. EPA is already applying the principles of its not yet finalized restricted science rule to justify removing key studies from a revised draft human health risk assessment of chlorpyrifos that will inform the agency's upcoming decision on how chlorpyrifos, a known neurotoxin with especially dangerous effects on children, will be used in the future. Ignoring this body of work funded by the agency itself means that it lacks the necessary evidence to formulate conclusions about chlorpyrifos' direct human health impacts.

Full Article

Union of concerned scientists, 8 October 2020

<https://blog.ucsusa.org/genna-reed/on-childrens-environmental-health-day-a-checklist-for-defending-science-and-protecting-kids?ga=2.59428269.1449015117.1602214400-1114461297.1602214400>

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REACH Update

OCT. 16, 2020

Post-Brexit EU chemical alignment mechanism urgently needed—NGOs

2020-10-09

Several UK-based NGOs have urged the government to bring in a mechanism that would match EU controls on chemicals to ensure the country does not become a post-Brexit 'dumping ground' for substances that do not comply with single market rules.

In a 7 October letter to George Eustice MP, secretary of state at Defra, ten NGOs including CHEM Trust and Breast Cancer UK, said the government had already acknowledged chemical dumping is a possibility and they emphasised that an alignment mechanism is the only preventative measure.

In June, Defra reiterated that the UK was not seeking associate membership of Echa or participation in EU REACH, despite persistent calls from industry and NGOs for full compliance with Union law to secure market access.

The UK will activate its independent REACH regime from 1 January when the Brexit transition period ends.

The current framework for this, the NGO letter says, will "fail to deliver" on the government's promise to provide a better system than EU REACH.

Full Article

Chemical Watch, 9 October 2020

<https://chemicalwatch.com/164211/post-brexit-eu-chemicals-alignment-mechanism-urgently-needed-ngos>

New restrictions intentions: bisphenol A and similar bisphenols, and PFAS in firefighting foams

2020-10-07

Germany has submitted an intention to restrict the placing on the market and use of 4,4'-isopropylidenediphenol (bisphenol A; EC 201-245-8, CAS 80-05-7) and 'structurally related bisphenols of similar concern for the environment'.

ECHA has submitted an intention to restrict the use of per- and polyfluoroalkyl substances (PFAS) in firefighting foams.

The UK will activate its independent REACH regime from 1 January when the Brexit transition period ends.

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REACH Update

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Both intentions were submitted on 1 October 2020 and the restriction proposals are expected on 1 October 2021.

ECHA, 7 October 2020

<https://echa.europa.eu/-/echa-weekly-7-october-2020>

Restriction proposals for lead in ammunition for hunting and fishing and DMAC/NEP postponed

2020-10-07

The submissions of the Annex XV restriction proposals on the use of lead in ammunition (gunshots and bullets) and fishing tackle (EC/CAS -) being prepared by ECHA and on DMAC/NEP (EC 204-826-4, CAS 127-19-5) by the Netherlands have been postponed until 15 January 2021.

For the proposal on lead in ammunition (gunshots and bullets) and fishing tackle more time is needed to complete the overall assessment as the

COVID-19 pandemic has reduced the capacity of stakeholders to respond to our requests for information.

Registry of restriction intentions

ECHA, 7 October 2020

<https://echa.europa.eu/-/echa-weekly-7-october-2020>

Webinar: Restriction of per- and polyfluoroalkyl substances (PFAS) under REACH

2020-10-07

29 October 2020, 13:30 – 15:30 CET, GMT +1

Germany, the Netherlands, Norway, Sweden and Denmark are working on a REACH restriction proposal to limit the risks to the environment and human health from the manufacture and use of all per- and polyfluoroalkyl substances (PFAS). A call for evidence was held during the summer of 2020.

Join our webinar to learn about the REACH restriction process and the status of the proposed PFAS restriction.

The webinar will be published on our home page on 29 October 2020 at 13:30 CET, GMT+1 together with instructions for joining a live Q&A

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session where experts from authorities in the five Member States will be answering your questions until 15:30.

ECHA, 7 October 2020

<https://echa.europa.eu/-/echa-weekly-7-october-2020>

Committees' opinions on applications for authorisation available

2020-10-07

The consolidated opinions of the Committees for Risk Assessment and Socio-economic Analysis are now available for:

- use of 4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated (EC -; CAS -) by Lonza Biologics Porriño, SL and Lonza Biologics, plc.;
- two uses (use 1, use 2) of 4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated (EC -; CAS -) by Wallac Oy;
- use of 4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated (EC -; CAS -) by Rentschler Biopharma SE;
- use of 4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated (EC -; CAS -) by Teva Baltics UAB; and
- use of 4-nonylphenol, branched and linear, ethoxylated (EC -; CAS -) by Sekisui S-lec BV Roermond.

Opinions

ECHA, 7 October 2020

<https://echa.europa.eu/-/echa-weekly-7-october-2020>

Authorisations granted for uses of two substances

2020-10-07

The European Commission has granted authorisations for the:

- use of strontium chromate (EC 232-142-6, CAS 7789-06-2) to Wesco Aircraft EMEA Limited, PPG Europe B.V., Cytec Engineered Materials Ltd. (review period expires on 22 January 2026); and
- use of sodium dichromate (EC 234-190-3, CAS 7789-12-0, 10588-01-9) to Società Chimica Bussi S.p.A. (28 August 2032).

ECHA, 7 October 2020

<https://echa.europa.eu/-/echa-weekly-7-october-2020>

The submissions of the Annex XV restriction proposals on the use of lead in ammunition (gunshots and bullets) and fishing tackle (EC/CAS -) being prepared by ECHA and on DMAC/NEP (EC 204-826-4, CAS 127-19-5) by the Netherlands have been postponed until 15 January 2021.

The consolidated opinions of the Committees for Risk Assessment and Socio-economic Analysis are now available for:

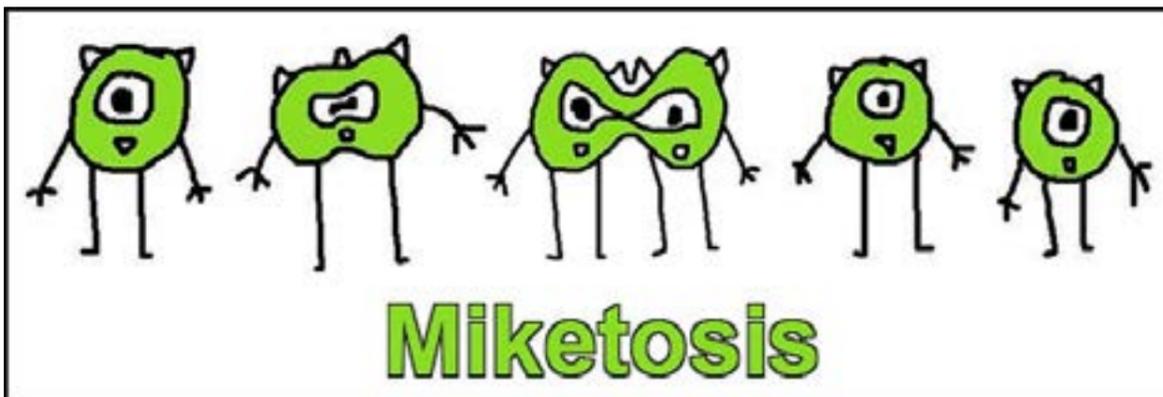
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Janet's Corner

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Miketosis

2020-10-16



<http://www.sevenminutescientist.com/2014/10/02/mitosis-jokes/>

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Hazard Alert

OCT. 16, 2020

Diethyl Ether

2020-10-16

Diethyl ether, aka ether or ethoxyethane, is a clear colourless highly flammable liquid. Its chemical formula is $C_2H_5OC_2H_5$. It has a distinctive smell and a low boiling point. [1,2]

USES [2,3]

Diethyl ether is, and was, used across a range of applications in various industries. Historically it was used as an anaesthetic agent, however it was replaced in the 1960s. It is currently used as a solvent in laboratories, and for plastics, oils, resins, waxes and dyes.

ROUTES OF EXPOSURE [3]

- The main route of exposure to diethyl ether is via inhalation.

HEALTH EFFECTS

Diethyl ether poisoning affects a range of systems, including the nervous and respiratory systems.

Acute Effects [4]

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

Swallowing the chemical may result in very serious health complications or death. If the liquid is swallowed and it aspirates into the lungs, it could result in chemical pneumonitis. Ingestion may also cause blurred vision, headaches, dizziness, stupor, and irritation of the mucous membrane. Eye contact with diethyl ether can result in redness, tears and irritation. If a person's skin is exposed, it can result in cracking, dryness or flaking. Entry into the bloodstream through open cuts, abrasions and wounds may cause systemic injury or illness. Inhalation of the chemical may cause dizziness and drowsiness, as well as loss of co-ordination and reflexes, narcosis and vertigo. It could also cause laryngeal spasm, vasodilation, seizures and damage to the kidneys and liver.

Chronic Effects [4]

Chronic exposure to diethyl ether is toxic to multiple body systems. Long term skin exposure to the chemical can result in irritation, cracking and drying. There is limited evidence that chronic exposure to diethyl ether can cause cumulative health effects. Although it is medically "safe", repeated

Diethyl ether, aka ether or ethoxyethane, is a clear colourless highly flammable liquid.

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Hazard Alert

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exposure can lead to “ether habit”, which resembles chronic alcoholism. Chronic exposure can also lead to sleepiness, dizziness, psychic disturbances and loss of weight and appetite.

~h1Safety

First Aid Measures [5]

- Ingestion: DO NOT induce vomiting. Move patient into recovery position. If the person is conscious (and not showing any signs of drowsiness), then you can give them water to rinse their mouth. Contact a medical professional.
- Skin contact: Remove all contaminated clothing, footwear and accessories. Do not re-wear clothing until it has been thoroughly decontaminated. Immediately rinse affected areas with plenty of soap and water. Contact a doctor in the event of continued irritation.
- Eye contact: Flush eyes (including under the eyelids), with fresh running water for at least 15 minutes. Removal of contact lenses should only be done by skilled personnel. Contact a medical professional immediately.
- Inhalation: If the person inhales fumes, combustion products or aerosols, remove them from the contaminated site. Prostheses, such as false teeth, should be removed prior to first aid procedures, as they may block airways. Perform CPR if you are qualified and if the patient is unconscious and not breathing. Use a one-way valve and mask if possible. 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 quick-drench areas should be accessible in the immediate area of the potential exposure. Ensure there is adequate ventilation.
- Personal protection: Safety glasses with side shields or chemical goggles, protective and dustproof clothing, gloves (protection class 5 or higher), a P.V.C apron and an appropriate mask or dusk respirator. Do not wear contact lenses as they could absorb chemicals in the air. Wear impervious shoes. Other protection could include barrier cream and skin cleansing cream. For specifications regarding other PPE, follow the guidelines set in your jurisdiction.

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Hazard Alert

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REGULATION [6]

United States:

The National Institute for Occupational Safety and Health (NIOSH) has set a Time Weighted Average (TWA) concentration limit for diethyl ether of 400ppm.

Australia [5]

Australia Exposure Standards have set a TWA for diethyl ether of 400ppm.

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40% of world's plant species at risk of extinction

2020-09-30

Two in five of the world's plant species are at risk of extinction as a result of the destruction of the natural world, according to an international report.

Plants and fungi underpin life on Earth, but the scientists said they were now in a race against time to find and identify species before they were lost.

These unknown species, and many already recorded, were an untapped "treasure chest" of food, medicines and biofuels that could tackle many of humanity's greatest challenges, they said, potentially including treatments for coronavirus and other pandemic microbes.

More than 4,000 species of plants and fungi were discovered in 2019. These included six species of *Allium* in Europe and China, the same group as onions and garlic, 10 relatives of spinach in California and two wild relatives of cassava, which could help future-proof the staple crop eaten by 800 million people against the climate crisis.

New medical plants included a sea holly species in Texas, whose relatives can treat inflammation, a species of antimalarial *Artemisa* in Tibet and three varieties of evening primrose.

"We would be able not survive without plants and fungi – all life depends on them – and it is really time to open the treasure chest," said Prof Alexandre Antonelli, the director of science at the Royal Botanical Gardens, Kew, in the UK. RBG Kew led [the report](#), which involved 210 scientists from 42 countries.

"Every time we lose a species, we lose an opportunity for humankind," Antonelli said. "We are losing a race against time as we are probably losing species faster than we can find and name them."

The UN revealed last week that [the world's governments failed to meet a single target to stem biodiversity losses](#) in the last decade.

The researchers based their assessment of the proportion of species under threat of extinction on the International Union for Conservation of Nature's [Red List](#). But only a small fraction of the 350,000 known plant species have been assessed, so the scientists used statistical techniques to adjust for biases in the data, such as the lack of fieldwork in some regions.

They also used artificial intelligence to assess little-known areas. "We now have AI approaches that are up to 90% accurate," said Eimear Nic

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Lughadha, a senior research leader at RBG Kew. "These are good enough to say, 'this area has a lot of species that haven't been assessed but are almost certainly threatened'"

In 2019, Nic Lughadha reported that [571 species had been wiped out](#) since 1750, although the true number was likely to be much higher.

The [2016 State of Plants report](#) found [one in five were threatened](#), but the new analysis reveals the real risk to be much higher. The main cause of plant losses is the destruction of wild habitat to create farmland. Overharvesting of wild plants, building, invasive species, pollution and, increasingly, the climate crisis are also important causes of losses.

Billions of people rely on herbal medicines as their primary source of healthcare, but the report found that 723 species used as treatments are threatened with extinction. These include a type of red angel's trumpet in South America used for circulatory disorders that is now extinct in the wild and an Indian pitcher plant traditionally used for skin diseases.

"Only 7% of [known] plants have documented uses as medicines and therefore the world's plants and fungi remain largely untapped as potential sources of new medicines," said Melanie-Jayne Howes, a research leader at RBG Kew. "So it is absolutely critical that we better protect biodiversity so we are better prepared for emerging challenges to our planet and our health."

Prof Monique Simmons, who researches the uses of plants and fungi at RBG Kew, said nature was a key place to look for treatments for coronaviruses and other diseases with pandemic potential: "I am absolutely sure going forward that some of the leads for the next generation of drugs in this area will come from plants and fungi."

The report also highlighted the very small number of plant species that humanity depends on for food. This makes supplies vulnerable to changes in climate and new diseases, especially with the world's population expected to rise to 10 billion by 2050. Half the world's people depend on rice, maize and wheat and just 15 plants provide 90% of all calories.

"The good news is that we have over 7,000 edible plant species that we could use in the future to really secure our food system," said Tiziana Ulian, a senior research leader at RBG Kew.

These species are all nutritious, robust, at low risk of extinction, and have a history of being used as local foods, but just 6% are grown at significant scale.

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Potential future foods include the morama bean, a drought-tolerant South African legume that tastes like cashew nuts when roasted, and a species of pandan fruit that grows from Hawaii to the Philippines.

Stefano Padulosi, a former senior scientist at the Alliance of Biodiversity International, said: "The thousands of neglected plant species are the lifeline to millions of people on Earth tormented by unprecedented climate change, pervasive food and nutrition insecurity, and [poverty]."

"Harnessing this basket of untapped resources for making food production systems more diverse and resilient to change should be our moral duty."

The report also found the current levels of beekeeping in cities such as London was threatening wild bees, as there was insufficient nectar and pollen available to support beehive numbers and honeybees were outcompeting wild bees.

theguardian.com, 30 September 2020

<https://www.theguardian.com>

Mysterious inflammatory syndrome tied to COVID-19 strikes adults as well as kids

2020-10-03

Months after the discovery of a "multisystem inflammatory syndrome" tied to COVID-19 in children, health officials are warning that a similar condition can strike adults as well.

On Friday (Oct. 2), the Centers for Disease Control and Prevention (CDC) released a report describing a "multisystem inflammatory syndrome in adults" or (MIS-A). Like the syndrome in children, MIS-A is a severe illness that targets multiple organs and causes increased inflammation in the body, the report said. And with both syndromes, many patients either test positive for SARS-CoV-2, the virus that causes COVID-19, or have antibodies against it, indicating a recent infection.

Currently, MIS-A appears rare, like its counterpart in children. The new CDC report identifies around two dozen cases of MIS-A.

Still, the new report, published in the CDC journal Morbidity and Mortality Weekly Report, urges doctors to consider a diagnosis of MIS-A in adults with compatible signs and symptoms. "Ultimately, the recognition of

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MIS-A reinforces the need for prevention efforts to limit spread of SARS-CoV-2," the authors concluded.

Adult syndrome

Reports of a mysterious inflammatory syndrome in children first appeared in the spring, and doctors dubbed the condition MIS-C, or "multisystem inflammatory syndrome in children." Children with this rare syndrome, which affects multiple organs and often requires hospitalization, can experience fever, abdominal pain, vomiting, diarrhea, neck pain, rash, bloodshot eyes and fatigue, according to the CDC. So far, the CDC has received reports of 935 cases of MIS-C in the United States, including 19 deaths. The official definition of MIS-C includes an age limit of 20 years old, and cases have been seen in children, teens and young adults.

Over the summer, there were reports of a similar syndrome popping up in adults. The new CDC report describes 27 cases of MIS-A from the United States and the United Kingdom. Sixteen of these cases are described in detail, nine of which were officially reported to the CDC, and seven of which were described in published case reports.

Among the 16 cases, patients ranged in age from 21 to 50 years old. Just one case was reported in the U.K., with the rest reported in the U.S., including cases in Maine, Florida, Louisiana, Georgia, New York, Massachusetts and Texas.

Some adult symptoms were similar to those seen in children, including fever, gastrointestinal symptoms and rash. Some patients reported chest pain or heart palpitations, and all had elevated levels of markers of inflammation. All of the patients had either a positive COVID-19 test or positive antibody test. Ten patients required treatment in the intensive care unit, and two patients died, the report said.

The findings "indicate that adult patients of all ages with current or previous SARS-CoV-2 infection can develop a hyperinflammatory syndrome resembling MIS-C," the authors wrote.

The authors note that hospitalized patients with COVID-19 in general can experience inflammation and effects on organs beyond the lungs. However, in most cases, those effects are accompanied by serious respiratory problems. However, with MIS-A, patients haven't shown serious respiratory symptoms. Of the 16 patients, half did not have any respiratory symptoms, and half had only mild ones.

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Concerningly, of 22 patients in the study with information on race/ethnicity available, all but one patient belonged to a minority group.

“Long-standing health and social inequities have resulted in increased risk for infection and severe outcomes from COVID-19 in communities of color,” the authors said. A similar trend has been seen in children with MIS-C — more than 70% of reported U.S. cases have occurred in children who are Hispanic or Black, [according to the CDC](#).

The underlying causes of MIS-C and MIS-A are not known. But 30% of adults in the current report and 45% of a sample of 440 children with MIS-C tested negative for SARS-CoV-2, but positive for antibodies against the virus, “suggesting MIS-A and MIS-C might represent postinfectious processes,” the authors wrote. Further research is needed to understand the exact causes of this condition and its long-term effects, they concluded.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 3 October 2020

<https://www.livescience.com>

Scientists design new type of biodegradable plastic using reclaimed plastic

2020-10-06

The Fraunhofer Institute for Production Systems and Design Technology IPK and its partners have developed an innovative process for creating a new type of plastic made of reclaimed waste which readily degrades in less than a year. The new substance, polyhydroxybutyrate will soon serve to manufacture and break down mainly **disposable products** in an ecofriendly way. This innovative material can be produced on an industrial scale with the recently developed method.

Polypropylene Like New Plastic

This new process turns industrial leftovers such as waste fats that contain a lot of mineral residue into polyhydroxybutyrate (PHB). Microorganisms can metabolize these residues in special fermentation processes. They deposit the PHB in their cells to store energy.

“Once the plastic has been dissolved from the cell, it is still not ready for industrial use, because the hardening process takes far too long,” says

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Christoph Hein, head of the Microproduction Technology department at Fraunhofer IPK.

The raw material must be mixed with chemical additives downstream in post-production stages. For example, the research team adjusted the plasticizing and processing parameters to trim the recrystallization time to fit the timing of industrial processing. The resulting biopolymer’s properties resemble those of polypropylene. But unlike PP, this plastic degrades fully in six to twelve months.

The Bioeconomy International Research Initiative

The German Federal Ministry of Education and Research (BMBF) has launched the “Bioökonomie International” (Bioeconomy International) research initiative in close cooperation with Fraunhofer IPK, the Department of Bioprocess Technology of the Technical University of Berlin, regional industrial partners and international research partners from Malaysia, Columbia and the USA. These researchers are developing a method of manufacturing polymers without drawing on premium resources such as mineral, palm and rapeseed oils, the production of which is very detrimental to the environment.

In this method of producing plastic, microorganisms synthesize the entire polymer in a biotechnical process. *“To this end, we convert biogenic residues such as waste fats into polyesters that can be put to technical use,”* says Hein. The research team opted for microorganisms, genetically modified with molecular methods, to serve as biocatalysts. With the help of chemical purification processes and an extensively optimized material, they have been able to develop a novel family of materials that satisfy the demands of technical plastics.

Greener Plastic Alternatives

The new process not only dispenses with petroleum-based synthetic components altogether; it also enables **green plastic alternatives**. Naturally occurring microorganisms can break down these newly developed plastics, so they need not be subjected to the special conditions that serve to degrade matter in industrial composting plants. They offer an ecofriendly alternative to making and degrading single-use products and other disposable items.

The process also lends itself to producing high-quality plastic parts for certain technical applications and periods of use. The specifications

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for this sort of product are more demanding. They may have to exhibit specific geometric tolerances and surface qualities or be reproducible with great precision. The researchers developed highly specialized replication processes to meet these requirements.

Source: Fraunhofer Institute for Production Systems and Design Technology

omnexus.specialchem.com, 6 October 2020

<https://www.omnexus.specialchem.com>

Coronavirus spike protein morphs into 10 different shapes to invade cells

2020-09-30

The novel coronavirus uses its «spike proteins» to latch onto and invade human cells. But to do so, the spikes morph into at least 10 different shapes, according to a new study.

At the start of the pandemic, scientists rapidly identified the structure of the spike protein, paving the way to target it with vaccines and other drugs. But there's still so much scientists don't know about the interaction between the spike protein and the "doorknob" on the outsides of human cells — called the ACE2 protein. For instance, they aren't sure what intermediate steps the protein takes to kickstart the process of fusing to, and then opening the cell, ultimately dumping viral material into the cell.

"The spike protein is the focus of so much research at the minute," said co-lead author Donald Benton, a postdoctoral research fellow at the Francis Crick Institute's Structural Biology of Disease Processes Laboratory in the United Kingdom. Understanding how it functions "is very important because it's the target of most of the vaccination attempts and a lot of diagnostic work as well." **PLAY SOUND**

To understand the process of infection, Benton and his team mixed human ACE2 proteins with spike proteins in the lab. They then used a very cold liquid ethane to rapidly freeze the proteins such that they became "suspended in a special form of ice," Benton told Live Science. They then put these samples under a cryo-electron microscope and obtained tens of thousands of high-resolution images of the spike proteins frozen at different stages of binding to the ACE2 receptors.

They found that the spike protein undergoes shape changes as it binds to the ACE2 receptor. After the spike protein first binds, its structure becomes

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more open to allow for more binding (imagine how much easier it would be to hug someone if they opened up their arms). The spike protein eventually binds to ACE2 at all three of its binding sites, revealing it's "central core," according to a statement. This final structure likely allows the virus to fuse to cell membranes.

"It's a very complicated receptor binding process compared to most virus spike proteins," Benton said. "Flu and HIV have a more simple activation process.» The coronavirus is covered in spike proteins, and it's likely only a small fraction of them go through these conformational changes, bind to human cells and infect them, Benton said.

"We know that the spike can adopt all these states that we were talking about," said co-lead author Antoni Wrobel, who is also a postdoctoral research fellow at the Francis Crick Institute's Structural Biology of Disease Processes Laboratory. "But whether each of the spikes adopts all of them we can't say because we can see only kind of snapshots."

The spike protein is very quick to change. In the lab, the spike can morph into all of these different conformations in less than 60 seconds, Wrobel told Live Science. But "this will be very different in a real infection; everything will be slower because the receptor will be stuck on the surface of a cell so you have to allow time for the virus to diffuse to this receptor," Benton said.

Why does the spike protein go through this many conformational changes to infect a cell? It "may be a way of the virus protecting itself from recognition by antibodies," Benton said. When the spike protein is in its closed states, it hides the site that binds with the receptor, maybe to avoid antibodies coming in and binding to that site instead, he said.

But "it's very hard to know," Wrobel said. In any case, this research reveals more surfaces on the spike protein that are exposed during infection — as different shapes reveal surfaces once thought hidden. Researchers can then potentially develop vaccines to target these surfaces. "We can then start to think about therapeutics that would fit somewhere either in the receptor surface or somewhere in the spike itself that then act as drugs," Wrobel told Live Science.

Wrobel and Benton hope to figure out why the coronavirus goes through so many conformational changes, how that compares to other coronaviruses and if these changes might help explain why this new virus spreads so easily.

They found that the spike protein undergoes shape changes as it binds to the ACE2 receptor.

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The findings were published Sept. 17 in the journal [Nature](#).

Originally published on [Live Science](#).

[livescience.com](#), 30 September 2020

<https://www.livescience.com>

Invasive jumping worms damage U.S. soil and threaten forests

2020-09-29

What could be more 2020 than an ongoing invasion of jumping worms?

These earthworms are wriggling their way across the United States, voraciously devouring protective forest leaf litter and leaving behind bare, denuded soil. They displace other earthworms, centipedes, salamanders and ground-nesting birds, and disrupt forest food chains. They can invade more than five hectares in a single year, changing soil chemistry and microbial communities as they go, new research shows. And they don't even need mates to reproduce.

Endemic to Japan and the Korean Peninsula, three invasive species of these worms — *Amyntas agrestis*, *A. tokioensis* and *Metaphire hilgendorfi* — have been in the United States for over a century. But just in the past 15 years, they've begun to spread widely (*SNS*: 10/7/16). Collectively known as Asian jumping worms, crazy worms, snake worms or Alabama jumpers, they've become well established across the South and Mid-Atlantic and have reached parts of the Northeast, Upper Midwest and West.

Jumping worms are often sold as compost worms or fishing bait. And that, says soil ecologist Nick Henshue of the University at Buffalo in New York, is partially how they're spreading (*SN*: 11/5/17). Fishers like them because the worms wriggle and thrash like angry snakes, which lures fish, says Henshue. They're also marketed as compost worms because they gobble up food scraps far faster than other earthworms, such as nightcrawlers and other *Lumbricus* species.

Bottom of Form

But when it comes to ecology, the worms have more worrisome traits. Their egg cases, or cocoons, are so small that they can easily hitch a ride on a hiker's or gardener's shoe, or can be transported in mulch, compost or shared plants. Hundreds can exist within a square meter of ground.

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Compared with *Lumbricus* worms, jumping worms grow faster and reproduce faster — and without a mate, so one worm can create a whole invasion. Jumping worms also consume more nutrients than other earthworms, turning soil into dry granular pellets that resemble coffee grounds or ground beef — Henshue calls it “taco meat.” This can make the soil inhospitable to native plants and tree seedlings and far more likely to erode.

To date, scientists have worried most about the worms' effects on ground cover. Prior to a jumping worm invasion, the soft layer of decomposing leaves, bark and sticks covering the forest floor might be more than a dozen centimeters thick. What's left afterward is bare soil with a different structure and mineral content, says Sam Chan, an invasive species specialist with Oregon Sea Grant at Oregon State University in Corvallis. Worms can reduce leaf litter by 95 percent in a single season, he says.

That in turn can reduce or remove the forest understory, providing less nutrients or protection for the creatures that live there or for seedlings to grow. Eventually, different plants come in, usually invasive, nonnative species, says Bradley Herrick, an ecologist and research program manager at the University of Wisconsin–Madison Arboretum. And now, new research shows the worms are also changing the soil chemistry and the fungi, bacteria and microbes that live in the soils.

In a study in the October *Soil Biology and Biochemistry*, Herrick, soil scientist Gabriel Price-Christenson and colleagues tested samples from soils impacted by jumping worms. They were looking for changes in carbon and nitrogen levels and in soils' release of carbon dioxide, which is produced by the metabolism of microbes and animals living in the soil. Results showed that the longer the worms had lived in the soils, the more the soils' basal metabolic rate increased — meaning soils invaded by jumping worms could release more carbon dioxide into the atmosphere, says Price-Christenson, who is at the University of Illinois at Urbana-Champaign.

Relative amounts of carbon and nitrogen in soils with jumping worms also shifted, the team found. That can affect plant communities, Herrick says. For example, although nitrogen is a necessary nutrient, if there's too much, or it's available at the wrong time of year, plants or other soil organisms won't be able to use it.

The team also extracted DNA from worm poop and guts to examine differences in microbes among the jumping worm species, and tested the soils for bacterial and fungal changes. Each jumping worm species harbors

And they don't even need mates to reproduce.

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a different collection of microbes in its gut, the results showed. That's "a really important find," Herrick says, "because for a long time, we were talking about jumping worms as a large group ... but now we're learning that [these different species] have different impacts on the soil, which will likely cascade down to having different effects on other worms, soil biota, pH and chemistry."

The finding suggests each species might have a unique niche in the environment, with gut microbes breaking down particular food sources. This allows multiple species to invade and thrive together, Herrick says. This makes sense, given findings of multiple species together, but it's still a surprise that such similar worms would have different niches, he says.

Scientists have been working hard to get a good handle on the biology of these worms, Henshue says. So the newly discovered soil chemistry and microbiology changes are "thoughtful" and important lines of research. But there's still a lot that's unknown, making it hard to predict how much farther the worms might spread and into what kinds of environments. One important question is how weather conditions affect the worms. For example, a prolonged drought this year in Wisconsin seems to have killed off many of the worms, Herrick says. Soils teeming with wriggling worms just a few weeks ago now hold far fewer.

Perhaps that's a hopeful sign that even these hardy worms have their limits, but in the meantime, the onslaught of worms continues its march — with help from the humans who spread them.

sciencenews.com, 29 September 2020

<https://www.sciencenews.com>

Groundbreaking method to produce renewable PU without toxic precursors

2020-09-30

NREL researchers have developed a groundbreaking method for producing renewable polyurethane without toxic precursors, using nontoxic resources like linseed oil, waste grease, or even algae. It is a breakthrough with the potential to green the market for products ranging from footwear, to automobiles, to mattresses, and beyond.

Natural Oils to Produce Renewable PU

NREL's chemistry reacts natural oils with readily available carbon dioxide

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to produce renewable, nontoxic polyurethanes—a pathway for creating a variety of green materials and products.

The real challenge was figuring out how to speed up that reaction to compete with conventional processes. Researchers needed to produce polymers that performed at least as well as conventional materials, a major technical barrier to commercializing bio-based polyurethanes.

"The reactivity of the non-isocyanate, bio-based processes described in the literature is slower. So, we needed to make sure we had reactivity comparable to conventional chemistry," Tao Dong, an expert in chemical engineering, NREL explained.

The Epoxidation Process

NREL's process overcomes the barrier by developing bio-based formulas through a clever chemical process. It begins with an epoxidation process, which prepares the base oil—anything from canola oil or linseed oil to algae or food waste—for further chemical reactions. By reacting these epoxidized fatty acids with CO₂ from the air or flue gas, carbonated monomers are produced. Lastly, researchers combined the carbonated monomers with diamines (derived from amino acids, another bio-based source) in a polymerization process that yields a material that cures into a resin—non-isocyanate polyurethane.

By replacing petroleum-based polyols with select natural oils, and toxic isocyanates with bio-based amino acids, researchers have managed to synthesize polymers with properties comparable to conventional polyurethane. In other words, they have developed a viable renewable, nontoxic alternative to conventional polyurethane. And the chemistry had an added environmental benefit.

"As much of 30% by weight of the final polymer is CO₂," said Phil Pienkos, a chemist who recently retired from NREL. He also added that the numbers are even more impressive when considering the CO₂ absorbed by the plants or algae used to create the oils and amino acids in the first place.

Boosting the Value of CO₂

CO₂, a ubiquitous greenhouse gas, is often considered an unfortunate

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waste product of various industrial processes, prompting many companies to look for ways to absorb it, eliminate it, or even put it to good use as a potential source of profit. By incorporating CO₂ into the very structure of their polyurethane, Pienkos and Dong had provided a pathway for boosting its value.

"That means less raw material per pound of polymer, lower cost, and a lower overall carbon footprint. It looks to us that this offers remarkable sustainability opportunities," Pienkos continued.

Meeting the Demand of the Market

The next step was to see if the process could be commercialized, scaled up to meet the demands of the market.

After all, renewable or not, polyurethane needs to demonstrate the properties that consumers expect from brand-name products. The process to create it must also match companies' manufacturing processes, allowing them to "drop in" the new material without prohibitively costly upgrades to facilities or equipment.

"That's why we need to work with industry partners to make sure our research aligns with their manufacturing processes," Dong explained.

In the two short years since the researchers first demonstrated the viability of producing fully renewable, nontoxic polyurethane, several companies have already contributed resources and research partnerships in the push for its commercialization.

Tunable Chemistry

By controlling the epoxidation process or amount of carbonization, for example, the process can be suited to meet the performance needs of a product. That may give the outsoles of a pair of running shoes enough flexibility and strength to endure many miles pounding into hot or cold asphalt. Or it may give a mattress a balance of stiffness and support.

"It's got regulation push. It's got market pull. It's got the potential to compete with non-renewables based on cost. It's got a lower carbon footprint. It's got everything. This became the most exciting aspect of my career at NREL."

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So, when I retired, I decided that I want to make this real. I want to see this technology actually make it into the marketplace," Pienkos said of the opportunities for commercialization.

"I think this is a great opportunity to solve the plastic pollution problem. We need to save our environment, and part of that begins with making plastic renewable," Dong said.

Source: NREL

polymer-additives.specialchem.com, 30 September 2020

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

Megalodon's hugeness was 'off-the-scale'—even for a shark

2020-10-06

Megalodon was the most massive shark that ever lived, and its gargantuan girth was highly unusual even among sharks, scientists recently discovered.

In fact, Megalodon's gigantism — it's estimated to have measured up to 50 feet (15 meters) in length, about as long as a bowling lane — was "off-the-scale," researchers wrote in a new study.

Evidence from extinct and living sharks in the order Lamniformes, the group that includes Megalodon, revealed that not only was the king of sharks an extreme outlier when compared with modern species; it was also substantially bigger than the next-biggest extinct shark in the Lamniformes order by at least 23 feet (7 m), the scientists reported.

SOUND

Modern sharks are comparative pipsqueaks next to Megalodon (*Otodus megalodon*). The biggest known predatory species, the great white shark (*Carcharodon carcharias*), grows to only about 20 feet (6 m) long, and the filter-feeding whale shark (*Rhincodon typus*), the biggest fish species alive today, measures about 18 to 33 feet (6 to 10 m) from nose to tail tip, on average. (However, the biggest known whale shark measured a whopping 62 feet (19 m) long, researchers reported in 2015 in the journal PeerJ.)

(However, the biggest known whale shark measured a whopping 62 feet (19 m) long, researchers reported in 2015 in the journal PeerJ.)

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There are 13 species of lamniform sharks alive today; these include mako sharks (the *Isurus* genus), deep-sea goblin sharks (*Mitsukurina*), and thresher sharks (*Alopias*), as well as great whites.

Most Megalodon fossils date to around 15 million years ago, and lamniforms were plentiful from the end of the Mesozoic era (252 million to about 66 million years ago) into the early Cenozoic era, (65 million years ago to the present). However, little is known about the anatomy of extinct lamniforms; since shark skeletons are made of cartilage rather than bone, they are extremely scarce in the fossil record, save for their plentiful fossilized teeth, said lead study author Kenshu Shimada, a professor of paleobiology at DePaul University in Chicago and a research associate at the Sternberg Museum in Kansas.

Tooth size can be used to estimate a shark's body size because as sharks grow they continuously replace their teeth, getting new and bigger ones over time. In the new study, Shimada and his colleagues generated a new tool for calculating body length: an equation representing the actual quantitative relationship between body length and tooth size in lamniforms. They based it on the teeth and known body lengths from 32 specimens of living, predatory lamniform sharks, representing all 13 species that are not plankton-eaters, Shimada told Live Science in an email. They then applied their equation to extinct predatory lamniforms.

The scientists found that many extinct lamniform sharks were quite large, with four Mesozoic genera (*Cretodus*, *Cretoxyrhina*, *Hispidaspis* and *Scapanorhynchus*) and four Cenozoic genera (*Alopias*, *Carcharodon*, *Isurus* and *Otodus*) holding at least one shark species that grew to more than 20 feet (6 m) in length.

Why does this group have so many supersize sharks? Their gigantism may be fueled by a reproductive strategy: Bearing live young "with a unique cannibalistic egg-eating behavior" that nourishes early-hatching embryos, enabling them to grow large while still inside their mothers by feeding on their siblings, Shimada said in the email.

But even though the researchers found that gigantism was common in multiple lamniform lineages, Megalodon dwarfed extinct sharks, too.

"We expected Megalodon to be large," Shimada said. What they did not predict was that there would be a gap of 23 feet (7 m) between Megalodon and the next-largest predatory lamniform shark in the fossil record, he said. According to their calculations, all other lamniforms that

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did not eat plankton grew no bigger than 23 feet in length, the authors reported.

While the Megalodon picture is now a little clearer than it was before, many fundamental questions about the size of the massive super-shark are still unanswered, such as the particulars of its body structure and what caused Megalodon's over-the-top gigantism, Shimada said.

"Why Megalodon became extinct is another big fundamental question that remains unsettled," he added.

The findings were published online today (Oct. 5) in the journal Historical Biology.

EDITOR'S NOTE: The article was updated on Oct. 7 to include the length of the biggest confirmed whale shark.

Originally published on Live Science.

livescience.com, 6 October 2020

<https://www.livescience.com>

Coronavirus can survive on skin for 9 hours

2020-10-07

The new coronavirus can linger on human skin much longer than flu viruses can, according to a new study from researchers in Japan.

SARS-CoV-2, the virus that causes COVID-19, remained viable on samples of human skin for about 9 hours, according to the study. In contrast, a strain of the influenza A virus (IAV) remained viable on human skin for about 2 hours.

Fortunately, both viruses on skin were rapidly inactivated with hand sanitizer.

The findings underscore the importance of washing your hands or using sanitizer to prevent the spread of COVID-19.

"This study shows that SARS-CoV-2 may have a higher risk of contact transmission [i.e. transmission from direct contact] than IAV because the first is much more stable on human skin [than the latter]" the authors wrote in their paper, which was published online Oct. 3 in the journal Clinical Infectious Diseases. "These findings support the hypothesis that proper hand hygiene is important for the prevention of the spread of SARS-CoV-2."

In contrast, a strain of the influenza A virus (IAV) remained viable on human skin for about 2 hours.

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PLAY SOUND

Survival on skin

Earlier in the pandemic, researchers in the U.S. analyzed how long SARS-CoV-2 could last on surfaces and found it remained viable on copper surfaces for up to 4 hours, on cardboard for up to 24 hours and on plastic and stainless steel for up to 72 hours, [Live Science previously reported](#). However, for ethical reasons, examining how long the virus can last on human skin is more complicated — you can't just put samples of a potentially lethal virus on people's hands.

So for the new study, the researchers, from Kyoto Prefectural University of Medicine in Japan, created a skin model using samples of [human skin](#) obtained from autopsies. The samples were collected approximately one day after death. The authors note that even 24 hours after death, human skin can still be used for skin grafts, meaning that it retains much of its function for some time after death. Thus, the collected samples could be a suitable model for human skin, the authors argued.

Using their model, the authors found SARS-CoV-2 survived on the human skin samples for 9.04 hours, compared with 1.82 hours for the influenza A virus. When these viruses were mixed with mucus, to mimic the release of viral particles in a cough or sneeze, SARS-CoV-2 lasted an even longer time, about 11 hours.

However, both viruses were inactivated on skin 15 seconds after using hand sanitizer that was 80% ethanol.

"Appropriate hand hygiene ... leads to the quick viral inactivation [of SARS-CoV-2] and may reduce the high risk of contact infections," the authors said.

The authors note that their study did not consider the "infectious dose" of SARS-CoV-2, that is, the quantity of virus particles needed to give someone an infection from contact with contaminated skin, and so future research should also examine this question.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 7 October 2020

<https://www.livescience.com>

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4 facts about phosphate, the chemical compounds that's everywhere

2020-10-07

It's very likely that at this point in your life, you've heard about the chemical [element](#) phosphorus. It's arguably one of the more famous, and with good reason: It's the 11th most common element on Earth, and the second most common in the human body. And like all chemical elements, phosphorus can be found in a few different forms, just like you can turn corn into grits or tortillas or creamed corn. But arguably the most useful form of phosphorus, as far as living things are concerned, is phosphates (singular: phosphate), which, simply put, are chemical compounds containing phosphorus. Here are four things to know about phosphates:

1. Phosphates Are Everywhere

Phosphorus shows up in nature as phosphate (PO_4^{3-}), and there's very little phosphates can't do, from cleaning your house to storing energy in your cells. Phosphates can be found in your toothpaste, your bones, table salt, fire extinguishers, your [DNA](#), yoga mats, snack cakes — you name something, it probably contains some form of phosphate.

"Phosphates' is a broad term that describes any chemical containing a group of linked oxygen and phosphorus atoms," says Erin Shanle, a biology professor at [Longwood University](#). "Phosphates are found on many chemicals, including detergents and fertilizers, and molecules in our bodies such as DNA and proteins. Phosphates can also be found in many other personal and household products."

2. Phosphates Work Overtime in Your Body

Phosphates are found in all living things — your body could get very little done without them. Phosphates are the workhorses that build molecules like DNA, transfer energy and transport molecules in and out of cells, and activate and inactivate proteins. But we also require phosphates to build strong bones: In vertebrates, approximately 85 percent of the body's phosphorus is found in bones and teeth. If you don't get enough phosphorus in your diet, your bones can become brittle.

"We often hear that calcium is used in bones — drink your milk to get strong bones! — but phosphates are just as important as calcium," says Shanle. "In fact, most of the phosphate in your body is found in your bones and teeth."

It's the 11th most common element on Earth, and the second most common in the human body.

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Most of us get an abundant amount of phosphorus in our diet — meat is rich in phosphorus, as are dairy, soy, beans, eggs and nuts.

Although phosphorus is essential in the body, people with chronic kidney disease have a problem removing excess phosphorus from the body. In these cases, too much phosphorus can actually be toxic.

3. We Need Phosphates to Feed Us

Food production requires a lot of phosphorus (in addition to the other essential nutrients, nitrogen and potassium). Although phosphorus can't be synthesized or manufactured, virtually all the phosphorus that started out on this planet remains here to this day — all the plants and animals that use it poop it right back out when they're done with it.

It's inconvenient, though, to wait around for animals to poop and plants to drop all their leaves in order to access the phosphorus needed to feed Earth's 7.5 billion people. Which is why we mine phosphorus in the form of phosphate rock, formed over millions of years by the bones and poo of ancient animals floating to the bottom of primeval seas. Ninety percent of the phosphate rock we mine today is used to make fertilizers for agriculture and food production. Phosphate rock is mined in the United States (mainly the State of Florida, which was underwater until not so long ago, geologically speaking), Canada, Brazil, Russia, South Africa and Zimbabwe.

4. Too Much Phosphate Can Lead to Big Environmental Problems

In the environment, phosphorus is essential for plants and other organisms to go about their business, but excess phosphate can cause major problems in freshwater environments like rivers, streams and lakes.

"Phosphorus is one of the main ingredients in fertilizers because it helps plants grow more quickly and increases crop yields," says Shanle. "When excess phosphorus washes off fertilized lawns or fields, it begins to build up in lakes, rivers, and other aquatic systems. This provides a rich food source for algae, which will make water cloudy and remove all of the oxygen from the water. This process, known as eutrophication, kills fish and other life in the lakes or rivers. Because of this, it is important that we minimize the amount of phosphorus we release to aquatic systems. There are efforts to reduce the amount of phosphorus-containing fertilizers that are widely applied."

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So, next time you're shopping for detergent, pick the phosphate-free option to help save fish and other marine life.

[science.howstuffworks.com](https://www.science.howstuffworks.com), 7 October 2020

<https://www.science.howstuffworks.com>

59 priest mummies and statue of unusual god unearthed in Egypt

2020-10-06

In a span of one month, the number of sealed coffins found at an archaeological dig in Saqqara in Egypt has ballooned from 13 to 59 — and there is more to come — the Egyptian Ministry of Antiquities said in a statement.

The colorful coffins, which date back to Egypt's 26th dynasty (688 B.C. to 525 B.C.), were found stacked together within or near three burial wells, the ministry said on Oct. 3. The mummies are still preserved within the coffins; and hieroglyphic writing on the coffins indicates that many of the mummies were priests.

Beside the coffins, they found the remains of 28 small statues. One of the most interesting statues is a nearly 14-inch-tall (35 centimeters) bronze statue of the god Nefertem, who is shown wearing a headdress shaped like a lotus blossom. The headdress is made of red agate stone, turquoise and lapis lazuli, the ministry statement said. In ancient Egyptian mythology, Nefertem was a god associated with lotus flowers and was the son of Ptah, a creator god who was popular in Memphis, the first capital of Egypt. (Saqqara served as the burial ground for Memphis.)

Another small statue found near the coffins depicts the god Ptah-Soker — an amalgamation of the gods Ptah and Soker. "Saqqara was called Saqqara because of the god Soker. In the Late Period [the time the coffins date to], there was a combination of the god Ptah of Memphis with Soker," Zahi Hawass, a former Egyptian minister of antiquities, said in a video released by the ministry. "This is unique. I have never seen this before," Hawass said of the Ptah-Soker statue.

Numerous shabti figurines were also found with the coffins. Ancient Egyptians often buried the dead with shabti figurines, which they believed would work for the deceased in the afterlife. **PLAY SOUND**

Egypt struggled to gain and maintain its independence during the 26th dynasty. At the start of the dynasty the pharaohs were vassals

Beside the coffins, they found the remains of 28 small statues.

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of Assyria however as Assyrian power weakened the Egyptians were able to assert their political independence. However the rise of Persia would spell the end of the dynasty and in 525 B.C. Egypt was conquered by the Persian empire.

Work at Saqqara is being conducted by an Egyptian team led by Mustafa Waziri, the secretary general of Egypt's Supreme Council of Antiquities. Work is ongoing and more coffins and other artifacts are expected to be discovered soon.

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<https://www.livescience.com>

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Flower colors are changing in response to climate change

2020-09-28

As the world's climate changes, plants and animals have adapted by expanding into new territory and even shifting their breeding seasons. Now, research suggests that over the past 75 years, flowers have also adapted to rising temperatures and declining ozone by altering ultraviolet (UV) pigments in their petals.

Flowers' UV pigments are invisible to the human eye, but they attract pollinators and serve as a kind of sunscreen for plants, says Matthew Koski, a plant ecologist at Clemson University. Just as UV radiation can be harmful to humans, it can also damage a flower's pollen. The more UV-absorbing pigment the petals contain, the less harmful radiation reaches sensitive cells.

Previously, Koski and colleagues found that flowers exposed to more UV radiation—usually those growing at higher elevations or closer to the equator—had more UV pigment in their petals. He then wondered whether two factors affected by human activity, damage to the ozone layer and temperature changes, also influenced the UV pigments.

To find out, Koski and colleagues examined plant collections from North America, Europe, and Australia dating back to 1941. In all, they examined 1238 flowers from 42 different species. They photographed flower petals from the same species collected at different times throughout their natural range using a UV-sensitive camera, which captured changes in UV pigment. They then matched these changes to data on the local ozone level and temperature.

On average, pigment in flowers at all locations increased over time—an average of 2% per year from 1941 to 2017, they reported this month in *Current Biology*. But changes varied depending on flower structure. In saucer-shaped flowers with exposed pollen, like buttercups, UV-absorbing pigment increased when ozone levels went down and decreased in locations where ozone went up. But flowers with pollen concealed within their petals, such as the common bladderwort, decreased their UV pigment as temperatures went up—regardless of whether ozone levels changed.

Though surprising, the finding “makes total sense,” says Charles Davis, a plant biologist at Harvard University who was not involved with the work. Pollen hidden within petals is naturally shielded from UV exposure, but

**In all, they examined
1238 flowers from
42 different species**

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this extra shielding can also act like a greenhouse, trapping heat. When these flowers are exposed to higher temperatures, their pollen is in danger of being cooked, he says. Reducing UV pigments in the petals causes them to absorb less solar radiation, bringing down temperatures.

Although such pigment changes may be indistinguishable to the human eye, they stand out like a beacon to pollinators like hummingbirds and bees. Koski says most pollinators prefer flowers with a "bull's-eye" pattern: UV-reflecting petal tips and UV-absorbing pigments near the center of the flower. Though scientists don't fully understand the appeal of this pattern, they think it could help distinguish flowers from the UV-absorbing background of other plants.

As a result, flowers with less pigment may pop even more to pollinators, Koski says. But flowers that dial up their pigment could lose that contrast, ultimately making them less attractive to passing flyers. These pigment changes may help protect pollen, Davis says, but "pollinators might miss the flowers entirely."

website, date

<https://www.sciencemag.org>

Feature-Silver lining in the health crisis? Less food waste

2020-09-30

ROME, Sept 30(Thomson Reuters Foundation) - When the coronavirus pandemic forced Rohini Singh to work from her house, she realised the grocery bill was likely to rise since her family of three would be mostly eating at home.

She also didn't want to waste food, with shelves in some supermarkets emptying in the early days of the crisis, and trips to stock up becoming more perilous.

"I think the pandemic made me more conscious about saving money and not wasting (food) if I can help it," the university professor, who lives in Ohio, told the Thomson Reuters Foundation.

To try to achieve both goals, she signed up to Imperfect Foods, which delivers produce and other foods rejected by grocery stores and supermarkets for cosmetic reasons.

"Certainly in the United States this pandemic is stretching out long enough that it is building new habits," she said.

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"Instead of getting thrown out, if (the foods) were to be sent to consumers who don't mind the bumps and blemishes, it seemed... a way to cut down on waste," Singh said.

Advocates against food waste say the pandemic has made some consumers in rich countries reconsider how much food they bin, a habit they hope will stick even after the health crisis is over.

Rachael Jackson, who runs Eat or Toss - a website that helps people assess if foods such as apples with black spots or sweet potatoes with purple sprouts are still safe to eat - said her traffic tripled between February and May.

"People didn't want to go out as much, and things they found in their kitchen that normally they would throw away... now they were interested in doing research to find out if it was still okay to eat," the Washington-based journalist said.

Since then, the site's traffic has neatly followed the U.S. pandemic's curve, slipping a little when shops and restaurants re-opened and climbing again since July as the virus resurged, Johnson said.

Dana Gunders, executive director of ReFED, a non-profit focused on reducing food waste in the United States, is optimistic pandemic-sparked behaviour changes - such as eating more leftovers and being careful about waste - will last.

"Certainly in the United States this pandemic is stretching out long enough that it is building new habits," she said.

People are likely to continue to eat more at home for the foreseeable future and do more food shopping online, which tends to result in less waste, she said.

Before the pandemic, almost a third of the food that makes it to the market was wasted at shops and homes, according to the U.S. Department of Agriculture.

'UNINTENDED CONSEQUENCE'

Studies in parts of Europe show food waste declining.

A survey of nearly 7,000 people in Belgium, Italy, Portugal and Spain, published Tuesday by Euroconsumers, a cluster of consumer organisations, found the number of people who said they threw away almost no food doubled to 70% during lockdown.

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WRAP, a British non-profit focusing on sustainability issues, similarly found in an April survey that households were wasting a third less of four key products - potatoes, bread, chicken and milk - than before the virus lockdown.

Waste figured inched slightly higher in a repeat survey in June, as lockdown eased.

Still, the 18% of food purchased that was thrown away in June was lower than the pre-lockdown level of 24%, said Andrew Parry, special advisor for food and drink at WRAP.

"It's a positive unintended consequence" of the pandemic, he said. "There's been an increase in the realisation food is precious."

Climate change concerns are playing an important role too, with more than 80% of people surveyed in June citing this as a worry. However, only 37% said they understand the link between food waste and global warming, Parry said.

With rising food production a major driver of deforestation and a big consumer of fossil fuels for farming, processing and delivery, cutting food waste can significantly cut climate changing emissions, scientists say.

Globally, a third of all food produced - about 1.3 billion tonnes - is lost or wasted along the whole supply chain, according to a 2011 assessment by the United Nations' Food and Agriculture Organization (FAO).

The U.N. Environment Programme is expected to put out updated figures on food waste in shops and homes in 2021.

Overall, food production accounts for about a quarter of climate changing emissions, according to a 2018 report in the journal Science.

SMALLER MENUS

The pandemic has made restaurants more open to tackling food waste to cut costs, said Renata Bade Barajas, CEO and co-founder of Iceland-based start-up GreenBytes, which uses artificial intelligence to predict sales and optimal stock levels.

"Now more than ever, they have to optimise their whole system and cut down unnecessary operational costs," she said.

Their initial research showed many restaurants in Reykjavik could be throwing away hundreds of kilos of food a month, said Bade Barajas,

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whose work in the kitchens of restaurants and juice bars during her university studies brought her face-to-face with food waste.

"Every day, without fail, you end up throwing away so much food," she said. "I felt guilty."

ReFED's Gunders said she sees "fundamental changes" in restaurants and food services that could lead to less waste in the long run, such as ending self-service buffets.

Many restaurants have also re-opened with smaller menus because of the unpredictability of footfall, a trend that could outlast the pandemic and cut waste, she said.

Other food businesses are getting into the act too.

Last week, some of the world's largest food retailers and providers including Carrefour, Walmart, Tesco and IKEA Food said nearly 200 of their major suppliers have committed to halving food waste by 2030.

Tesco in Britain has also partnered with food sharing app OLIO, which allows users to see food items nearing their expiry date in their area and collect them for free.

Jackson, who runs Eat or Toss, said cutting food waste is a way for households to have a real impact on climate change.

"We can feel helpless about addressing climate change because it seems really big. But if you're keeping an eye on what you're wasting, and consciously cutting that down, you can actually have a significant impact," she said.

[in.reuters.com](https://www.in.reuters.com), 30 September 2020

<https://www.in.reuters.com>

Can China, the world's biggest coal consumer, become carbon neutral by 2060?

2020-09-29

China's surprise pledge last week to cut its net carbon emissions to zero within 40 years has reignited hopes of limiting global climate change to tolerable levels. The country is the world's largest producer of carbon dioxide (CO₂), accounting for 28% of global emissions, and its move may inspire other countries to follow suit. But observers warn that China faces

He says the new targets "won't likely let us to stop at 1.5° Celsius [of global warming]," the preferred target set in the 2015 Paris agreement.

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daunting challenges in reaching its goals. Kicking its coal habit will be particularly hard.

“We aim to have CO₂ emissions peak before 2030 and achieve carbon neutrality before 2060,” Chinese President Xi Jinping told the United Nations General Assembly via a video link on 22 September. That’s “a very significant and encouraging announcement,” says Josep Canadell, an earth system scientist at Australia’s Commonwealth Scientific and Industrial Research Organisation. He says the new targets “won’t likely let us to stop at 1.5° Celsius [of global warming],” the preferred target set in the 2015 Paris agreement. “But below 2° might still be consistent with [Xi’s] announcement.” China’s commitment also “ratchets up pressure on other major emitters” to set more ambitious targets “while further isolating the Trump administration in its climate myopia,” Vance Wagner of Energy Foundation China wrote in a piece published online by the nonprofit China Dialogue.

China had previously said its CO₂ emissions would peak “around” 2030, a target most analysts considered within reach. But achieving carbon neutrality before 2060 will require drastically reducing the use of fossil fuels in transportation and electricity generation and offsetting any remaining emissions through carbon capture and storage or planting forests.

China has not yet revealed details of how it will do this. But a research group at Tsinghua University presented a \$15 trillion, 30-year road map on 27 September that calls for ending the use of coal for electricity generation around 2050, dramatically increasing nuclear and renewable power generation, and relying on electricity for 80% of China’s energy consumption by 2060.

Coal is both the biggest challenge and an opportunity. Last year, the carbon-heavy fuel accounted for about 58% of China’s total energy consumption and 66% of its electricity generation. In coal-producing regions, coal is also used to heat buildings. Recent advances in renewable energy have made replacing coal easier than cutting oil use in transportation and emissions from farm fields and livestock. “The power sector is the part of the energy system where zero emission technologies are the most mature and economically competitive,” says Lauri Myllyvirta, an air pollution analyst at the Centre for Research on Energy and Clean Air in Helsinki. Zero-carbon electricity could make charging electric vehicles cleaner and supplant coal for heating.

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But it will require a U-turn. A recent study by Myllyvirta and colleagues found that China’s coal-fired generating capacity grew by about 40 gigawatts (GW) in 2019, to about 1050 GW. Another 100 GW is under construction and coal interests are lobbying for even more plants. “This is all despite significant overcapacity in the sector,” with plants running at less than 50% of capacity and many coal-power companies losing money, the study said. Canadell says the building boom is the result of misplaced incentives to build coal plants and create construction jobs. He predicts many of the new plants will barely be used or become stranded assets that have to be written off.

A related challenge will be reforming the electricity market. Renewable energy is increasingly cost competitive with coal, says Li Shuo, a climate policy adviser to Greenpeace China. But regulators allocate operational time among electricity plants to match generation to demand, with little consideration of economic or environmental implications, Li says. The system overwhelmingly favors coal-fired generation, partly because it doesn’t suffer from the variability of wind and solar power. The uncertain market access has already slowed investment in renewables, Li says. Given the power of coal and construction interests, the needed reforms will take considerable political will.

Expanding nuclear power presents challenges as well. The 2011 Fukushima Daiichi nuclear disaster in Japan sent ripples of concern through China, which mandated additional safety measures that made new plants more expensive. Public opposition is also growing. China has 48 nuclear power reactors in operation and 12 under construction, according to the World Nuclear Association. The government had aimed for 58 GW of nuclear capacity by this year but did not get beyond 52 GW.

China’s Five-Year Plan for 2021–25, now being drafted, may contain concrete measures to help realize Xi’s ambitious target. “China’s interest in climate change has waned in recent years, due to the slowing down of economic growth and the U.S. withdrawal from the Paris agreement,” says Zhang Junjie, an environmental economist at Duke Kunshan University. “The commitment on carbon neutrality reignited hopes for China’s climate action.”

sciencemag.org, 29 September 2020

<https://www.sciencemag.org>

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What is 'intersectional environmentalism'?

2020-09-30

In 2014, [Leah Thomas](#) was in college studying environmental science and policy when a crisis unfolded in Ferguson, Missouri, near her hometown of Florissant.* Police shot unarmed black teenager Michael Brown, sparking widespread protests.

"I'm trying to learn about the Clean Air Act while my sister is getting tear-gassed back home in a protest," Thomas says.

She says the events made her question who the Clean Air Act really protects. And her concern increased when she read data showing that people of color are more exposed to many air and water pollutants. As a Black woman, she was dismayed.

"Because I would say, 'That's me on that page. That's my community. That's my family,'" she says.

So this past May, in what became a viral Instagram post, Thomas called on environmentalists to stand in solidarity with the Black Lives Matter movement. And she defined what she calls "[intersectional environmentalism](#)."

"It's a more inclusive version of environmentalism," she says, "that identifies the ways in which injustices happening to marginalized communities and the earth are interconnected."

She hopes that the definition helps articulate a new approach to environmental activism – one that has the well-being of the planet and people at its core.

Reporting credit: [ChavoBart Digital Media](#).

yaelclimateconnections.org, 30 September 2020

<https://www.yaelclimateconnections.org>

Nature's toxic gifts: The deadly story of poison

2020-10-04

When [prehistoric hunters](#) first dipped their arrows in snake venom, we turned nature's toxic gifts against one another for the first time in history. It would not be the last.

Over the centuries, different lethal concoctions have been in vogue, and the popular pick was generally whatever could be plucked off the local

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herbalist or apothecary's shelves. "A poison in a small dose is a medicine," said Alfred Swaine Taylor, a 19th century toxicologist, "and a medicine in a large dose is a poison."

Classic poisons like hemlock, nightshade, aconite, foxglove, opium, and strychnine were used to treat a range of ails, from the humble head cold to heart conditions, and even worn as makeup. Toxic metals like mercury, lead, and arsenic were ingredients in medicines lining pharmacy shelves as late as the 20th century.

For as long as we've needed to cure, we've also been tempted to kill—and poison has provided the means.

KINGS OF POISON, POISON OF KINGS

Since the beginning, poison has been a murderous tool for emperors, pharaohs, and kings.

Around 1550 B.C., Egyptians scribbled numerous recipes for poison in hieroglyphics in the *Ebers Papyrus*, one of the earliest medical documents. It's believed the first known Egyptian pharaoh, Menes, experimented with deadly toxins, as did the last, Cleopatra, who supposedly took her own life with a poison asp.

Experimenting with poison killed the father of Chinese herbal medicine, Shen Nung—he sampled 365 herbs before dying of an overdose—as well as the first Chinese emperor, Qin Shi Huang. The ancient civilizations of India, Persia, and Greece used poison to assassinate rivals for political gain (Mughal rulers would "gift" their enemies with poison-lined robes), to execute criminals (Socrates was sentenced to drink poison Hemlock), and even to offer the sick and elderly the gift of a quick death.

By Roman times, [poisoning had run so rampant](#) that the "Lex Cornelia," an ancient Roman law, was issued outright forbidding toxic tinctures—but the problem only grew. Six Roman emperors met their end due to poison, including Claudius, who was murdered by his own wife, Agrippina, to advance the position of her son Nero, who then turned around and poisoned his stepbrother in order to take the throne.

Pick Your Poison

People in ancient and medieval times had many poisons to choose from.

Hemlock

"I'm trying to learn about the Clean Air Act while my sister is getting tear-gassed back home in a protest," Thomas says.

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A favorite of the ancient Greeks, poison hemlock comes from a large fern-like plant that bears a dangerous resemblance to the carrot plant. It was readily available for treating muscle spasms, ulcers, and swelling, but in large doses will cause paralysis and ultimately respiratory failure. In Athens it was the drug of choice for capital punishment, known as “State Poison.”

Mandrake

This storied plant gets its name from the long, vaguely human-shaped root. It was used as a sedative, hallucinogen, and aphrodisiac. Superstitious medieval denizens believed that when the vaguely human-shaped root was pulled out, the plant gave a piercing shriek that would drive anyone that heard it to madness—or death.

Nightshade

A main ingredient in witches’ brews, a single leaf or a few berries of Nightshade could cause hallucinations—a few more was a lethal dose. Medieval women used the juice of the berries to color their cheeks. They would even put a few drops on their eyes to cause the pupils to dilate for a lovestruck look. That’s why this deadly poison is also called belladonna, or “beautiful woman.”

Aconite

This toxic plant, also called Monkshood or Wolfsbane, was used by indigenous tribes around the world as arrow poison, and was so deadly that growing it was forbidden in ancient Rome. In the Middle Ages, aconite was one of the ingredients in a potion used by witches to give them the feeling of flying.

Strychnine

Derived from a bitter-tasting tree native to India, this toxin was known since antiquity in Asia and was used in many traditional medicines. It eventually made its way to the West in the 1700s where it became a rat poison. A lethal dose causes muscle contractions and ultimately death by respiratory arrest.

But no king was as haunted by poison than King Mithridates VI, who ruled Pontus (modern Turkey) over 2,000 years ago. Terrified of being assassinated with poison (a phobia not unwarranted considering his mother had poisoned his father), Mithridates became obsessed with finding a universal antidote, so much so that history remembers him as the “Poison King.”

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The king tried to build up his tolerance by consuming tiny amounts of different toxins along with various experimental antidotes. He eventually devised a top-secret recipe known as the “mithridatum,” which was highly coveted for years to come. The elixir remained a mystery until the Roman general Pompey invaded Pontus and took the precious cure-all back to Rome. In a cruel irony, Mithridates tried to use poison to commit suicide during Pompey’s invasion—but it failed to kill him. One of his soldiers had to be tasked to finish the deed.

Fast forward 800 years and the story of poison would change forever. One of the great thinkers of the Islamic Golden Age, alchemist Jabir ibn Hayyan, produced a deadly white powder that was odorless, tasteless, and totally undetectable in the human body. It was a lethal compound of arsenic, a naturally occurring and ubiquitous element that becomes toxic when converted to arsenic trioxide, or white arsenic.

Arsenic kills by disrupting energy transfer to the cells, which begin to die off and cause basic bodily functions to break down. With a high enough dose, or if consumed gradually over time, vital organs will start to fail. This creeping sickness looked a lot like natural illness, especially since the usual symptoms, vomiting and diarrhea, were easily mistaken for cholera, dysentery, and other common diseases of the time.

Over the next millennia, arsenic made it possible, even *easy*, to commit the perfect crime. Not only could the powder be mixed into a glass of wine or food unnoticed—if carefully dosed, it could take hours, days, or even months for any symptoms to show, making it very hard to trace. Even if poison was suspected, up until the 19th century there was no way to detect arsenic in the body after death.

But what made arsenic so deadly was that it was also incredibly easy to get your hands on. For centuries, civilizations used its compounds medicinally. It was used in Chinese medicine, by the Greek physician Hippocrates, by medieval alchemists in search of the elixir of life, and by 18th-century doctors who turned to an arsenic-based solution to treat everything from asthma to syphilis.

As a lethal toxin, the discrete and deadly metalloid became the weapon of choice for those looking to quietly dispose of anyone standing in their way. Arsenic was a common way of tampering with the natural line of succession, and it was so effective, a plague of poison swept across the wealthy nations of the world for centuries.

MIEVEAL MAGIC

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Europe in the Middle Ages was marked with superstition. After the fall of the Roman Empire, knowledge progressed very little over the next several centuries, and folklore, religious beliefs, and magic took its place. Not so in the Arab world, where science and math flourished. Building on the texts of the Greek philosophers, many Islamic scientists and physicians experimented with poisons and antidotes, writing influential texts that hugely advanced the field of toxicology.

This wealth of knowledge didn't reach the West until the 13th century, but Christian monks did little more than methodically copy these ancient texts. So medieval Europe had no more of a clue than Mithridates on how to protect against poisons—but they feared them more than ever. With no scientific remedies to turn to, peasants, traders, and kings turned to more magical solutions.

Bezoar stones are solid masses of undigested food or fibers found in the stomach of animals—just the thing, people (erroneously) thought, to drop into a drink to neutralize the effects of any poison. Bezoars were popular in Persia and other parts of Asia and were eventually traded into Europe.

Others “cures” included talismans, amulets, or “anti-poison” goblets lined with minerals to induce vomiting. In the courts of dynastic China and the kingdoms of Korea, people used silver chopsticks to test for poison in their food and drinks.

But the apex of all unlikely antidotes was the prized “unicorn” horn. The mythical beast's long, ivory horns (which were actually narwhal tusks) were thought to both detect and protect against poison. Unicorn horns were extremely coveted and cost a small fortune, worth 10 times more than gold. These precious tusks were found in royal palaces all across Europe. In Denmark, generations of rulers were even crowned on a throne chair made of the mythical horn.

Unicorn horns eventually fell out of fashion as the Renaissance brought a resurgence of scientific study to Europe. But that increased knowledge of poisons *also* made them more deadly as some people became better at using them. As Europe finally exited the Dark Ages, concocting increasingly potent potions became an art, and just like the other Renaissance art forms, the craft was mastered in Italy.

A POISON RENAISSANCE

In the streets of Florence, Rome, and Venice—poison was booming.

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Alchemists were busy brewing tonics in search of eternal life, and “schools” of study sprung up working to perfect the art of poison. In Venice, the contract assassins in the ominous “Council of Ten” organization poisoned people for a fee. And in Rome, one ambitious family mastered the art.

The Borgia family wasn't afraid to kill to hold onto its powerful position in the Catholic clergy. Rodrigo Borgia (Pope Alexander VI), his son Duke Cesare, and his daughter Lucrecia are infamous for poisoning dozens of cardinals, bishops, and nobles (though historians now think Lucrecia may have been wrongly accused). Witnessing this state of affairs, the Venetian ambassador reported “every night four or five men are discovered assassinated. Bishops, prelates, and others, so that all Rome trembles for fear of being murdered by the Duke.”

The family experimented with strychnine, aconite, and other toxins on animals and the poor, and kept their vials in the basement along with their wines. They eventually arrived at a deadly formula known as cantarella. Its contents are a mystery to this day, though it's thought to have been a mix of arsenic and blister beetles.

The Borgias' *modus operandi* was to mix cantarella into the wine of unfortunate dinner guests, who would then turn up dead weeks or months later—a length of time carefully predetermined by the poisoner. This was executed so skillfully that “tasting the cup of the Borgias” became a euphemism for a sudden or mysterious death.

But the Borgias weren't the only powerful clan utilizing poison for political gain. Catherine de Medici, the “Black Queen” of France, tested different poisons on animals and prisoners, and kept her deadly vials in hundreds of secret cabinets in her quarters at the royal residence.

By the end of the 16th century, a French “school” of poison was spreading this nefarious knowledge through the city of Paris, where thousands of poison practitioners were mastering the silent killer. Arsenic compounds were so commonly used to eliminate wealthy or noble members of the French bourgeoisie that the poison became known as the *poudre de succession*, or “inheritance powder.”

In the decadent court at Versailles, the killing reached such a treacherous level that King Louis XIV set up a tribunal specifically to investigate poison homicides. Hundreds of cases were tried, revealing a sweeping underground poison ring that reached right into the king's inner circle.

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At the center of the scandal was a fortune teller named Catherine Deshayes, better known as “La Voisin.” Pedaling a mix of arsenic, belladonna, aconite, and opium, she sold poison to many noblewomen looking to rid themselves of an unwanted child or spouse, including the king’s mistress. By the end of the inquisition, 36 people were sentenced to die and were burnt at the stake. Louis XIV finally issued a decree banning arsenic and other poisons from being sold at apothecaries on penalty of death.

FAMILY MATTERS

In the 17th century, some ladies would powder their faces with arsenic to achieve a more pale complexion. Others used it to become widows.

In Rome in 1659, a fortune-teller sorceress named Hieronyma Spara ran a secret society that would dole out poison to women who wanted to kill their husbands. Then, there was Guilia Toffana, the infamous poison peddler behind the death of some 600 people, including two popes and countless husbands. She sold her brew of arsenic and belladonna, known as “Aqua Toffana,” in cosmetics bottles disguised as makeup. A few drops was enough to cause a slow and untraceable death.

In Paris, this troublesome trend became intertwined with a dark underworld of witchcraft and black magic. At court, women sought out powerful potions to attract lovers, remove enemies, and even terminate unwanted pregnancies.

The powdery white widow-maker also made its way across the channel. In Victorian England, arsenic was surprisingly easy to come by. A woman simply needed to walk into the chemist shop or market and hand over a few pence for some rat poison or arsenic powder to smooth her complexion.

Arsenic was much easier to obtain than a divorce, and husband-killing was more prevalent than ever because of the booming business of life insurance. Soon, the Victorian era became known as the “golden age” of arsenic poisoning. Many arsenic homicide cases became famous, such as the murderess Mary Ann Cotton, who killed three husbands—as well as one fiancé and many of her children and stepchildren—and then cashed in on the insurance.

To quash this criminal craze, the English Parliament tried to pass a law forbidding women from buying arsenic. But ultimately it was science, not the law, that ended the white powder’s reign.

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Centuries after the invention of arsenic trioxide, physicians still had no idea how to treat—or even detect—arsenic poisoning. Well into the 19th century, doctors were hopelessly trying to determine whether victims had been poisoned by throwing the contents of their stomach into a fire to see if they smelled like garlic—and people were getting away with murder.

Finally, in 1836, an English chemist named James Marsh came up with a chemical method to detect minute traces of arsenic in human tissue. It was put the test in the murder trial of a French woman charged with feeding her husband arsenic cakes. She was proven guilty.

Arsenic poisoning dropped off significantly with the development of the Marsh Test, which scientists improved and used as forensic evidence of poisoning for the next century, ushering in the era of modern toxicology.

POISON GOES TO WAR

Humans first began using poison in warfare thousands of years ago. The indigenous people of South America used plant extracts and venomous frogs to create poison darts. The Scythians, nomadic tribes of the Central Asian steppe, were famous for their poison arrowheads, as were the Indians who used them against the army of Alexander the Great.

The ancient Chinese, Greeks, Romans, Persians, and Mongols also used toxic gas (usually burning sulfur) to smoke out the enemy. In the 7th century, the Byzantines introduced “Greek Fire,” a terrifying burning liquid often described as “ancient napalm.” The chemicals could float on water and would burn people alive in their wooden ships. Inevitably, poison was also added to a new weapon invented in China in the 9th century: gunpowder.

But the rise of industry made it possible for nations to produce and stockpile chemical weapons on an unprecedented scale. The danger in deadly gases was so innately understood that these weapons were banned before they were ever used. But Pandora’s box was opened, and it released a toxic cloud across the Earth.

At sunset on April 22, 1915, the German army opened 168 tons of chlorine gas over the bomb-pocked battlefield in Ypres, Belgium. A Canadian officer later described it as a «deadly wall of gas» that «rolled slowly over the ground turning the budding leaves of the trees, the spring flowers, and the grass a sickly white.” The wind carried the yellow-green vapor toward the Allied trenches, where troops stood waiting for the shooting to begin.

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Instead, they felt a hot burning sensation in the eyes and throat. The poison gas caused intense pain, blindness, and the feeling of being strangled. Over 5,000 troops were killed by asphyxiation.

The gas was developed by the German-Jewish chemist Fritz Haber, a brilliant scientist with a tortured legacy. Haber won the Nobel Prize for Chemistry in 1918 for discovering a way to synthesize ammonia from nitrogen in the air, enabling the mass production of a nitrogen fertilizer that revolutionized agriculture and helped feed billions of people around the globe.

But during World War I, Haber enthusiastically applied his talents to what he called a “higher form of killing.” A fervent patriot, he said “in peace-time the scientist belongs to humanity, in war-time to his fatherland.”

Haber personally oversaw the deployment of chlorine gas at Ypres, and in the chemical weapons arms race that followed, he led the development of even more deadly chemicals: mustard gas, a painful blistering agent, and phosgene, a choking agent that not only burns the body but can also induce psychological terror.

By the end of World War I, there were an estimated 1.2 million casualties caused by chemical weapons. After the gas attack at Ypres, Haber was hailed as a hero in Berlin, and a party was thrown in his honor a month after the battle.

But others were horrified by the introduction of poison to warfare—including Haber’s wife, the renowned chemist Clara Immerwahr. She called it “a sign of barbarity, corrupting the very discipline which ought to bring new insights into life.” The night of the party, Clara shot herself in the heart.

When Adolf Hitler rose to power in Germany, Haber came under attack for his Jewish heritage. He fled Germany in 1933 and died of a heart attack while in exile. Not long after, his lab and research were used by the Nazis to develop Zyklon B, the poison gas used to murder millions of Jews and other innocent civilians in gas chambers at concentration camps—including members of Haber’s extended family.

A COLD WAR KILLER

Poison played another, altogether different role in the wars of the 20th century: as a suicide pill.

A chemical compound that can take the form of gas or crystalline powder, cyanide is one of the most potent and fast-acting poisons in existence.

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While cyanide has been known since antiquity, a compound of hydrogen cyanide distilled in the 18th century quickly gained attention for its ability to kill with efficiency. It became the drug of choice for suicide during World War II and the Cold War.

The tactic was used by many Nazi leaders at the end of World War II. Adolf Hitler and his wife Eva Braun poisoned themselves with cyanide in a bunker in Berlin. Later, Hermann Göring killed himself to avoid execution during the Nuremberg Trials by biting a cyanide pill hidden in his mouth.

Cyanide also became almost synonymous with the suicide pills made famous by spy movies. And while there’s little truth to the pop-culture trope of the cyanide tooth, the CIA and KGB did give spies L-pills (L for “lethal”) to avoid being tortured and spilling state secrets if they were caught. The drug was hidden in secret compartments in the stem of eyeglasses or fountain pens, and chewing on these objects would release the poison.

How Cyanide Kills So Fast

Although it depends on the amount and method of exposure, cyanide poisoning is one of the quickest ways to kill. But how does it achieve these deadly results in such a short amount of time?

Cyanide attacks the very cells that make life possible, specifically the mitochondria and its electron transport chain. Known as the cell’s powerhouse, mitochondria is responsible for cellular respiration and produces energy, known as adenosine triphosphate (ATP), from oxygen. The mitochondria needs a specific enzyme called cytochrome oxidase to make this possible.

But when cyanide enters the mix, things go downhill—fast. The cyanide ion binds to this enzyme, and blocks it from doing its life-giving job. Once the cells can no longer use oxygen, things deteriorate quickly, the most likely cause of death being respiratory or heart failure. Because of that small, lethal cyanide ion, the human body experiences chemical asphyxiation (also known as histotoxic hypoxia) within minutes.

Cyanide was the poison fed to Rasputin that famously failed to kill him (a gunshot finished the job). In the late 1950s, a spray gun that fired a cloud of poison cyanide gas was used by a former KGB agent to assassinate two Ukrainian nationalist leaders. And in 1978, potassium cyanide was mixed into fruit punch in the Jonestown mass murder-suicide in Guyana.

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In recent years, nerve agents, highly toxic “organophosphates” like Sarin gas, have become poisons of choice. Originally developed during World War II, these deadly concoctions have been used by terrorists, dictators, and authoritarians around the world, leading to sinister political plots that would’ve made for sleepless nights for Mithridates some 2,000 years ago.

popularmechanics.com, 4 October 2020

<https://www.popularmechanics.com>

‘Digital chemistry’ breakthrough turns words into molecules

2020-10-02

A new system capable of automatically turning words into molecules on demand will open up the digitisation of chemistry, scientists say.

Researchers from the University of Glasgow’s School of Chemistry, who developed the system, claim it will lead to the creation of a “Spotify for chemistry”—a vast online repository of downloadable recipes for important molecules including drugs.

The creation of such a system could help developing countries more easily access medications, enable more efficient international scientific collaboration, and even support the human exploration of space.

The Glasgow team, led by Professor Lee Cronin, have laid the groundwork for digital chemistry with the development of what they call a “chemical processing unit”—an affordable desktop-sized robot chemist which is capable of doing the repetitive and time-consuming work of creating chemicals. Other robot chemists, built with different operating systems, have also been developed elsewhere.

Up until now, those robot chemists have required a massive amount of programming from their human counterparts, with detailed instructions. The problem is there is currently no standard programming language for chemistry, meaning that programs made for one robot do not work on any other type.

In a new paper published in the journal *Science*, the Glasgow researchers describe a universal approach to digitizing chemistry, including a programming system which could remove the vast majority of the effort required to program the robots.

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They have found a way to create new sets of instructions for robot chemists by harnessing the power of natural language processing. They developed a computer program called SynthReader to scan through scientific papers and recognize sections which outline procedures for organic and inorganic chemical synthesis. Synthreader automatically breaks those procedures down to simple instructions and stores them in a format the team call Chemical Description Language, or XDL, which is a new open source language for describing chemical and material synthesis.

Those XDL files are chemical instructions which can in principle be read any chemical robot in. The team built an easy-to-use interface called ChemIDE to integrate with any robotic chemist system and allow the XDL instructions to be turned into chemicals. The only human input required is ensuring that the equipment the robot needs to make the molecules is set up correctly.

The paper describes how the team used their system to scan scientific papers and produce 12 different molecules using their chemical processing unit, including the analgesic lidocaine, the Dess-Martin periodinane oxidation reagent, and the fluorinating agent AlkylFluor.

Professor Lee Cronin, Regius Professor of Chemistry at the University of Glasgow, said: “What we’ve managed to do with the development of our ‘Chemical Spotify’ is something similar to ripping a compact disc into an MP3. We take information stored in a physical format, in this case a scientific paper, and pull out all the data we need to create a digital file which can be played on any system, in this case any robot chemist, including our robotic system which is an order of magnitude lower cost than any other similar robot. We’re hoping that the system we’ve built will massively expand the capabilities of robot chemists and allow the creation of a huge database of molecules drawn from hundreds of years’ worth of scientific papers. Our system, which we’re calling Chemify, can read and run XDL files which have been shared among users. Putting that kind of knowledge directly in the hands of people with access to robot chemists could help doctors make drugs on demand in the future. It could even mean that future manned missions to Mars could take raw chemical materials with them and make whatever they need right there on the red planet.»

phys.org, 10 October 2020

<https://www.phys.org>

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Are non-stick pans safe?

2020-10-04

Spending each morning at the kitchen sink scraping at the charred remains of breakfast gets tedious after a while. Non-stick cookware may seem like an appealing alternative — but is it safe?

Usually when people inquire about the safety of their non-stick cookware, they're talking about Teflon, said Suzanne Fenton, a reproductive endocrinologist at the National Institutes of Environmental Health Sciences in North Carolina. Also known as polytetrafluoroethylene (PTFE), this clear plastic is used to coat metal pots and pans, giving them a waxy, easy-to-clean surface — and for decades, scientists have debated whether it's safe for cooking.

Experts tend to agree that Teflon itself isn't a problem. The coating itself is considered non-toxic. Even if you ingest small flakes of it, it passes right through you. But some experts are concerned about what happens when Teflon gets too hot. "When pans are overheated, that PTFE coating begins to disintegrate," Fenton told Live Science. As Teflon breaks down, it releases a host of toxic gases. In rare instances, breathing in these chemical fumes can cause polymer fume fever, a condition characterized by a high fever, shortness of breath and weakness. These gases also deadly to birds — lightbulbs coated in Teflon have wiped out poultry houses. Of particular concern is perfluorooctanoic acid (PFOA), one of the chemicals released when Teflon pans heat up. Long-term exposure to PFOA is linked to a host of conditions from cancer to thyroid disease, Fenton said.

PLAY SOUND

Not all researchers think that people need to worry about their Teflon pans breaking down. Some point out that no studies have specifically analyzed the long-term effects of Teflon pans on humans. Instead, these studies focus on the health-effects of Teflon's chemical byproducts, like PFOA. Much of the data on these toxins come from cases of environmental exposure — such as drinking water or factory settings, where exposure levels are much higher than they would be from non-stick cookware. "Generally speaking, nonstick pans are not dangerous," said Kyle Steenland, a professor of environmental health at Emory University in Atlanta.

Steenland and other scientists also argue that people don't cook at high enough temperatures for these chemical reactions to take place. "Now, if you burn your pans for an hour at high heat, it [Teflon] will break down,"

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"But that will be the least of your problems because your house will be on fire."

However, research suggests pans can easily reach a temperature hot enough to disintegrate Teflon. One group of researchers in Canada published a 2001 study in the journal Nature, in which Teflon broke down at 680 degrees Fahrenheit (360 degrees Celsius). For context: a Teflon-coated pan can reach 750 F (399 C) if left for eight minutes at high heat on a stovetop, according to a 2017 article published in Environmental Science and Pollution Research. And at lower temperatures, Teflon coating still breaks down over time, according to a 1998 article published in the journal Polymer Degradation and Stability. If you consistently heat your pan to 500 F (260 C; the temperature at which we sear steak), the pan should last around 2.3 years, according to the 2001 Nature study.

Taking good care of non-stick pans can help keep your kitchen safe. "It's really important that you use the pans on low-to-medium heat, and you don't use utensils that will scratch it," Fenton said.

But in some cases, it's best to ditch Teflon pans altogether, Fenton added — especially if you're pregnant, breastfeeding or have young children. PFOA in particular is tied to problems with kids' development. That's because this chemical is considered an endocrine disruptor, meaning it interferes with the body's hormone system. PFOA exposure causes elevated estrogen in male rats and delayed mammary-gland development in female mice, according to a 2012 article published in The Journal of Steroid Biochemistry and Molecular Biology. In humans, the chemical is linked to obesity, diabetes, low sperm quality and irregular menstrual cycles — potential signs of endocrine disruption.

Luckily, there's a wealth of other options for those averse to scrubbing pans. Cookware made of anodized aluminum (a product that protects against corrosion and scratches) and ceramic is non-stick and perfectly safe, Fenton said. If cared for correctly, a cast-iron skillet can also serve as another non-toxic, non-stick pan, while enriching food with blood-building iron.

"Non-stick pans come in many forms," Fenton said, "one can certainly safely cook healthy meals in them."

Editor's note: This story was updated on Oct. 7 to correct a temperature; steak isn't seared at 260 F (127 C) but at 500 F (260 C).

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Originally published on [Live Science](#).

[livescience.com](#), 10 October 2020

<https://www.livescience.com>

Your dog's brain doesn't care about your face

2020-10-05

Lots of dog owners love to gaze at their pups' faces. But that fascination may be a one-way street, at least in the brain. Dogs' brains aren't especially impressed by faces, either those of other dogs, or of people, a new study suggests.

People's brains are exquisitely tuned into faces, and the wealth of information that expressions can convey. Whether other animals' brains are as vigilant to faces is an open question.

Researchers in Hungary and Mexico used brain-scanning technology on 20 pet dogs to measure responses to faces. The dogs were trained to lie still in a sphynx position inside an MRI tube, resting their head on a chin rest while watching a screen. The scientists played four types of two-second video clips for the dogs to view: the front or back of a human head, and the front or back of a dog head. Thirty human volunteers in MRI machines saw the same short videos.

As many earlier studies have found, faces were captivating for people. When shown a face — either human or dog — a large swath of these people's visual systems became active. These brain regions were quieter when the people saw the backs of heads.

The vision-processing parts of the dogs' brains, however, didn't seem to care about faces, the researchers report October 5 in the *Journal of Neuroscience*. No brain areas had greater activity when viewing a face compared with the back of a head. Instead, areas of the dogs' visual systems were more tuned to whether the video featured a dog or a human.

Still, the study measured brain responses — not behavior. The results don't mean that dogs themselves don't see, or don't care, about faces. Other studies have shown that canines can recognize people's facial cues.

Whether other animals' brains are as vigilant to faces is an open question.

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The new finding adds to tidbits gleaned from other studies on canine cognition (*SN: 8/30/16, SN: 9/2/19*). But for now, a full reckoning of how a dog experiences the world lies beyond human understanding.

[sciencenews.org](#), 5 October 2020

<https://www.sciencenews.org>

Op-ed: It is time to protect kids' developing brains from fluoride

2020-10-07

The debate on the fluoridation of drinking water—one of the most polarized, long-running, and high-decibel controversies in public health—has been reignited as new studies find that fluoride is toxic to the developing brain.

Last week, the U.S. National Toxicology Program (NTP) released a systematic review of all published studies evaluating the potential neurotoxicity of fluoride; the benefits of fluoride with respect to reducing tooth decay were not addressed. A committee of the National Academy of Science, Medicine, and Engineering will review it this fall. This comprehensive report scrutinized hundreds of human and animal studies on the impact of fluoride on brain and cognitive function. Most, but not all, of the high-quality studies evaluated fluoride concentrations that were about twice the level added to drinking water or higher. However, when considering all the evidence, their conclusion was «fluoride is presumed to be a cognitive developmental hazard to humans.»

The NTP's conclusion was strengthened by a synthesis of high-quality studies showing that children who were exposed to higher amounts of fluoride during early brain development scored about 3 to 7 points lower on their IQ tests.

Their conclusion is consequential; about 75 percent of Americans on community water systems have fluoride in their tap water. Water is the main source of fluoride for people who live in communities with water fluoridation.

When do we know enough to revise long-held beliefs? We are reminded of the discovery of neurotoxic effects of lead that led to the successful banning of lead in gasoline and paint. Despite early warnings of lead toxicity, regulatory actions to reduce childhood lead exposures were not

However, when considering all the evidence, their conclusion was “fluoride is presumed to be a cognitive developmental hazard to humans.”

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taken until decades of research had elapsed and millions more children were poisoned.

We know that the developing brain is exquisitely sensitive to minute concentrations of lead and other toxic chemicals. Moreover, toxic chemicals' irreversible effects on children's rapidly growing brains emphasize the need for prevention.

Failing to act on accumulated evidence raises deep and unsettling questions.

Why are beliefs about the safety of fluoride so intransigent in the face of consistent evidence to the contrary?

Costs outweigh benefits

Fluoride offers no benefits to the fetus and infant and – as shown in the [video below](#) – new evidence suggests that fluoride is toxic to the developing brain at levels routinely found in the general population.

The benefits of fluoride in the prevention of tooth decay are predominately topical, occurring only after teeth appear in the child's mouth. Fortunately, pregnant women can use fluoridated toothpaste and, if they want to do more to prevent cavities, they can limit their consumption of sugar, a leading cause of tooth decay.

The loss of a single IQ point for an individual child is imperceptible, but the societal cost of millions of children losing 5 IQ points, or more is enormous. A decrement of even one IQ point translates to a 2 percent reduction in lifetime economic productivity (roughly \$20,000), not to mention the additional educational costs required for children with lower IQs.

Many health and dental organizations in North America recommend community water fluoridation. Given the weight of evidence that fluoride is toxic to the developing brain, it is time for health organizations and regulatory bodies to review their recommendations and regulations to ensure they protect pregnant women and their children.

We can act now by recommending that pregnant women and infants reduce their fluoride intake.

Specialized water filtration systems can be used to remove fluoride from tap water for pregnant women and infants fed formula. Pregnant women can also avoid black tea, which hyper-accumulates fluoride. The good news for all women is that there is little fluoride in breast milk. Bottled

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water typically contains lower amounts of fluoride than fluoridated tap water.

Some health advocates are going a step further. In 2016, a group of citizens petitioned the U.S. Environmental Protection Agency (EPA) to stop adding fluoride to drinking water because it is toxic. The EPA rejected the petition. In response, the citizen's group took an unprecedented step and sued the EPA in federal court. EPA lawyers argued half-heartedly that the science was insufficient and said the Agency does not have the resources to regulate fluoride under the Toxic Substances Control Act (TSCA).

In August, Judge Edward Chen of the Ninth Circuit deferred his ruling on whether fluoridation poses an unreasonable risk until the NTP released their report.

New evidence questions existing policies about the safety of fluoride for babies' developing brains. Given that safe alternatives are available and that there is no benefit of fluoride to babies' teeth before they erupt or appear, it is time to protect those who are most vulnerable.

ehn.org, 7 October 2020

<https://www.ehn.org>

Future tires may create way less pollution with this innovative contraption

2020-10-06

As the automotive industry truly starts to turn its attention to limiting and eliminating [tailpipe emissions](#) that cause pollution, new studies bring forth a new challenge: tire particle pollution. No, tires don't create emissions themselves, but as they wear down, the dust and particles they shed create unhealthy nonexhaust emissions. It's not good for the planet, nor our lungs.

Enter the Tyre Collective and its future tire concept, which is designed to suck up these pollutants as the tire rolls. The [James Dyson Award organization](#) announced its winners in the UK this week and the group of innovative thinkers took home one of the accolades for its contraption that eliminates 60% of tire pollution as the car rolls. We don't have a name for the device, but essentially, it acts like an air filter to capture nonexhaust emissions before they enter the atmosphere. As the tire rolls, the filter sucks up the particles that manufacturers can even use to create new tires, according to the Tyre Collective.

It's not good for the planet, nor our lungs.

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A past study showed a typical European hatchback can create about 4.5 grams (0.16 ounces) of particle pollution every kilometer (0.62 mile) it travels. And the heavier the vehicle, the worse the results. As the Tyre Collective explained, that's because the particles are released due to positively charged friction. What kind of cars create a lot more than usual? Electric cars. Battery packs are heavy. While EVs start to solve the tailpipe emissions problem, they create a new (albeit much smaller) pollution problem in nonexhaust emissions. If you need a better visual, the group found a standard bus can create a pile of tire dust the size of a grapefruit in a single day.

The Tyre Collective imagines this device attached to the steering knuckle, running on power from the vehicle's alternator. It moves with the driver's inputs to the tires and uses the airflow from the spinning tire to keep things cleaner. And the group says the solution is far more effective than a HEPA filter elsewhere, since it's capturing the pollutants right at the source. It's truly novel thinking for a stealthy pollution problem. These particles not only float in the air for us to breathe in, they end up in the water and even in the food supply.

What's next? The Tyre Collective said it's working with two major tire producers and a major automaker to create joint-development processes. The goal is to develop a small production device batch to test on the undisclosed automaker's vehicles to pilot the devices by 2030.

cnet.com, 6 October 2020

<https://www.cnet.com>

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Technical Notes

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

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[An inadvertent issue of human retina exposure to endocrine disrupting chemicals: A safety assessment](#)

[Are Persistent Organic Pollutants Linked to Lipid Abnormalities, Atherosclerosis and Cardiovascular Disease? A Review](#)

[Agrochemicals in freshwater systems and their potential as endocrine disrupting chemicals: A South African context](#)

ENVIRONMENTAL RESEARCH

[Pre- and Post-harvest Factors Affecting Glucosinolate Content in Broccoli](#)

[Plasma titanium level is positively associated with metabolic syndrome: A survey in China's heavy metal polluted regions](#)

OCCUPATIONAL

[Occupational Exposure to Electric Shocks and Extremely Low-Frequency Magnetic Fields and Motor Neurone Disease](#)

[Self-reported disease symptoms of stone quarry workers exposed to silica dust in Ghana](#)

[Quantitative microbial risk assessment and sensitivity analysis for workers exposed to pathogenic bacterial bioaerosols under various aeration modes in two wastewater treatment plants](#)

PHARMACEUTICAL/TOXICOLOGY

[Cetuximab produced from a goat mammary gland expression system is equally efficacious as innovator cetuximab in animal cancer models](#)

[Histone methylation status of H3K4me3 and H3K9me3 under methionine restriction is unstable in methionine-addicted cancer cells, but stable in normal cells](#)