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

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ASIA PACIFIC

Pool Products

2021-09-20

Applications for the registration of chlorinating pool products that contain the active constituent:

- calcium hypochlorite tablet or granule product to provide available 650 to 700 g/kg chlorine
- lithium hypochlorite granule product to provide available 350 g/kg chlorine
- sodium hypochlorite liquid to provide available 100 to 130 g/L chlorine
- sodium dichloroisocyanurate granule product to provide available 500 to 630 g/kg chlorine
- trichloroisocyanuric acid tablet product to provide 800 to 900 kg available chlorine

Should either be submitted as an:

- Item 9 application, if you meet the Agricultural and Veterinary Chemicals Code (Listed Chemical Product – Home Swimming Pool and Spa Products) Standard 2014. An Item 9 application requires no reference product, must have an upper pack size limit of 25 kg or 25 L, and have identical label instructions to those contained in the Pool Standard. An Item 9 application has a 3-month timeframe with an application fee of $2,632.
- Item 7 application, if you have a registered reference product where the formulation is the same or closely similar, with identical label instructions as the reference product. Additional pack sizes are permissible for these types of pool products as no data are required. Item 7 applications have a 3-month timeframe, with an application fee of $2,632.
- Item 8 application, if all aspects of the product are the same as the reference product. Formulation, manufacturing site, pack sizes and label instructions are the same. Item 8 applications have a 3-month timeframe, with an application fee of $2,632.

Applications submitted as an Item 10 with a 2-month timeframe will be re-categorised as appropriate. Item 10 applications are defined in schedule 6 of the Agricultural and Veterinary Chemicals Code Regulations as an application for registration for all situations other than those described in Items 1 to 9. Therefore, if the Item 10 application with no modules requires

Applications for the registration of chlorinating pool products that contain the active constituent:

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no technical assessment for chemistry or efficacy, the application falls within the definition of another Item (e.g. Item 7) and these applications will be re-categorised.

Note, applications for Items 7, 8 and 9 allow for you to pay the full fee at the time of submission and avoid the need for invoices to be issued during preliminary assessment.

Read More

APVMA, 20 September 2021

https://apvma.gov.au/node/91481

New regulation on household e-waste

2021-09-28

A NEW regulation on household electrical and electronic waste (e-waste) (pic) will be introduced to implement the Extended Producer Responsibility (EPR) for e-waste, according to the 12th Malaysia Plan (12MP) document released Monday.

EPR is a policy approach where producers are held responsible for the treatment and disposal of post-consumer products, either through self-undertaking or financial contribution.

The document stated that assigning such responsibility will incentivise producers to reduce waste at the source and promote the production of environment-friendly products.

The EPR approach will also be extended to cover other types and streams of waste, particularly packaging materials and single-use plastics, the document said.

"Relevant regulations, economic instruments and monitoring mechanisms will be put in place to enable producers and retailers to implement the EPR for other types of waste.

"Implementation of EPR will be supported through the take-back system by producers or brand owners as well as the adoption of the user-pay and polluter-pay principles," the document said.

The EPR approach will also be extended to cover other types and streams of waste, particularly packaging materials and single-use plastics, the document said.

In moving towards zero-waste, the document noted that solid waste management would also be strengthened to ensure compliance with existing standards, in which the enforcement of waste separation at source and the implementation of the 3R initiatives would be intensified.

For this purpose, the provision of waste collection, separation and recycling facilities will be increased.

Read More

Daily Express, 28 September 2021

http://www.dailyexpress.com.my/news/178705/new-regulation-on-household-e-waste/

October is National Safe Work Month—a time to commit to budling a safe and healthy workplace.

2021-10-01

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

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

The theme for National Safe Work Month this year is **think safe. work safe. be safe.**

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

Safe Work Australia, 1 October 2021

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

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

AMERICA

Amendment to Section 25705 No Significant Risk Level for Dibromoacetic Acid

2021-09-14

On July 6, 2021, the Office of Administrative Law approved the amendment to Title 27, California Code of Regulations, section 25705, to add a No Significant Risk Level for the chemical dibromoacetic acid. **The**

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regulation will be effective on October 1, 2021. This regulation establishes a No Significant Risk Level of 2.8 micrograms per day for dibromoacetic acid for purposes of Proposition 65.

Downloads

Proposed Amendment: Dibromoacetic Acid Specific Regulatory Levels Posing No Significant Risk

May 22, 2020

Initial Statement of Reasons - Proposed Amendment to Section 25705: No Significant Risk Level for Dibromoacetic Acid

May 22, 2020

Final Statement of Reasons - Amendment to Section 25705: No Significant Risk Level for Dibromoacetic Acid

Sep 14, 2021

Regulation Text - Amendment to Section 25705: No Significant Risk Level for Dibromoacetic Acid

Sep 14, 2021

Chemical Reference

Dibromoacetic Acid

Read More

California OEHHA, 14 September 2021

https://oehha.ca.gov/proposition-65/crnr/amendment-section-25705-no-significant-risk-level-dibromoacetic-acid

The EPA projects that the reduction of emissions from 2022 to 2050 will be equivalent to 4.6 billion metric tons of carbon dioxide.

EPA ratchets back US production of HFCs

2021-09-27

Agency proposes that two chemical plants destroy HFC-23 made as a byproduct

The US Environmental Protection Agency is ratcheting back US production of hydrofluorocarbons (HFCs), which are extremely potent greenhouse gases, and is proposing that two chemical plants destroy an HFC made as a byproduct.

A regulation that administrator Michael S. Regan signed Sept. 23 implements a 2020 law that mandates the phasedown of HFC production in the US to 15% of 2011–13 average levels by 2036.

The EPA projects that the reduction of emissions from 2022 to 2050 will be equivalent to 4.6 billion metric tons of carbon dioxide.

Separately, the EPA is proposing a regulation that specifically targets HFC-23, or fluoroform, which is generated as a byproduct at plants making hydrochlorofluorocarbons (HCFCs). HFC-23 has a "substantially longer" lifetime in the atmosphere and a higher global warming potential than any other HFC, the EPA says. The regulation would require chemical manufacturers to control, capture, and destroy HFC-23.

Like the rest of the world, the US is phasing out the production and use of HCFCs, which both deplete stratospheric ozone and are greenhouse gases. But there is an exception. Companies are allowed to manufacture HCFCs as feedstocks that are entirely consumed, except as trace quantities, in the production of other chemicals.

The EPA's proposal would allow facilities to emit a maximum of 0.1% of the HFC-23 generated during production of HCFCs as of Oct. 1, 2022. The agency says the proposal would only affect two chemical manufacturing plants. The EPA's Facility Level Information on Greenhouse gases Tool indicates these are Chemours's facility in Louisville, Kentucky, and Daikin America's plant in Decatur, Alabama. These two facilities reported HFC-23 emissions from the manufacture of HFCs in 2019, the most recent year for which data are available, the tool shows.

In concert with EPA's actions, the US Department of Homeland Security is beefing up efforts to prevent illegal imports of HFCs.

President Joe Biden has called for the US to join a 2016 pact that controls HFCs, the Kigali Amendment to the 1989 Montreal Protocol on Substances

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that Deplete the Ozone Layer. The US signed the deal but is not an official partner to it because the Senate has not yet consented to formal ratification of the treaty.

Read More

Chemical & Engineering News, 27 September 2021

https://cen.acs.org/environment/greenhouse-gases/EPA-ratchets-back-US-production/99/web/2021/09

EPA extends submission deadline for health and safety studies on high-priority chemical and organ halogen flame retardants

2021-09-27

The U.S. Environmental Protection Agency (EPA) announced on September 24, 2021, that it is extending the submission deadline for manufacturers (including importers) of 50 chemicals to report data from certain unpublished health and safety studies. The deadline for the **reporting rule** was originally September 27, 2021, and EPA has extended the deadline until **December 1, 2021**, for 20 of the 50 chemicals and to **January 25, 2022**, for 30 of the 50 chemicals. The 50 chemicals include:

- **Twenty chemicals designated by EPA as high-priority substances** and currently undergoing risk evaluation under the Toxic Substances Control Act (TSCA). The deadline for manufacturers to submit studies on these chemicals will be **December 1, 2021**. EPA states that this deadline "ensures that health and safety studies will be received in time for use in risk evaluations on these chemical substances."

- Thirty organohalogen flame retardants being evaluated for health risks by the Consumer Product Safety Commission (CPSC) under the Federal Hazardous Substances Act (FHSA). The deadline for manufacturers to submit studies on these chemicals will be **January 25, 2022**.

TSCA Blog, 27 September 2021

http://www.tscablog.com/entry/epa-extends-submission-deadline-for-health-and-safety-studies-on-high-prior

…EPA has extended the deadline until December 1, 2021, for 20 of the 50 chemicals and to January 25, 2022, for 30 of the 50 chemicals.

Industrial plastic is spilling into Great Lakes, and no one's regulating it, experts warn

2021-09-27

Plastic pollution is becoming a growing problem in the Great Lakes, especially near busy cities and industries

As the people of Toronto flocked to the Lake Ontario waterfront to swim, paddle and generally escape pandemic isolation, Chelsea Rochman's students at the University of Toronto were throwing plastic bottles with GPS trackers into the water.

The research team's goal is to track trash that ends up in the lake, to figure out where it accumulates in the water and where it's coming from in the first place.

Using information from the tracking bottles, they chose spots to put in Seabins — stationary cleaning machines that suck in water all day and trap any garbage and debris — at marinas along the waterfront. They are emptied daily, and the debris collected in them is examined to ferret out what kinds of trash is getting into the lake.

Read More

CBC, 27 September 2021

https://www.cbc.ca/news/science/plastics-waste-great-lakes-water-1.6185621?utm_source=ActiveCampaign&utm_medium=email&utm_content=Top+news%3A&utm_campaign=ATF+Daily

EUROPE

German Federal Institute for Risk Assessment (BfR) publishes overview on Europe food safety

2021-09-10

The fifth edition of the EU Food Safety Almanac of the BfR, a scientifically independent institution within the portfolio of the German Federal Ministry of Food and Agriculture, provides an overview of the current legal frameworks for food and feed safety in 37 countries, by describing the work and responsibilities of the relevant institutions. It identifies 18 possible areas of responsibilities, which include contaminants, environmental risk assessment, FCM and packaging, food ingredients and nanotechnology. The book covers all EU Member States, as well as neighbouring countries (Albania, Bosnia and Herzegovina, Iceland, Kosovo, Montenegro, Norway, Republic of North Macedonia, Serbia, Switzerland and Turkey).

It identifies 18 possible areas of responsibilities, which include contaminants, environmental risk assessment, FCM and packaging, food ingredients and nanotechnology.

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The National Law Review, 10 September 2021

https://www.natlawreview.com/article/sustainability-outlook-european-union-august-2021

Biocidal products – classification of a product containing the active substance ADBAC/BKC (C12-16)

2021-09-21

Following a request from Denmark, the Commission will decide whether a product containing the active substance Alkyl (C12-16) dimethylbenzyl ammonium chloride (abbreviated as 'ADBAC/BKC (C12-16)') available on the Danish market for use as a cleaning product and to control and prevent algal growth, is a biocidal product as defined under EU rules on biocidal products (Regulation (EU) 528/2012, Article 3(1)(a)).

Feedback period

21 September 2021 - 19 October 2021 (midnight Brussels time)

The Commission would like to hear your views.

This draft act is open for feedback for **4 weeks**. Feedback will be taken into account for finalising this initiative. Feedback received will be published on this site and therefore must adhere to the feedback rules.

This draft act is open for feedback for 4 weeks.

Read More

European Commission, 21 September 2021

https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13060-Biocidal-products-classification-of-a-product-containing-the-active-substance-ADBAC-BKC-C12-16-_en

Spain plans ban of plastic packaging for fruits and vegetables

2021-09-28

Following France's example, Spain's Ministry for Ecological Transition is drafting a decree to ban the sale of produce wrapped in plastic by 2023; wants to discourage sales of drinks in single-use plastic bottles by encouraging the installation of drinking fountains and bottle reuse systems

On September 22, 2021, the newspaper El País reported the Spanish Ministry for Ecological Transition is drafting a decree that will ban grocers from selling produce that weighs less than 1.5 kg in plastic packaging by 2023. The exact list of which products must comply with the new ordinance will be developed by Spain's Food Safety and Nutrition Agency. In addition to removing plastic from fruit and vegetable sales, the Ministry also wants to reduce sales of drinks in plastic bottles by 50% by 2030 through the installation of drinking fountains and the development of reuse systems.

The Spanish decree is based heavily on a piece of legislation France passed as part of the country's single-use plastics ban (FPF reported). Both the Spanish and French bans make exceptions for foods "at risk of deteriorating when sold loose." France's ban will go into effect beginning January 2022. Spain's decree is still in development, but El País does not report if other aspects of single-use plastic packaging in grocery stores will be affected. Produce stickers, for example, are included in the French ban unless they are made of paper or another compostable material.

Read More

Food Packaging Forum, 28 September 2021

https://www.foodpackagingforum.org/news/spain-plans-ban-of-plastic-packaging-for-fruits-and-vegetables

On September 22, 2021, the newspaper El País reported the Spanish Ministry for Ecological Transition is drafting a decree that will ban grocers from selling produce that weighs less than 1.5 kg in plastic packaging by 2023.

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INTERNATIONAL

Environmental Health must be adequately resourced to enforce public health regulations

2021-09-27

Madam Stella Kumedzro, Volta Regional Environmental Health Officer (REHO), has added to calls for the Department to be resourced to effectively pursue its mandate of enforcing public health regulations.

She said in a statement to the Ghana News Agency (GNA) to mark the 2021 World Environmental Health Day, which is on the theme, "Prioritizing Environmental Health for Healthier Communities in Global Recovery", that the COVID-19 pandemic coupled with the increase in galamsey activities added to land, air, and water pollution to impact the environment, and livelihoods.

Madam Kumedzro said the fallouts from illegal mining; a major cause of environmental depletion, affected deprived communities the most, causing significant genetic defects.

She noted support levels for the Department and its activities continued to show neglect for its essence, saying, "it has already been determined that the environmental health role is overlooked in most countries across the globe.

"Environmental health is a key part of any comprehensive public health system. Emergencies such as the coronavirus pandemic, perianal flooding, quite recently galamsey and it's associated environmental health challenges such as land, water, and air pollution, and deforestation shows the impact environmental health issues can have on a vulnerable population.

Read More

News Ghana, 27 September 2021

https://newsghana.com.gh/environmental-health-must-be-adequately-resourced-to-enforce-public-health-regulations/

EU releases database of toxic chemicals in products

2021-09-18

Consumers in the European Union now have access to a database of toxic chemicals in commonly used products, the European Chemicals Agency (ECHA) announced Sept. 14. The new database contains information provided by about 6,000 companies, which are required to notify ECHA if they market products that contain "substances of very high concern" at concentrations of more than 0.1% by weight. Lead compounds, found in products such as batteries, automotive parts, and crystalware, are the most common substances in the database. ECHA received more than 4 million notifications, but it is unclear how many products are associated with them. In some cases, multiple companies submitted notifications for the same product; in other cases, companies submitted one notification for multiple products. The information is intended to help consumers make decisions about the products they purchase and to assist waste operators in safely reusing and recycling items. "It will help to track products containing substances of very high concern until they reach the waste stage, supporting the goals of a circular economy," ECHA executive director Bjorn Hansen says in a statement.

Read More

c&en, 18 September 2021

https://cen.acs.org/safety/consumer-safety/EU-releases-database-toxic-chemicals/99/i34

Lead compounds, found in products such as batteries, automotive parts, and crystalware, are the most common substances in the database.

INSIGHT: Chemical industry and partners must going 'essential use' debate at all levels

2021-09-27

The 'essential use' concept is gaining ground in the EU as the bloc seeks to build out its legislative framework for chemicals control.

The so-called 'precautionary principle' has become much more embedded in the REACH regulation that aims to identify and prompt replacement of some of the most toxic or persistent in the environment chemicals that are still used in industry. Notwithstanding the fact that regulation is based on sound science, more questions are asked today, compared even with five or ten years ago, about how important in use certain substances are.

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The European Commission published a Chemicals Strategy for Sustainability in October last year acknowledging the facts that most chemicals are in some ways hazardous to human health and the environment, and that chemicals production globally is likely to double by 2030.

The chemicals strategy is part of the EU's zero pollution ambition which, the Commission says is a key commitment of the EU Green Deal.

Chemical producers, importers and users in Europe can expect greater scrutiny of what chemicals they produce, trade and use, and the importance of those chemicals in bringing real benefits in goods and services.

It is the benefits argument that is coming under greater scrutiny and by a wider section of society, not just regulators and law makers, but also deeply concerned citizens whether organised in non-governmental organisations, special interest groups or individually.

Read More

ICIS, 27 September 2021

https://www.icis.com/explore/resources/news/2021/09/27/10689187/insight-chemical-industry-and-partners-must-join-essential-use-debate-at-all-levels

Janet's Corner

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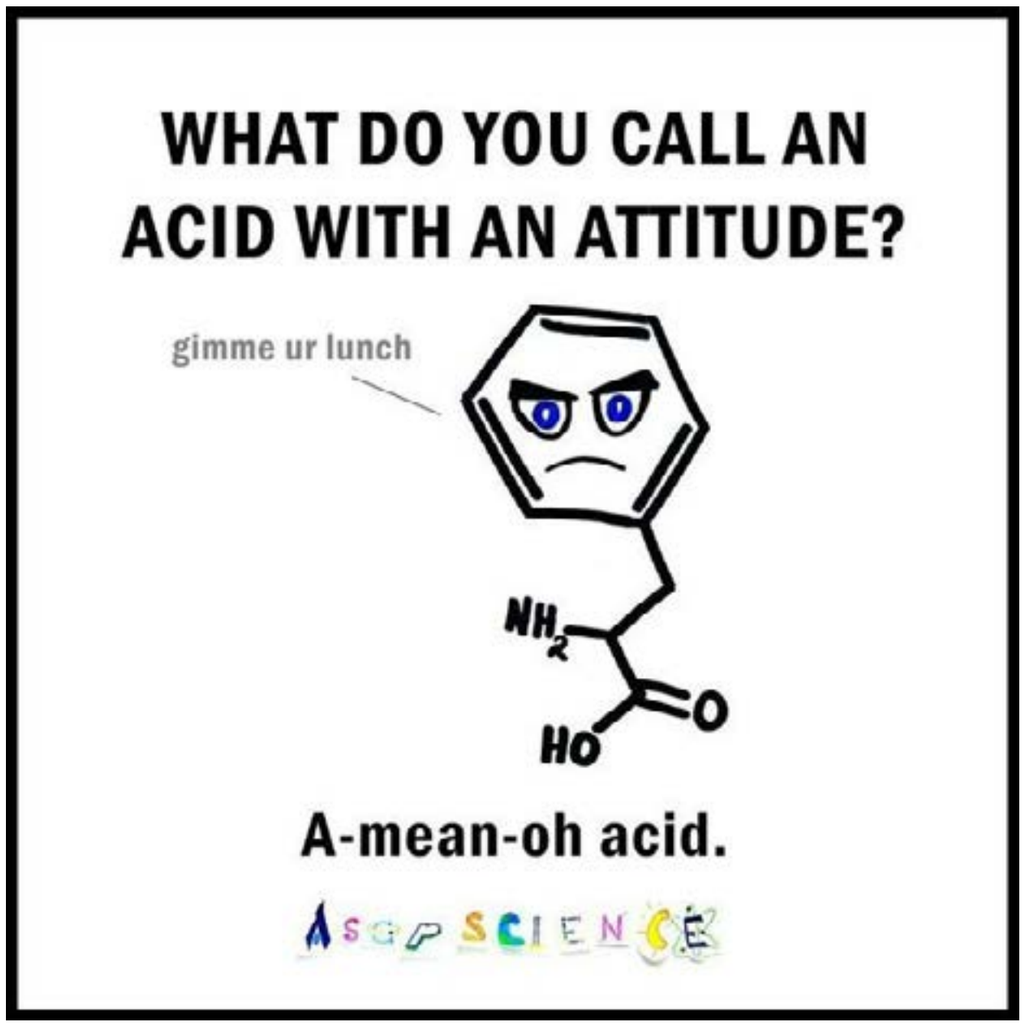
A Mean Oh Acid

2021-10-08



https://www.pinterest.com.au/pin/10555380366424500/

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Hazard Alert

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Acrylic Acid

2021-08-10

Acrylic acid (IUPAC: prop-2-enoic acid) is an organic compound with the formula CH_2=$CHCO_2H$. It is the simplest unsaturated carboxylic acid, consisting of a vinyl group connected directly to a carboxylic acid terminus. This colourless liquid has a characteristic acrid or tart smell. [1] It is miscible with water, alcohol, ether, benzene, chloroform, and acetone. It polymerises readily in the presence of oxygen. Exothermic polymerisation at room temperature may cause acrylic acid to become explosive if confined. It is sensitive to heat and sunlight. It is also a fire hazard when exposed to heat or flame. Acrylic acid is incompatible with strong oxidisers, strong bases, strong alkalies and pure nitrogen. It may polymerise (sometimes explosively) on contact with amines, ammonia, oleum and chlorosulfonic acid, iron salts and peroxides. It may corrode iron and steel. [2]

USES [2]

The primary use of acrylic acid is in the production of acrylic esters and resins, which are used primarily in coatings and adhesives. It is also used in oil treatment chemicals, detergent intermediates, water treatment chemicals, and water absorbent polyacrylic acid polymers. Acrylic acid is used widely for polymerisation, including production of polyacrylates. It is a monomer for polyacrylic and polymethacrylic acids and other acrylic polymers. It is used in the manufacture of plastics, as a tackifier, as a flocculant, in the production of water-soluble resins and salts, as a comonomer in acrylic emulsion and solution polymers and in moulding powder for signs, construction units, decorative emblems and insignias. It is used in polymer solutions for coatings applications, in paint formulations, in leather finishings, in paper coatings, in polishes and adhesives and in general finishes and binders.

SOURCES & ROUTES OF EXPOSURE [3,4]

Exposure can occur through inhalation, ingestion, and contact to the eyes and skin. Studies show that eye or skin irritation from exposure to acrylic acid can range in intensity from mild to severe. People can be exposed to acrylic acid through direct contact with a product containing it or by inhaling it in air contaminated by a nearby plant manufacturing acrylic acid. Exposure to acrylic acid occurs primarily in the workplace via inhalation and dermal contact during its manufacture or use. Consumers

Acrylic acid (IUPAC: prop-2-enoic acid) is an organic compound with the formula CH2=CHCO2H.

may be exposed to acrylic acid in polishes, paints, coatings, rug backings, adhesives, plastics, textiles, and paper finishes. In addition, acrylic acid may be released in wastewater and as emissions during its production and use. Individuals may be exposed by inhaling ambient air or ingesting contaminated water. Acrylic acid is also produced naturally by some species of algae.

HEALTH EFFECTS [4]

Potential effects of exposure to acrylic acid include:

- Mild to moderate oral toxicity: Patients with mild ingestions may only develop irritation or grade (superficial hyperaemia and oedema) burns of the oropharynx, oesophagus or stomach; acute or chronic complications are unlikely. Patients with moderate toxicity may develop grade II burns (superficial blisters, erosions and ulcerations) are at risk for subsequent stricture formation, particularly gastric outlet and oesophageal. Some patients (particularly young children) may develop upper airway oedema.
- Severe Oral Toxicity: May develop deep burns and necrosis of the gastrointestinal mucosa. Complications often include perforation (oesophageal, gastric, rarely duodenal), fistula formation (tracheoesophageal, aortoesophageal), and gastrointestinal bleeding. Upper airway oedema is common and often life threatening. Hypotension, tachycardia, tachypnea and, rarely, fever may develop. Other rare complications include metabolic acidosis, hemolysis, renal failure, disseminated intravascular coagulation, elevated liver enzymes, and cardiovascular collapse. Stricture formation (primarily gastric outlet and oesophageal, less often oral) is likely to develop long term. Oesophageal carcinoma is another long term complication.
- Inhalation Exposure: Mild exposure may cause dyspnea, pleuritic chest pain, cough and bronchospasm. Severe inhalation may cause upper airway oedema and burns, hypoxia, stridor, pneumonitis, tracheobronchitis, and rarely acute lung injury or persistent pulmonary function abnormalities. Pulmonary dysfunction similar to asthma has been reported.
- Ocular Exposure: Ocular exposure can produce severe conjunctival irritation and chemosis, corneal epithelial defects, limbal ischemia, permanent vision loss and in severe cases perforation.
- Dermal Exposure: A minor exposure can cause irritation and partial thickness burns. More prolonged or a high concentration exposure can cause full thickness burns. Complications may include cellulitis, sepsis, contractures, osteomyelitis and systemic toxicity.
- Chronic Exposure: Animals exposed via chronic inhalation have developed lethargy, weight loss, kidney abnormalities, embryotoxicity, and inflammation to the upper respiratory tract and gastric mucosa.

The International Agency for Research on Cancer states acrylic acid is embryotoxic and teratogenic, having the ability to adversely affect the growth or development of the embryo. However the US Environmental Protection Agency and other agencies state that no information is available to substantiate these conclusions. Tests done on rats found acrylic acid to be both embryotoxic and teratogenic. Acrylic acid is not classifiable as a human carcinogen.

SAFETY [5]

Fist Aid Measures

- Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.
- Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
- Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.
- Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
- Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.
- Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person.

Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Handling & Storage

- Keep locked up
- Keep container dry
- Keep away from heat
- Keep away from sources of ignition
- Ground all equipment containing material
- Do not ingest or breathe gas/fumes/ vapour/spray
- Never add water to this product
- Keep away from incompatibles such as oxidising agents, acids, alkalis, moisture
- Store in a segregated and approved area
- Keep container in a cool, well-ventilated area
- Keep container tightly closed and sealed until ready for use

Exposure Controls & Personal Protection

Engineering Controls:

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

Personal Protection:

- Face shield
- Full suit
- Vapour respirator (be sure to use an approved/certified respirator or equivalent)
- Gloves
- Boots

Personal Protection in Case of a Large Spill:

- Splash goggles
- Full suit
- Vapour respirator
- Boots

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

REGULATION [5]

Exposure Limits

- TWA: 2 (ppm) from ACGIH (TLV) [United States] [1997]
- TWA: 2 [Australia] STEL: 20 (ppm)
- TWA: 10 (ppm) [United Kingdom (UK)]

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2. http://www.npi.gov.au/substances/acrylic-acid/index.html
3. http://www.epa.gov/ttn/atw/hlthef/acrylica.html
4. http://toxipedia.org/display/toxipedia/Acrylic+Acid
5. http://www.sciencelab.com/msds.php?msdsId=9922794

Cocktail of pesticides in almost all oranges and grapes, UK study finds

2021-09-29

Almost all grapes and oranges contain a "cocktail of pesticides" according to research, which has singled out the most polluted fruit and vegetables in our shopping trolleys.

Each year, the government tests samples of groceries for chemicals to see if traces can be found in Britain's food.

The official figures, analysed by Pesticide Action Network (PAN), found 122 different pesticides in the 12 most polluted products, which the charity calls the "dirty dozen". Many of these are hazardous to human health; 61% are classified as highly hazardous pesticides (HHPs), a concept used by the UN to identify those substances most harmful to human health or the environment.

The list of pesticides includes 47 with links to cancer, 15 "reproductive or developmental toxins" that can have adverse effects on sexual function and fertility, and 17 cholinesterase inhibitors that can impair the respiratory system and cause confusion, headaches and weakness. A quarter of the pesticides found are suspected endocrine disruptors that can interfere with hormone systems, causing an array of health problems including birth defects and developmental disorders.

Every fruit or vegetable on the list contains two or more types of pesticide, with some containing up to 25. Although the levels of individual pesticides are within legal limits, activists fear the combination of multiple chemicals could be particularly damaging to people's health.

Nick Mole from PAN UK said: "These figures highlight the wide array of chemicals that we are exposed to daily through our diets. While safety limits continue to be set for just one pesticide at a time, the evidence is growing that chemicals can combine to be more toxic, a phenomenon known as the cocktail effect."

There are also gaps in the data. This year the government chose to test only three of the 12 types of fruit and vegetables from last year's dirty dozen list compiled by PAN. Strawberries, lemons and pre-packed salad, which topped the previous list, were not tested so there is no way of knowing if the amount of pesticides on these products was reduced.

A spokesperson for PAN said there was no real way to avoid ingesting pesticides, other than campaigning for a reduction in their use.

Each year, the government tests samples of groceries for chemicals to see if traces can be found in Britain's food.

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"The best way for people to avoid pesticides is to buy organic. Of course, almost no one in the UK can financially afford or access a fully organic diet so that is why we publish the dirty dozen – to help consumers prioritise which produce to avoid," she said.

"In terms of washing, it should remove some residues on the skin of a product (which will often be fungicides used to prevent rotting during storage and transportation). However, many modern pesticides are what are called 'systemic' which means that they are absorbed into the plant and distributed throughout its tissues, reaching any fruits or flowers. As a result, pesticide residues are often contained within the body of the produce itself and therefore washing the surface won't remove them."

It is also recommended that consumers buy from EU countries as well as the UK, as the EU has by far the most protective pesticide regime in the world and is far more likely to ban a pesticide due to concerns over the harms it causes. The UK regime currently mirrors the EU regime.

There are also environmental implications: half of the top 12 pesticides found are groundwater contaminants, meaning they persist in water bodies, potentially affecting aquatic biodiversity or drinking water quality. The list includes the neonicotinoid acetamiprid which, while thought to be less toxic to pollinators than other neonicotinoids, PAN says could still represent a potential threat to bee health.

Mole added: "Consumers presume that their food has been through rigorous testing and that if an item is available for sale in the UK then it must be safe. Unfortunately, this is not necessarily the case. We actually have very limited understanding of the long-term impacts to human health of consuming small amounts of tens of different pesticides every day of our lives."

A spokesperson for the Department for Environment, Food and Rural Affairs said: "All food sold in the UK must meet strict rules on pesticide residue to ensure it is safe to eat. These are enforced via a comprehensive residues monitoring programme overseen by an independent specialist body and in 2020 more than 97% of tested samples were compliant.

"However we continue to encourage a move away from chemical pest control, and recently consulted on a national action plan which aims

to minimise the impacts of pesticides and increase the uptake of safer alternatives."

theguardian.com, 29 September 2021

https://www.theguardian.com

These giant birds could eviscerate you. People were raising them 18,000 years ago.

2021-09-30

Whoever came up with the age-old riddle "Which came first: the chicken or the egg?" failed to consider the world's most dangerous (and Australia's largest) bird — the cassowary (Casuarius).

New research suggests that the relationship between humans and cassowaries dates back to the late Pleistocene era — several thousand years before humans domesticated chickens and geese. "And this is not some small fowl," lead study author Kristina Douglass, an archaeologist at Penn State, said in a statement. "It is a huge, ornery, flightless bird that can eviscerate you — most likely, the dwarf variety that weighs 20 kilos (44 pounds)." By examining the remains of ancient cassowary eggshells, Douglass and an international team of researchers determined that some 18,000 years ago, people in New Guinea were collecting, hatching — and possibly raising — cassowary chicks, which the researchers consider a sophisticated food-gathering technique. This represents the earliest known evidence of intentional bird rearing.

Using a combination of 3D imaging, computer modeling and egg morphology, the scientists examined over 1,000 fragments of cassowary eggshells dating to between 6,000 and 18,000 years ago. "We used that approach to see whether or not there was any pattern in terms of when people were harvesting cassowary eggs," Douglass told Live Science. "And we found that there was a pattern and that people were harvesting eggs preferentially in the later stages of development."

According to Douglass, people would have kept these eggs for one of two purposes: to eat them or to raise the hatched chicks for their meat and feathers. Today, late-stage fertilized eggs are a popular street food in several East Asian and South Pacific countries — notably, the Philippines, according to a paper published in 2019 in the Journal of Ethnic Foods. Known as balut, the dish is usually made with duck eggs today. But Douglass and her team suggest that people in New Guinea may have been eating cassowary balut thousands of years ago.

"It is a huge, ornery, flightless bird that can eviscerate you — most likely, the dwarf variety that weighs 20 kilos (44 pounds)."

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Or, they may have been raising cassowary chicks. Like geese, cassowary chicks imprint on the first creature they see, according to the University of Michigan's Animal Diversity Web. That makes them oddly ideal for human rearing, a practice that continues in parts of New Guinea to this day, University of Maine anthropologist Paul Roscoe told Live Science. Though Douglass and her team did not find evidence of ancient people penning cassowaries, it is something they plan to look for in the future.

Cassowaries and their eggs are valuable resources for New Guineans. Historically, cassowary tibiotarsae, the upper part of the bird's leg, were used to fashion bone daggers for hunting, according to research published in Royal Society Open Science. Today, their feathers are prized for ornamentation, and the birds remain an important source of meat. "Cassowary is quite a delicacy," Roscoe said.

But these striking birds, which can reach nearly 6 feet (1.8 meters) tall and 120 pounds (54 kg), are also incredibly dangerous. "They have these really large, 4-inch-long [10 cm] claws. And if they feel threatened, they will use them," Douglass said. A frightened or territorial cassowary can lash out with a kick powerful enough to eviscerate a medium-size (or even human-size) mammal, vertebrate paleontologist Darren Naish wrote for Scientific American. Cassowaries do occasionally kill humans, including a man in Florida who was lethally attacked by a cassowary he kept on his farm in 2019, The Florida Times-Union reported. Even so, these instances are exceedingly rare.

In addition to being anthropologically important, ancient cassowary husbandry helps dispel some pervasive scientific myths. To this day, many people broadly assume that hunter-gatherer cultural practices are somehow less sophisticated than those of agricultural societies, Douglass said. But her team's research contradicts this outdated assumption.

"People had this very sophisticated knowledge that they were passing down from one generation to the next," she said, and this kind of research reaffirms "the importance of local and Iindigenous knowledge."

The research is detailed in the October issue of the journal Proceedings of the National Academy of Sciences.

Originally published on Live Science.

livescience.com, 30 September 2021

https://www.livescience.com

We're miscalculating the cancer risk from a massive class of chemicals: MIT study

2021-10-01

Around the world, regulators have long relied on one compound to assess a community's lung cancer risk from a class of chemicals that we're exposed to while grilling burgers, waiting in traffic, and breathing in wood smoke from a fire.

That compound—benzo(a)pyrene, a polycyclic aromatic hydrocarbon (PAH)—however, only accounts for 11% of lung cancer risk associated with PAHs, MIT researchers found in a study published earlier this month in GeoHealth. Meanwhile, 17% of the PAH-linked cancer risk in the study came from the largely unregulated and under-studied breakdown products.

People can be exposed to PAHs in a variety of ways, from smoking to eating grilled food to breathing in tailpipe or wildfire emissions. Workers in coal plants, or those who use coal products, are considered especially at-risk to PAH exposure.

When people inhale PAH particles, the particles can travel deep into the lungs, causing cell mutations that can lead to lung cancer. Scientists are also concerned about exposure to PAHs through food and drinking water, as ingestion has been linked to birth defects and higher prevalence of developing breast, pancreatic, and colon cancers.

Experts say this study provides further evidence that both regulators and scientists need to factor in a broader range of PAH compounds when assessing a community's cancer risks — and determining what pollution reduction projects to fund.

"The big challenge in regulating air pollutants is: What are the most important sources and locations to prioritize?" Noelle Selin, director of MIT's Technology and Policy Program and a co-author of the paper, told EHN. "If you're using just a model of benzo(a) pyrene, you might not actually end up with the best answer in terms of the most beneficial reductions."

Toxic breakdown products

In the 1970s, the U.S. Environmental Protection Agency (EPA) identified 16 of the more than 10,000 PAH compounds as pollutants of concern, and since then, that group of chemicals has been widely monitored around the world. One of those—benzo(a)pyrene—is still used as the toxicity

Meanwhile, 17% of the PAH-linked cancer risk in the study came from the largely unregulated and under-studied breakdown products.

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benchmark for polycyclic aromatic hydrocarbons in epidemiological studies, in large part because it's the best-studied PAH.

But in recent years, researchers have been questioning whether that narrow focus makes sense. In particular, researchers have been challenging the assumption that once PAH compounds break down in the atmosphere, they're no longer carcinogenic. "It turns out that some of the products that they can react to are even more toxic than what's initially emitted," said Selin.

As part of their work on a Superfund site in Maine, the MIT researchers examined global lung cancer risk from 16 PAH compounds and their degradation products — 48 altogether.

Once they had developed a global atmospheric model for PAH concentrations and fine-tuned it against real-world pollutant measurements, the researchers used animal studies to assess the associated lung cancer risk from different PAH compounds. They also estimated lung cancer risks based on epidemiological studies that use benzo(a)pyrene as a proxy for overall PAH cancer risk.

While they found that industrial regions in China, India, and Eastern Europe had the highest levels of lung cancer risk in both methods, animal experiments showed that changing benzo(a)pyrene emissions did not have a linear correlation with overall lung cancer risk from PAHs. For example, although simulated benzo(a)pyrene emissions were 3.5 times higher in Hong Kong than in India, the animal-based method predicted that Hong Kong residents are 12 times more likely to develop lung cancer, according to the paper.

While it's difficult to scale up the animal studies to human outcomes, that data provides researchers with a window into the "relative importance" of different PAH compounds in overall cancer risk, said Selin. The study also showed the importance of monitoring the sub-compounds that PAHs can break down into.

Toxic mixtures

Staci Simonich, an environmental toxicology professor at Oregon State University who also researches PAHs but was not involved in this study, told EHN that the new paper likely under-estimated the cancer risk as the researchers did not include the class of heavier-weight PAH compounds described in her 2011 study as a significant contributor to cancer risk. Selin said that her group had not included those and other PAH compounds

due to limitations in global monitoring data—including having almost no measurements from Africa.

Both Selin and Simonich stressed the need for future studies that assess the risk of PAH mixtures, noting that the total toxicity might not always be as simple as just adding up the toxicity of the individual compounds.

"I think regulators, whether it's in air, soil or sediment, are getting the message…in Europe and the U.S. that you really have to take a much broader look at PAHs in terms of exposure and risk," said Simonich.

ehn.org, 1 October 2021

https://www.ehn.org

Boy dies from rare 'brain-eating' amoeba found in splash pad at Texas park

2021-09-30

A boy in Arlington, Texas, has died from a rare and deadly brain infection he likely contracted from a city splash pad, health officials say.

The boy, whose name and age were not released, was hospitalized at Cook Children's Medical Center in Fort Worth, Texas, on Sept. 5, where he was diagnosed with primary amoebic meningoencephalitis (PAM), a devastating brain infection caused by a single-celled organism called Naegleria fowleri, according to a statement from the City of Arlington Office of Communication. He died at the hospital on Sept. 11, the statement said.

N. fowleri are typically found in bodies of warm fresh water, such as lakes, rivers and hot springs, Live Science previously reported. But in the boy's case, officials determined that the only possible sources for his exposure to the amoeba were either water from his home or water from a splash pad at Don Misenhimer Park in Arlington, the statement said.

Water samples collected from the park's splash pad, which sprays water up from the ground, were sent to the Centers for Disease Control and Prevention (CDC) following the boy's diagnosis. On Sept. 24, the agency confirmed that the samples tested positive for N. fowleri, and that the splash pad was the likely source of the infection, the statement said.

Infections caused by N. fowleri are extremely rare — between 1962 and 2019, just 148 cases were reported in the United States, according to the CDC. But when infections occur, they are almost always fatal, with less

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than a 3% survival rate, Live Science previously reported. The majority of PAM cases occur in southern states, with more than half the total U.S. cases reported in Texas and Florida, according to the CDC. Infections happen when contaminated water goes up the nose — people can't become infected from swallowing contaminated water, according to the CDC.

The vast majority of people are infected while swimming in warm freshwater lakes and rivers. Of the 148 U.S. cases, just six have been linked with drinking water systems, according to the CDC. One of those cases was a 4-year-old boy in Louisiana who died of the infection in 2013 after using a lawn Slip 'N Slide, Live Science previously reported.

Almost exactly one year ago, a boy in Lake Jackson, a city near Houston, Texas, died from a PAM infection that was also linked with a city splash pad, Live Science previously reported.

There is no routine or rapid test to identify whether N. fowleri is present in water, according to the CDC. But city water systems are treated with chlorine, which kills N. fowleri when chlorine levels are above 0.5 milligrams per liter, according to a 2015 paper on a case of N. fowleri linked to tap water published in the journal Clinical Infectious Diseases. But if water systems aren't properly maintained, and chlorine levels drop, the organisms may start to grow inside the system, the paper said.

This appears to be what happened at the Arlington splash pad. Records show that employees at Don Misenhimer Park did not consistently document or conduct daily water-quality testing on the splash pad, including checking the levels of chlorine, which is required prior to opening the facility each day, the statement said. What's more, when employees did document chlorine levels that were low, they did not always record what actions were taken to bring the chlorine levels back up, the statement said. Chlorine readings were not documented on two of the three days that the boy visited the splash pad in late August and early September, and chlorine levels were documented as low one day after the boy visited the park, the statement said.

"We have identified gaps in our daily inspection program," Lemuel Randolph, Arlington's deputy city manager, said in the statement. "Those gaps resulted in us not meeting our maintenance standards at our splash pads."

The city closed all of its splash pads on Sept. 5, and they will remain closed for the rest of the year, the statement said.

The drinking water supply for the city of Arlington is not affected, officials said. The park's splash pad has a "backflow prevention device" that isolates the facility's water system from the city's water distribution system, the statement said.

Originally published on Live Science.

livescience.com, 30 September 2021

https://www.livescience.com

How Merck's antiviral pill could change the game for COVID-19

2021-10-02

A new drug by Merck significantly reduces the risk of hospitalization and death in people who take it early in the course of their COVID-19 illness, according to the interim results of a major study released today. It is the first oral antiviral found to be effective against this coronavirus.

People who took this drug, called molnupiravir—four pills twice a day for five days—within five days of showing symptoms were about half as likely to be hospitalized as those taking the placebo. They were also less likely to die, with eight deaths in the placebo group reported within a month of treatment and none in those who received the medicine.

"Having a pill that would be easy for people to take at home would be terrific. If this was available through a drug store, more people could get it," says Albert Shaw, an infectious diseases specialist at Yale Medicine in New Haven, Connecticut, who was not involved with the research. All of the antiviral medicines available today, including remdesivir and the monoclonal antibodies, must be administered through an IV in a medical setting. Monoclonal antibodies are much more effective against COVID-19 and cut the risk of hospitalization and death by up to 85 percent, but this treatment costs almost three times as much as molnupiravir.

How the antiviral works

Antiviral drugs are used against many viruses, including for herpes and the flu. These drugs take advantage of the fact that viruses need to replicate inside a person's cells in order to sicken them. Antivirals stop the replication process so the illness doesn't progress.

It is the first oral antiviral found to be effective against this coronavirus.

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The Merck drug works by introducing RNA-like building blocks into the virus's genome as it multiplies, which creates numerous mutations, disrupts replication, and kills the virus.

Keeping the virus from multiplying is important because the more it replicates, destroying cell after cell, the sicker a person usually becomes, says Waleed Javaid, an epidemiologist and director of infection prevention and control at Mount Sinai Downtown in New York, who was not involved in the study. Additionally, when enough virus is inside the body the immune system may go into overdrive. "At a certain point the body detects a virus it has never seen and will throw everything against it, like a tank coming at a small target." he says. This helps the body eliminate the virus but can cause sometimes deadly collateral damage throughout the body in its wake.

The research, which was conducted in numerous sites around the world, was stopped early because the results were so promising, Merck says. The drug was even effective against variants like Delta and Mu. Based on this interim analysis in 775 people, the company plans to submit an application for Emergency Use Authorization (EUA) to the U.S. Food and Drug Administration as well as regulatory bodies in other countries in hopes the drug can be made available. When that will happen is not clear, but the U.S. government has already agreed to purchase 1.7 million courses of treatment at $700 each, Merck notes.

Who can get the drug?

It's also not known who would ultimately be authorized to take the medicine. The study included only people who were sick and unvaccinated and had at least one risk factor for developing a severe case of COVID-19, says Aaron Weinberg, national director of clinical research at Carbon Health, a for-profit provider of primary and urgent care, and a principal investigator of the study. This includes people who are older than 60, obese, immunocompromised from another condition, or have underlying heart or pulmonary disease, among others.

If the FDA does authorize the drug, it could limit who gets it to people like those in the research, Javaid says.

Although this drug looks promising, it's a treatment but not a prophylactic like the vaccine. The medicine does not negate the need for unvaccinated people to get their shot, Shaw says. Some people taking the pills still got sick enough to be hospitalized. And while side effects in this study were mild—generally gastrointestinal issues, Weinberg says, and at comparable

rates in the treatment and placebo groups—safety issues might emerge when the drug is given more broadly, Shaw says. Meanwhile, hundreds of millions of people have already gotten the vaccines with no major consequences.

Still, the results of this study should be celebrated, Javaid says. "Saving eight lives is huge, as is halving hospitalization," he says. Perhaps another drug being studied will later prove to be more effective, reducing hospitalization by 80 or even 100 percent, he says. "But this is better than any oral antivirals we have right now, which is none," he says.

nationalgeographic.com, 2 October 2021

https://www.nationalgeographic.com

Glastonbury River was so full of MDMA and cocaine is could harm wildlife

2021-09-28

Festival attendees are being urged to change their urination habits after scientists found that damaging traces of drugs were making their way into nearby waterways.

Glastonbury Festival is one of the U.K.'s biggest and most popular music events, attracting more than 200,000 people in 2019.

That same year, scientists from Bangor University in Wales decided to investigate how the water quality of nearby rivers changed by measuring them before, during, and after the festival, both upstream and downstream of the festival site. Two waterways, the Whitelake and Redlake rivers, run by the site.

Often, illicit drugs make their way into music festivals, so the researchers decided to test for drug pollution into the local environment. Specifically, they tested for popular drugs such as cocaine, benzoylecgonine, and MDMA.

The Redlake measurements did not detect any significant changes. But the researchers found notable traces of all three drugs at the Whitelake site, and levels were significantly higher downstream of the festival than they were upstream of it.

The research team believes drug pollution is making its way into the water via festival-goers' public urination.

The research team believes drug pollution is making its way into the water via festival-goers' public urination.

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Levels of MDMA, in particular, were found to be high enough to be classed as harmful to aquatic life. Traces were found at levels 104 times greater downstream than upstream.

The same drug was found to have reached its highest level on the weekend after the festival, suggesting that it continues to leach from the festival site even after the event has concluded.

Cocaine, as well, was found at levels that are known to affect the lifecycle of European eels, a protected species, according to a Bangor University press release outlining the study.

The drug was found at levels 40 times higher downstream of the festival site than upstream.

Dan Aberg from the university's School of Natural Sciences took part in the study. He said in the press release that "illicit drug contamination from public urination happens at every music festival," but added that because Glastonbury is so close to a river, these drugs do not have time to degrade in the soil before they reach the water.

Christian Dunn, a zoology lecturer at Bangor who led the study, said the team's "main concern" was the environmental impact of the drugs and their potential to disrupt wildlife.

He said in the press release: "Education is essential for environmental issues, just as people have been made aware of the problems of plastic pollution, and Glastonbury have made great efforts to become plastic-free; we also need to raise awareness around drug and pharmaceutical waste—they are hidden yet potentially devastating pollutants."

The scientists say information on the harmful effects of public urination should be provided to attendees and that festival-goers should use official toilets provided by the organizers.

In a statement to Newsweek, Glastonbury's organizers said: "Protecting our local streams and wildlife is of paramount importance to us at Glastonbury Festival and we have a thorough and successful waterways sampling regime in place during each Festival, as agreed with the Environment Agency. There were no concerns raised by the Environment Agency following Glastonbury 2019.

"We are aware that the biggest threat to our waterways—and the wildlife for which they provide a habitat—comes from sestival-goers urinating on the land. This is something we have worked hard to reduce in recent

years through a number of campaigns, with measurable success. Peeing on the land is something we will continue to strongly discourage at future Festivals. We also do not condone the use of illegal drugs at Glastonbury.

"We are keen to see full details of this new research, and would be very happy to work with the researchers to understand their results and recommendations."

newsweek.com, 28 September 2021

https://www.newsweek.com

2020 babies may suffer up to seven times as many extreme heat waves at 1960s kids

2021-10-01

The kids are not all right. Children born in 2020 could live through seven times as many extreme heat waves as people born in 1960.

That's the projected generational disparity if global greenhouse gas emissions are curbed by the amount currently promised by the world's nations, climate scientist Wim Thiery of Vrije Universiteit Brussel in Belgium and colleagues report September 26 in Science. Under current pledges, Earth's average temperature is expected to increase by about 2.4 degrees Celsius relative to preindustrial times by 2100. While the older generation will experience an average of about four extreme heat waves during their lifetime, the younger generation could experience an average of about 30 such heat waves, the researchers say.

More stringent reductions that would limit warming to just 1.5 degrees C would shrink — but not erase — the disparity: Children born in 2020 could still experience four times as many extreme heat waves as people born in 1960.

Scientists have previously outlined how climate change has already amped up extreme weather events around the globe, and how those climate impacts are projected to increase as the world continues to warm (SN: 8/9/21). The new study is the first to specifically quantify how much more exposed younger generations will be to those events.

An average child born in 2020 also will experience two times as many wildfires, 2.8 times as many river floods, 2.6 times as many droughts and about three times as many crop failures as a child born 60 years earlier, under climate scenarios based on current pledges. That exposure to extreme events becomes even higher in certain parts of the world: In the

Under current pledges, Earth's average temperature is expected to increase by about 2.4 degrees Celsius relative to preindustrial times by 2100.

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Middle East, for example, 2020 children will see up to 10 times as many heat waves as the older cohort, the team found.

With this possible grim future in mind, student climate activists in the #FridaysforFuture movement have been among the most powerful voices of protest in recent years (SN: 12/16/19). Thiery and colleagues note that these findings come at a crucial time, as world leaders prepare to gather in Glasgow, Scotland, in late October for the 2021 United Nations Climate Change Conference to negotiate new pledges to reduce greenhouse gas emissions.

sciencenews.org, 1 October 2021

https://www.sciencenews.org

S'pore gov chatbot ends up telling people to wear condoms when they get COVID

2021-10-06

We all love an entertaining chatbot or two. They make use of machine learning in order to respond autonomously to human interactions. Some times their responses are spot-on, and at other times, they're just a hot mess.

But we love to see it – for shits and giggles, of course.

Ask Jamie, a chatbot used by Singapore's Ministry of Health (MOH), is like your average machine learning tool. It offers direct solutions to simple queries, whether COVID-19-related or not.

However, like all chatbots, our dear Jamie isn't perfect.

When a parent's child tested positive for COVID-19, they looked to Jamie for answers.

What they got in return can either be considered misguided advice, or a thinly-veiled (extremely savage) insult:

"My son tested COVID positive what should I do?" asks the parent.

"You should practice safe sex through the correct and consistent use of condoms, or abstinence, for at least the whole duration of your female partner's pregnancy," Jamie responds.

It's not verified whether the person's child actually tested positive for COVID-19, or whether they're even a parent in the first place. However, the

However, like all chatbots, our dear Jamie isn't perfect.

bizarre response given by Jamie has gotten social media users laughing their butts off, exposing the mild imperfections of the chatbot.

Other variations of the same question also generate the same response from Jamie, like switching 'son' with 'daughter' for example:

But it's not like Jamie doesn't do her job. In some cases, she comes back with the perfect recommended steps. It seems that the answer depends on how well you use your punctuation when posing a question. When done right, there are zero issues:

"Please reman calm and stay at your place of accommodation," Jamie says. "Necessary transport arrangements would be made to send you to the hospital."

See? Perfect.

One guess points to the machine learning technology associating detected words like 'son', 'daughter', and 'positive' with pregnancy.

Kind of makes sense if you really think about it.

Perhaps this serves as the perfect case study of the importance of punctuation and general grammar.

Social media users had a field day reacting to the little 'glitch' of sorts, with one Reddit user positing that Jamie is actually more intelligent than she seems, throwing savage insults at people who 'don't take good care' of their kids.

"I think Jamie wants you to go back to the past and use protection so you can't have a son instead.. That's next level machine learning lol," says Redditor u/beklog.

Another Reddit user makes a hilarious reference to Stanley Hudson (Leslie David Baker) from the hit TV series, The Office.

"You: 'Did you get my question wrong?'"

"Jamie: 'DID I STUTTER?'"

I read it in his burly voice too.

Look at this clip from The Office for reference:

With all the comical reactions to the little mishap, MOH has taken Jamie off their website, unfortunately.

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But if you're in Singapore, and you do have legit questions pertaining to COVID-19, you can visit this site instead.

sea.mashable.com, 6 October 2021

https://www.sea.mashable.com

California sets nation's strictest rules on recycling labels

2021-10-06

Californians will have a better idea of what's headed for landfills instead of recycling centers under one of several related bills that Gov. Gavin Newsom signed into law Tuesday. It sets the nation's strictest standards for which items can display the "chasing arrows" recycling symbol, advocates say. Consumers assume that the symbol showing three circular arrows means that items should go into curbside recycling bins, California's Statewide Commission on Recycling Markets and Curbside Recycling said earlier this year. It recommended that the symbol "be reserved for materials which are accepted in curbside bins and do not cause contamination." "It's dishonest, it's not fair to companies that have invested in actually making their products recyclable, and it's not fair to consumers who pay more for something that they think will be better for the environment," said Californians Against Waste Director of Advocacy Nick Lapis. Sorting materials that can't be recycled from bins increases garbage rates, he added. $2 for 2 months Subscribe for unlimited access to our website, app, eEdition and more CLAIM OFFER Opponents countered that the bill is so restrictive it could send more items to landfills. The state regulators' list showing what's recyclable could wind up including just eight types of paper materials, two forms of glass, two types of metals, two types of plastics and one type of colored plastic, predicted a coalition of 14 opposition organizations. The state Department of Resources Recycling and Recovery now has until Jan. 1, 2024, to publish a study on what is recyclable. The new law exempts products and packaging that is manufactured up to 18 months after the study is published. Several states have been trying to stem confusion about recycling after a Consumer Brands Association report recently found it contributed to "a broken recycling system in America." Newsom, a Democrat, also approved a bill strengthening rules for what can be used in compost to prevent contamination of the soil. It requires state regulators to approve labeling rules so consumers can tell what can be composted. Today's top headlines Sign up for the Daily Afternoon Bulletin and get a quick summary of the day's news. SIGN UP This site is protected by reCAPTCHA and the Google Privacy Policy and Terms of Service apply. The bill's author, Democratic

It sets the nation's strictest standards for which items can display the "chasing arrows" recycling symbol, advocates say.

Assemblyman Phil Ting, said some companies label items as useable for compost even though they contain harmful chemicals that make the compost unusable. "It shouldn't be a difficult concept: if it says 'recyclable,' that means you should be able to put it in the recycling bin, and if it says 'compostable,' you should be able to put it in the composting bin," Lapis said. "Somehow companies have decided that they can get away with marketing that that they know is deceptive because of the technicality that most things are theoretically recyclable or compostable." A third bill expands on an existing state law that allows restaurants to distribute single-use straws only upon request. It requires take-out places to give consumers single-use condiment packages like ketchup and mustard and utensils like knives, forks and spoons only if asked. They were among nine related bills signed by the governor, who also touted $270 million in the state budget to modernize and encourage recycling. He also signed a second Ting bill that will ban the use of so-called "forever chemicals" in food packaging starting Jan. 1, 2023, and by 2024 will require cookware manufacturers to disclose if hazardous materials are used in their products. Ting said PFAS, or perfluoroalkyl and polyfluoroalkyl substances, have been linked to cancer and thyroid disease and can disrupt hormones and vaccines. California joins Connecticut, Maine, Minnesota, New York, Vermont, and Washington in banning PFAS in food packaging. A different law signed by Newsom bars the chemicals in products intended for infants and children, such as cribs and playpens starting in July 1, 2023.

https://www.sacbee.com

A custom brain implant lifted a woman's severe depression

2021-10-04

A personalized brain implant eased the crushing symptoms of a woman's severe depression, allowing her to once again see the beauty of the world. "It's like my lens on the world changed," said Sarah, the research volunteer who requested to be identified by her first name only.

The technology, described October 4 in Nature Medicine, brings researchers closer to understanding how to detect and change brain activity in ultraprecise ways (SN: 2/10/19).

The device was bespoke; it was built specifically for Sarah's brain. The details of the new system may not work as a treatment for many other people, says Alik Widge, a psychiatrist and neural engineer at the University of Minnesota in Minneapolis. Still, the research is "a really

"It's like my lens on the world changed," said Sarah, the research volunteer who requested to be identified by her first name only.

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significant piece of work," he says, because it points out a way to study how brain activity goes awry in depression.

Researchers at the University of California, San Francisco implanted temporary thin wire electrodes into Sarah's brain. The 36-year-old woman had suffered from severe depression for years. These electrodes allowed researchers to monitor the brain activity that corresponded to Sarah's depression symptoms — a pattern that the researchers could use as a biomarker, a signpost of trouble to come. In Sarah's case, a particular sign emerged: a fast brain wave called a gamma wave in her amygdala, a brain structure known to be involved in emotions.

With this biomarker in hand, the researchers then figured out where to stimulate the brain to interrupt Sarah's distressing symptoms. A region called the ventral capsule/ventral striatum, or VC/VS, seemed to be the key. That's not surprising; previous research suggests the region is involved with feeling good and other emotions. When researchers applied tiny jolts of electrical current to this region, Sarah's mood improved. "We could learn the road map of Sarah's brain in a way that we could really improve her depression symptoms," Katherine Scangos of UCSF said in a Sept. 30 news briefing.

During this mapping phase of the experiment, Sarah felt joy when the right spot was stimulated. "I laughed out loud," she said in the briefing. "This was the first time I had spontaneously laughed and smiled where it wasn't faked or forced in five years."

Surgeons then implanted a more permanent device into Sarah's brain last June. Scientists programmed the device to detect when gamma signals were high in Sarah's amygdala, and respond with a tiny jolt to her VC/VS. This happened about 300 times a day. The stimulation was calibrated so Sarah didn't feel any zaps, but she said they left her feeling a little more energetic.

The research paper describes Sarah's improvements as the technology did its work in her head over two months; it's unclear how long the benefits might last, though she's now had the device implanted for over a year. "As time has gone on, it's been this virtuous cycle, a spiral upwards," Sarah said. "Everything has gotten easier and easier and easier."

The approach used by the UCSF researchers required a lot of sophisticated imaging and machine learning technology. That complexity may prevent it from being a wider treatment, cautions Helen Mayberg, a neurologist at Icahn School of Medicine at Mount Sinai in New York City.

Still, the results — which add to a variety of ways to detect and change problematic brain activity — contain valuable information about how depression takes hold of a brain, and how brain stimulation can change that, says Mayberg, whose research has helped build and refine the field of deep brain stimulation for mood disorders. "What we all want to know is, 'How does this work?'"

sciencenews.org, 4 October 2021

https://www.sciencenews.org

A blood test may help predict recovery from traumatic brain injury

2021-09-29

Elevated blood levels of a specific protein may help scientists predict who has a better chance of bouncing back from a traumatic brain injury.

The protein, called neurofilament light or NfL for short, lends structural support to axons, the tendrils that send messages between brain cells. Levels of NfL peak on average at 10 times the typical level 20 days after injury and stay above normal a year later, researchers report September 29 in Science Translational Medicine. The higher the peak NfL blood concentrations after injury, the tougher the recovery for people with TBI six and 12 months later, shows the study of 197 people treated at eight trauma centers across Europe for moderate to severe TBI.

Brain scans of 146 participants revealed that their peak NfL concentrations predicted the extent of brain shrinkage after six months, and axon damage at six and 12 months after injury, neurologist Neil Graham of Imperial College London and his colleagues found.

These researchers also had a unique opportunity to check that the blood biomarker, which gives indirect clues about the brain injury, actually measured what was happening in the brain. In 18 of the participants that needed brain surgery, researchers sampled the fluid surrounding injured neurons. NfL concentrations there correlated with NfL concentrations in the blood.

"The work shows that a new ultrasensitive blood test can be used to accurately diagnose traumatic brain injury," says Graham. "This blood test can predict quite precisely who's going to make a good recovery and who's going to have more difficulties."

Study participants were adults and mostly male, so more work needs to be done to determine if these findings apply to women, children and people with mild TBI.

Finding a reliable biomarker for the severity and outlook of TBI, a head injury that disrupts brain function, could improve millions of lives. Studies of U.S. football players have brought attention to the injury (SN: 12/13/17), but it's a far more widespread problem. Around 55 million people globally were living with a TBI in 2016, and there's no one-size-fits-all treatment.

"No two traumatic brain injuries are alike," says David Okonkwo, director of the Neurotrauma Clinical Trials Center at the University of Pittsburgh.

This blood test can predict quite precisely who's going to make a good recovery and who's going to have more difficulties."

Scientists have been looking for biomarkers of TBI injury such as NfL to develop injury-specific interventions, and Okonkwo says these new findings are promising for patients whose injury has damaged their axons.

"We have not had the tools to measure a specific injury type of an individual patient," Okonkwo says. While this test probably is still a few years from use in U.S. clinics, other large research groups are looking for ways to use NfL and other blood-based biomarkers for diagnosing TBI and creating opportunities for intervention.

sciencenews.org, 29 September 2021

https://www.sciencenews.org

Jane Goodall's survival guide

2021-10-04

Before the pandemic, Jane Goodall travelled three hundred days a year to speak to audiences about the climate crisis. "I used to do, like, three days in the Netherlands, three days in Belgium, three days in France," Goodall, who is eighty-seven, recalled recently. In China or Australia, "it would be, like, two weeks, where they'd spread me through their country." Everywhere she went, she met young people who were "angry, depressed, or just apathetic, because, they've told me, we have compromised their future and they feel there is nothing they can do about it," she writes in her twenty-first and most recent work, "The Book of Hope: A Survival Guide for Trying Times." Amid flooding and wildfires, impassivity and eco-grief, the question she was asked most often was "Do you honestly believe there is hope for our world?"

She does, and she'll tell you why. "The Book of Hope," which she wrote with Douglas Abrams and Gail Hudson, is structured like a dialogue in which the naturalist (Ph.D., D.B.E., U.N. Messenger of Peace) plays whack-a-mole with the darkest fears we hold for our ailing planet. Stories of the human intellect and indomitable spirit abound. Also, the resilience of nature and the power of young people. Hope, she argues, is not merely "passive wishful thinking" but a "crucial survival trait." She noted, "If you don't have hope that your action is going to make a difference, why bother to do anything? You just become a zombie."

Goodall was seated on a sofa in the drawing room of her childhood home, in Bournemouth, on the south coast of England. She had her hair in a ponytail and was wearing a Patagonia jacket with jeans, moccasins, and whale-print socks. Shuttered in the house since the outbreak began,

Amid flooding and wildfires, impassivity and eco-grief, the question she was asked most often was "Do you honestly believe there is hope for our world?"

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Goodall has adopted a relentless schedule of online engagements, Zooming to multiple countries each day. "Virtual Jane has been busier than ever," she said. "It's hurting my voice, my eyes." She has not taken a day off in a year and a half; she Zoomed twice on Christmas, launched a podcast called "The Hopecast," and, in May, accepted the Templeton Prize (previous recipients include Mother Teresa and the Dalai Lama). "But the pluses!" she said. "I've reached literally millions more people in many more countries. I was in Tanzania this morning, and then I was in the Netherlands for an interview. Or is it Belgium?"

Goodall was sharing the Gothic-style house (built in 1872) with her sister, Judy, Judy's daughter and grandchildren, and an aging rescue whippet named Bean. It's not the first time the family has taken refuge there. "It was my grandmother's," she said. "Mum and Judy and I came here when the war broke out. World War Two." In the garden, butterflies flitted by; Bean was asleep in an armchair. Growing up, there were always animals around, she said. Dogs, cats, "a couple of tortoises." "Peter the canary, who used to fly around the whole house. Hamlet the hamster, who escaped and spent the rest of her life in the back of the sofa, coming out at night for food."

In 1960, at the age of twenty-six, Goodall left England for Gombe National Park, in Tanzania, to study animals in the wild. She took her mother with her. ("Mum played a very important role.") It was in Gombe that Goodall almost lost hope. She was up at dawn every morning, crawling through the forest with binoculars, looking for chimps. She would return to camp unsuccessful and depressed. Finally, a chimpanzee she called David Greybeard ("very handsome") let her observe him using grass stems to collect termites, the report of which prompted Goodall's mentor to send an exuberant telegram: "Ah! We must now redefine man, redefine tools, or accept chimpanzees as human!"

In the drawing room, Goodall checked the time: fifteen minutes until she needed to record a message for French university students. She poured herself a drop of whiskey. "When my voice goes like this, it's the only thing that works," she said. (It was a lifesaver when she had bronchitis at Davos.) Did she ever get tired? "I care about the future, I care about animals, I care about trees, I care about children," she said. "And I'm obstinate and I won't give in. I won't be defeated by the Bushes, and the Putins, and the Bolsonaros, all these terrible, terrible people."

Lately, Goodall has been working from an attic bedroom surrounded by objects that give her hope: a photograph of David Greybeard, a Native American talking stick, a bell made from a defused land mine. She climbed

the stairs slowly, held up the bell, and rang it. "Special," she said. She checked the time again. The French students beckoned. ♦

newyorker.com, 4 October 2021

https://www.newyorker.com

How COVID-19 can damage all five senses

2021-09-29

Considering how sick he was, Michael Goldsmith seemed like one of the lucky ones, because he survived. After becoming severely ill with COVID-19 in March 2020, he spent 22 days on a ventilator in the ICU. Fortunately, Goldsmith's condition improved, and he was moved to an intermediate level of care in the hospital as he recovered. That's when he began to realize he had lost most of his hearing in his left ear.

"Anything I did hear had to be loud, and then it sounded like Charlie Brown's teacher," says Goldsmith, now 35, referencing the nonsensical noises the teacher made in the popular cartoon show.

He also had a static sound in that ear that turned out to be tinnitus. After he fully recovered from the infection and went back to his home in Bergenfield, New Jersey, the IT security analyst and father of two saw one doctor after another, seeking relief for his hearing problems. He tried several different prescription medicines, and still he was no better off.

It's easy to take our senses for granted—until there's a problem with one of them. This is something many people who suffered from COVID-19 discovered when they unexpectedly lost their senses of smell and taste. More recently, though, it has become apparent that a COVID-19 infection can also affect sight, hearing, and touch.

In the short term and the long run, this virus can affect all the ways we perceive and interact with the world.

Though not life-threatening, "it's disarming to lose any of these senses, especially as suddenly as happens in the context of this infection," says Jennifer Frontera, a professor of neurology at the NYU Grossman School of Medicine.

Diminished hearing

Like Goldsmith, many people who recovered from COVID-19 continued to experience some auditory loss. In the March issue of the International Journal of Audiology, researchers reviewed published case studies and

That's when he began to realize he had lost most of his hearing in his left ear.

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other reports of COVID-19 symptoms, and they estimate that hearing loss has occurred in about 8 percent of patients who had COVID, while about 15 percent developed tinnitus.

The mechanisms aren't completely understood, but experts suspect the disease may affect the eustachian tube, which connects the middle ear with the throat. "With any viral infection, you can have eustachian tube dysfunction, which can lead to fluid build-up in the middle ear—this acts as a mechanical dampener on the ear drum," explains Elias Michaelides, an associate professor of otolaryngology at Rush University Medical Center in Chicago.

Once someone recovers from the illness, the eustachian tube drains and hearing returns to normal in most cases, though it can take a couple of weeks, he says. In the meantime, taking an oral decongestant and using a nasal steroid spray may help hasten drainage, says Michaelides.

But if the virus damages the sensory neurons in the inner ear or cochlea, sudden hearing loss may occur, and it may be permanent. Exactly how this nerve damage happens isn't clear, though it may have to do with COVID-19's ability to trigger a cascade of inflammatory effects and small blood vessel damage.

Because Goldsmith's hearing didn't improve in his left ear after he fully recovered and tried various prescription medications, he went to see J. Thomas Roland, Jr., chair of the department of otolaryngology-head and neck surgery at NYU Langone Health. Roland told him he was a good candidate for a cochlear implant, a small electronic device that can directly stimulate the auditory nerve and generate signals that the brain registers as sound.

"The inner ear is a very delicate organ and very susceptible to microvascular problems and inflammation, so I'm not surprised people have experienced hearing loss or tinnitus related to COVID," says Roland.

In September 2020, Goldsmith had a cochlear implant surgically placed in his left ear. It has made a world of difference, he says. "I now have 80 percent recognition of single words, and it's even higher with full sentences in my left ear." And when the device is on, his tinnitus disappears completely. "I wish I didn't need this," Goldsmith says, "but I'm glad I had it."

Blurred sight

Other people who've had COVID-19 have reported problems with their vision. A study published last year in BMJ Open Ophthalmology found

that light sensitivity, sore eyes, and blurred vision are among the more common eye disorders experienced by patients. And in a study involving 400 COVID-19 patients who were hospitalized, researchers found that 10 percent had eye disorders, including conjunctivitis, vision changes, and eye irritation.

"There is definitely a viral load in the eye that causes symptoms, but that doesn't mean it necessarily causes long-term diseases in the eye," says study co-author Shahzad I. Mian, a professor of ophthalmology and visual sciences at the University of Michigan Medical School.

Still, some doctors are finding that the SARS-CoV-2 virus can increase the risk of blood clots throughout the body, including in blood vessels in the retina, which can cause blurry vision or some degree of vision loss, explains Julia A. Haller, ophthalmologist-in-chief at the Wills Eye Hospital in Philadelphia.

If someone experiences any vision changes possibly related to COVID-19, it's important for them to see an ophthalmologist as soon as possible, the experts say. "Some forms of vision loss are treatable with medications, depending on how much damage has occurred," Haller says.

Tingling and numbness

A person's sense of touch also can be affected by a COVID-19 infection, since the disease has been shown to cause persistent neurologic symptoms.

In a study published in May 2021, researchers evaluated 100 people who weren't hospitalized for COVID-19 but had ongoing symptoms. They found that 60 percent had numbness and tingling six to nine months after the onset of their illness. Sometimes these symptoms were widespread throughout the body; in other instances, they were localized to the hands and feet.

The exact mechanisms behind these stubborn symptoms aren't well understood, but they most likely relate to local inflammation and local infection with COVID-19 virus in the nerves, explains Igor Koralnik, a professor of neurology at the Northwestern Feinberg School of Medicine and chief of the division of neuroinfectious diseases and global neurology at Northwestern Memorial Hospital in Chicago.

"In most cases, [the numbness and tingling] improves over time," he says. "Everybody goes at their own pace." And in some cases, tingling and other

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symptoms of neuropathy can be treated with medications like gabapentin, a drug that is used to prevent seizures and relieve nerve pain.

Loss of smell and taste

Perhaps the most recognizable effect COVID-19 has on the senses is the one-two punch of lost smell and taste. Elizabeth DeFranco, a medical sales rep in Cleveland, Ohio, experienced both sensory changes shortly after developing a mild COVID-19 infection in June 2020.

"I was eating salt and vinegar potato chips, and I couldn't taste anything," recalls DeFranco, 58. Then she realized she couldn't smell anything, either. These losses remain with her to this day, though once in a while she gets a brief whiff of an odor like freshly cut grass.

Viral-induced smell loss existed before anyone had ever heard of COVID-19, but the percentage of people who experience smell dysfunction or loss is much higher with this virus than with other types of infections, experts say. A review of studies published in 2020 found that of 8,000 subjects with confirmed COVID-19, 41 percent experienced problems with smell and 38 percent reported problems with taste. When people who contract COVID-19 lose their sense of smell, a condition called anosmia, they lose it across the board, not just with one type of scent.

Generally speaking, there are two major types of smell loss. Conductive smell loss can occur when nasal congestion or obstruction prevents odor molecules from passing into the nasal cavity. Sensorineural smell loss involves damage or dysfunction to the olfactory neurons, which seems to be what's happening with COVID-19.

"With COVID-19, most people don't have a lot of nasal symptoms, and yet smell loss can be fairly severe," says Justin Turner, an associate professor of otolaryngology-head and neck surgery at Vanderbilt University Medical Center and director of the Vanderbilt Smell and Taste Center. "We believe this stems from damage to sustentacular cells that live way up in the nose and are particularly susceptible to infection by the virus."

As people recover from COVID-19, regenerating cells can spring into action and make new functional neurons, Turner explains. This allows most people to regain their sense of smell six to eight weeks after infection—but not everyone does. At that point, doctors may prescribe systemic or topical steroids and sometimes smell conditioning, which involves repeated exposure to essential oils that have different scents. It's like the olfactory equivalent of physical therapy.

"What you're doing is exposing the olfactory system to these odorants and helping the brain form new connections," Turner explains. "Once the damage [to neurons] has been done, we're relying on regenerative capacity in the olfactory system to help people regain their sense of smell."

Losing the sense of taste usually goes hand in hand with the loss of smell, says Michael Benninger, professor and chair of the department of otolaryngology-head and neck surgery at the Cleveland Clinic Lerner College of Medicine.

"We are not seeing people who have truly lost their sense of taste [with COVID-19 infection]. When people lose their sense of smell, their taste is diminished"—meaning, their ability to discriminate between different flavors is lost. "If the sense of smell comes back, taste comes back, too," Benninger says.

Since she recovered from COVID-19, DeFranco has tried numerous interventions—including steroid medications, antibiotics, cryotherapy, craniosacral therapy, supplements, homeopathic remedies, and smell retraining. Nothing has helped. So she has found ways to work around these limitations to protect her safety. She installed additional smoke detectors in her home because she wouldn't be able to smell smoke. She throws all her food out by the "best by" date and often has a neighbor smell food from her fridge to make sure it hasn't spoiled.

The worst part: "It is very depressing to think that this anosmia could be forever. I have no enjoyment of food," she says. "I may never be able to appreciate the taste of wine or chocolate or the smell of a barbecue or cookies baking in the oven or the salt in the air when I go to the ocean. No one can really empathize unless it happens to them."

nationalgeographic.com, 29 September 2021

https://www.nationalgeographic.com

People have long claimed to hear the northern lights. Are the reports true?

2021-10-06

It's a question that has puzzled observers for centuries: do the fantastic green and crimson light displays of the aurora borealis produce any discernible sound?

Conjured by the interaction of solar particles with gas molecules in Earth's atmosphere, the aurora generally occurs near Earth's poles, where the magnetic field is strongest. Reports of the aurora making a noise, however, are rare — and were historically dismissed by scientists.

A recording made by one of the researchers involved in the study even claimed to have captured the sound made by the captivating lights 70 meters above ground level.

But a Finnish study in 2016 claimed to have finally confirmed that the northern lights really do produce sound audible to the human ear. A recording made by one of the researchers involved in the study even claimed to have captured the sound made by the captivating lights 70 meters above ground level.

Still, the mechanism behind the sound remains somewhat mysterious, as are the conditions that must be met for the sound to be heard. My recent research takes a look over historic reports of auroral sound to understand the methods of investigating this elusive phenomenon and the process of establishing whether reported sounds were objective, illusory or imaginary.

Historic claims

Auroral noise was the subject of particularly lively debate in the first decades of the 20th century, when accounts from settlements across northern latitudes reported that sound sometimes accompanied the mesmerizing light displays in their skies.

Witnesses told of a quiet, almost imperceptible crackling, whooshing or whizzing noise during particularly violent northern lights displays. In the early 1930s, for instance, personal testimonies started flooding into The Shetland News, the weekly newspaper of the subarctic Shetland Islands, likening the sound of the northern lights to "rustling silk" or "two planks meeting flat ways."

These tales were corroborated by similar testimony from northern Canada and Norway. Yet the scientific community was less than convinced, especially considering very few western explorers claimed to have heard the elusive noises themselves.

The credibility of auroral noise reports from this time was intimately tied to altitude measurements of the northern lights. It was considered that only those displays that descended low into the Earth's atmosphere would be able to transmit sound which could be heard by the human ear.

The problem here was that results recorded during the Second International Polar Year of 1932-3 found aurorae most commonly took place 100 km above Earth, and very rarely below 80 km. This suggested it would be impossible for discernible sound from the lights to be transmitted to the Earth's surface.

Auditory illusions?

Given these findings, eminent physicists and meteorologists remained skeptical, dismissing accounts of auroral sound and very low aurorae as folkloric stories or auditory illusions.

Sir Oliver Lodge, the British physicist involved in the development of radio technology, commented that auroral sound might be a psychological phenomenon due to the vividness of the aurora's appearance — just as meteors sometimes conjure a whooshing sound in the brain. Similarly, the meteorologist George Clark Simpson argued that the appearance of low aurorae was likely an optical illusion caused by the interference of low clouds.

Nevertheless, the leading auroral scientist of the 20th century, Carl Størmer, published accounts written by two of his assistants who claimed to have heard the aurora, adding some legitimacy to the large volume of personal reports.

Størmer's assistant Hans Jelstrup said he had heard a "very curious faint whistling sound, distinctly undulatory, which seemed to follow exactly the vibrations of the aurora," while Mr Tjönn experienced a sound like "burning grass or spray." As convincing as these two last testimonies may have been, they still didn't propose a mechanism by which auroral sound could operate.PLAY SOUND

Sound and light

The answer to this enduring mystery which has subsequently garnered the most support was first tentatively suggested in 1923 by Clarence Chant, a well-known Canadian astronomer. He argued that the motion of the northern lights alters Earth's magnetic field, inducing changes in the electrification of the atmosphere, even at a significant distance.

This electrification produces a crackling sound much closer to Earth's surface when it meets objects on the ground, much like the sound of static. This could take place on the observer's clothes or spectacles, or possibly in surrounding objects including fir trees or the cladding of buildings.

Chant's theory correlates well with many accounts of auroral sound, and is also supported by occasional reports of the smell of ozone — which reportedly carries a metallic odor similar to an electrical spark — during northern lights displays.

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Yet Chant's paper went largely unnoticed in the 1920s, only receiving recognition in the 1970s when two auroral physicists revisited the historical evidence. Chant's theory is largely accepted by scientists today, although there's still debate as to how exactly the mechanism for producing the sound operates.

What is clear is that the aurora does, on rare occasions, make sounds audible to the human ear. The eerie reports of crackling, whizzing and buzzing noises accompanying the lights describe an objective audible experience — not something illusory or imagined.

Sampling the sound

If you want to hear the northern lights for yourself, you may have to spend a considerable amount of time in the Polar regions, considering the aural phenomenon only presents itself in 5% of violent auroral displays. It's also most commonly heard on the top of mountains, surrounded by only a few buildings — so it's not an especially accessible experience.

In recent years, the sound of the aurora has nonetheless been explored for its aesthetic value, inspiring musical compositions and laying the foundation for novel ways of interacting with its electromagnetic signals.

The Latvian composer Ēriks Ešenvalds has used journal extracts from the American explorer Charles Hall and the Norwegian statesman Fridjtof Nansen, both of whom claimed to have heard the northern lights, in his music. His composition, Northern Lights, interweaves these reports with the only known Latvian folksong recounting the auroral sound phenomenon, sung by a tenor solo.

Or you can also listen to the radio signals of the northern lights at home. In 2020, a BBC 3 radio program remapped very low frequency radio recordings of the aurora onto the audible spectrum. Although not the same as perceiving audible noises produced by the northern lights in person on a snowy mountaintop, these radio frequencies give an awesome sense of the aurora's transitory, fleeting and dynamic nature.

Body of article

livescience.com, 6 October 2021

https://www.livescience.com

Discovering how we sense temperature and touch wins the 2021 medicine Nobel Prize

2021-10-04

Some touching research took the 2021 Nobel Prize in physiology or medicine. David Julius of the University of California, San Francisco and Ardem Patapoutian of the Scripps Research Institute in La Jolla, Calif., were awarded the prize October 4 for their research to identify sensors on nerve cells that detect heat, cold and pressure.

The laureates discovered proteins called receptors that turn the burning heat from chili peppers or a hot stove, menthol's cooling sensation or the pressure from a hug into nerve signals that can be sent to the brain. Those proteins are crucial to the sense of touch and for feeling pain.

Recognizing basic research on touch is important because "it's such an elemental function of the nervous system, which is how we react with our environment," says Walter Koroshetz, director of the U.S. National Institute of Neurological Diseases and Stroke in Bethesda, Md.

The temperature sensors warn of danger from fire or extreme cold, said Abdel El Manira, a neuroscientist and a member of the Nobel Assembly of the Karolinska Institute, which awards the physiology or medicine prize.

Touch receptors are important for feeling where our body parts are in space. "Without them, we would not be able to stand. We would not be able to touch or feel our surroundings," El Manira said. "Over the last year, we've been social distancing from one another. We have missed the sense of touch, the sense of the warmth we get from one another like during a hug."

Despite its importance, "touch is perhaps the sense that people take mostly for granted," Patapoutian said during a news conference.

Scientists had been searching for touch and temperature receptors for many years before Julius and Patapoutian began their work, Koroshetz said. "Everybody knew [the receptors] were there, but nobody could find them," he says. Then the two laureates came up with some clever ways to probe for the elusive proteins.

Julius, a biochemist and molecular physiologist and Howard Hughes Medical Institute trustee, used capsaicin, the compound that gives chili peppers their heat, to discover receptor proteins that allow people to feel chili's burn. At the time, he didn't know that the receptor, TRPV1, also

"Over the last year, we've been social distancing from one another. We have missed the sense of touch, the sense of the warmth we get from one another like during a hug."

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responds to heat, he said during a news conference. That discovery came later.

"Some of the great advances … in medicine started off with people just following their curiosity, without knowing in advance that they could one day be useful," Julius said.

The protein is an ion channel, a type of molecular gate nestled in a cell's membrane that opens or closes to control the flow of charged atoms or molecules into or out of the cell. In this case, when TRPV1 encounters capsaicin or heat, it opens, allowing charged calcium ions into the cell. That flood of calcium triggers electrical signals that are sent to the brain to warn of hot stuff.

Exactly how small changes in the protein's shape allow it to communicate to the brain small differences in temperature, such as sensing when a room gets a few degrees warmer than usual, is still a mystery that Julius hopes to solve, he said.

Julius used the winter-fresh compound menthol to uncover TRPM8, a cold-sensing receptor protein (SN: 2/13/02). Working independently, Patapoutian, a neuroscientist and a Howard Hughes Medical Institute investigator, simultaneously discovered that receptor.

After spending about a year poking nerve cells in lab dishes, Patapoutian also discovered a receptor protein, PIEZO1, that opens in response to mechanical pressure. That protein, named after the Greek word for pressure, and another called PIEZO2 allow people to feel touch (SN: 12/4/14).

PIEZO2 is the receptor on nerve cells in the skin called Merkel cells that sense light touches and caresses (SN: 6/18/09). It also helps nerves in the lungs keep the organs from overinflating and is important for bladder and bowel functions (SN: 12/21/16). Children who lack PIEZO2 have balance problems and can't feel where their limbs are, Koroshetz says. "They have to look to see where their fingers are when they reach out to grab something." Abnormal pressure sensing may contribute to glaucoma and high blood pressure, too. PIEZO1 also is involved in regulating iron levels in the blood.

Touch and temperature receptors may also be involved in processing pain. But despite the potential for drug development, pharmaceutical companies have struggled to develop new treatments using these channels, says Gary Lewin, whose lab at the Max Delbrück Center for

Molecular Medicine in Berlin studies the molecular physiology of somatic sensation.

A major stumbling block comes from the fact that drugs targeting TRPV1, the receptor involved in sensing heat, tend to induce fever. Other closely related receptors may be more promising, says Lewin. "Both discoveries really boosted the field of pain research. But we're really at the beginning — there's a huge amount still to be discovered." Treatments based on these receptors could provide an alternative to addictive pain medication, like opioids.

Because the touch receptors are involved in so many body processes, treatments aimed at them will need to be localized, such as with skin patches or delivering medication directly to the affected organ, Patapoutian said.

Julius and Patapoutian will split the prize of 10 million Swedish kronor, or more than $1.1 million.

Unlisted numbers and cell phones set on mute meant the Nobel committee had to track down the winners through relatives. Julius learned of the award through a sister-in-law. Patapoutian got a call from his 94-year-old father relaying the message. "I guess even if you have 'do not disturb' [on], people in your favorites can still call you," he said. "It ended up being a very special moment."

sciencenews.org, 4 October 2021

https://www.sciencenews.org

Hundreds of three-eyed 'dinosaur-shrimp' emerge after Arizona monsoon

2021-10-06

Following a torrential summer downpour in northern Arizona, hundreds of bizarre, prehistoric-looking critters emerged from tiny eggs and began swimming around a temporary lake on the desert landscape, according to officials at Wupatki National Monument.

These tadpole-size creatures, called Triops "look like little mini-horseshoe crabs with three eyes," Lauren Carter, lead interpretation ranger at Wupatki National Monument, told Live Science. Their eggs can lie dormant for decades in the desert until enough rainfall falls to create lakes that provide real estate and time for the hatchlings to mature and lay eggs for the next generation, according to Central Michigan University.

Following a monsoon in late July, "We knew that there was water in the ball court, but we weren't expecting anything living in it," Carter said.

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Triops' appearances are so uncommon, that when tourists reported seeing them at a temporary, rain-filled lake within the monument's ceremonial ball court — a circular walled structure 105 feet (32 meters) across — the monument's staff weren't sure what to make of the critters.

Following a monsoon in late July, "We knew that there was water in the ball court, but we weren't expecting anything living in it," Carter said. "Then a visitor came up and said, 'Hey, you have tadpoles down in your ballcourt.'"

At first, Carter wondered if toads, which live in underground burrows during the dry season, had emerged during the wet spell to lay eggs. To investigate, she went to the ballcourt, which was originally built by the Indigenous people at Wupatki.

"I just scooped it up with my hand and looked at it and was like 'What is that?' I had no idea," Carter said. But then, she felt an inkling of familiarity; Carter had previously worked at Petrified Forest National Park in northeastern Arizona, and recalled reports of Triops there. "And then I had to look it up," she said.

Three-eyed crustacean

Triops — which is Greek for "three eyes" — are sometimes called "dinosaur shrimp" because of their long evolutionary history; the ancestors of these crustaceans evolved during the Devonian period (419 million to 359 million years ago), and their appearance has changed very little since then, according to Central Michigan University. (Of note, the dinosaurs didn't emerge until much later, during the Triassic period, which began about 252 million years ago.)

However, Triops aren't exactly the same as their ancestors, so they wouldn't be considered "living fossils."

"I don't like the term 'living fossil' because it causes a misunderstanding with the public that they haven't changed at all," Carter said. "But they have changed, they have evolved. It's just that the outward appearance of them is very similar to what they were millions of years ago."

There are two genuses in the family Triopsidae — Triops and Lepidurus — that together include up to 12 species, Central Michigan University reported. The critters found at the Wupatki ball court could be Triops longicaudatus, a species found in short-lived freshwater ponds, known as vernal pools, in North, Central and South America, but a scientific analysis is needed to confirm it, Carter said.

After hatching, Triops can grow up to 1.5 inches (4 centimeters) long, with a shield-like carapace that looks like a miniature helmet, according to Central Michigan University. Their eyes make them look angry and wise at the same time — they have two large, black-rimmed compound eyes (like those of a dragonfly or bee) and a small ocellus, or simple eye, between them. Ocellus eyes are common among arthropods (a group that includes insects, crustaceans and arachnids), which are filled with simple photoreceptors that help these creatures detect light, according to the Amateur Entomologists' Society.

In this case, the Triops at Wupatki National Monument got lucky with a short but intense rainy spell. Usually, Wupatki gets around 9 inches (22.9 cm) of rain a year, Carter said. In 2020, Wupatki had its driest lowest monsoon summer on record, with just 4 inches (10.2 cm) of rain, Carter said. But in the last week and a half of July 2021, the region got a tumult of rain: nearly 5 inches (12.7 cm).

During that time, the Triops' eggs hatched and, within hours, the little critters likely began filter feeding, according to a life cycle description at Central Michigan University. Like other crustaceans, they went through several molts before fully maturing in just over a week.

Triops males and females typically pair up to mate by sexual reproduction, but in times of scarcity, they have other means; these crustaceans are also hermaphrodites, meaning they have both male and female sex organs, and parthenogenetic, meaning females can produce offspring from unfertilized eggs, according to BioKids, a partnership between the University of Michigan School of Education, University of Michigan Museum of Zoology and the Detroit Public Schools.

Triops can live up to 90 days, but the pond at the ball court lasted just three to four weeks, Carter said. Almost immediately, local birds took notice, with ravens and common nighthawks swooping down into the water to gobble up the critters, she noted.

It's unknown how many Triops managed to lay eggs before the lake dried up. Rangers will have to wait for the next monsoon to find out.

Editor's note: This story was corrected at 2:22 p.m. EDT to note that Triops means "three eyes" in Greek, not Latin, as was previously stated. It was updated at 9:32 a.m. EDT Oct. 6 to clarify that the rainfall measurements were for Wupatki, not Flagstaff, Arizona.

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Originally published on Live Science.

livescience.com, 6 October 2021

https://www.livescience.com

It's getting hot in here, scientists warn

2021-10-04

Since the 1980s, the number of people in urban areas exposed to extreme heat events has skyrocketed, tripling between 1983 and 2016.

Scientists warned in a new study published Monday that urban population growth paired with warmer temperatures due to climate change have contributed to increasing numbers of people experiencing extreme heat, the number one weather-related cause of death in the U.S.

The researchers wrote in the Proceedings of the National Academy of Sciences that the problem of urban heat is even worse than we thought because earlier studies underestimated extreme heat exposure, particularly in areas experiencing rapid population growth.

Using thermal infrared satellite data combined with daily temperature measurements on the ground, the researchers identified extreme heat events — meaning a wet-bulb temperature of 86 degrees Fahrenheit or more — in 13,115 cities around the world. The scientists then counted "person-days" of heat, meaning the number of days of extreme heat multiplied by the number of people in cities who experienced it. While 1983 saw 40 billion person-days of heat per year, 2016 had 119 billion, a 200 percent increase.

While 1983 saw 40 billion person-days of heat per year, 2016 had 119 billion, a 200 percent increase.

The researchers also found that in 2016, 1.7 billion people, making up 23 percent of the global population, had seen higher levels of urban heat exposure that year. They attributed one-third of the increase in heat exposure to increased temperatures caused by climate change, but most of the growth is because more people are moving to urban areas.

Heat in cities is particularly dangerous because of the heat island effect, where pavement, buildings, and other infrastructure absorb and emit heat from the sun. Lack of greenery in cities contributes to this effect. In the wake of a deadly, historic heat wave this summer in the Pacific Northwest, the White House in September launched an all-of-government effort to reduce the number of deaths from extreme heat. Six federal agencies will collaborate to protect workers, children, seniors, and at-risk communities.

While there are solutions for urban heat — such as building green roofs and planting trees and vegetation — the problem of global warming will only continue to get worse unless we take drastic action to cut global carbon emissions that cause rising temperatures. A recent climate report from the United Nations, which the U.N. secretary-general called a "code red for humanity," warned that extreme heat events that once happened every 50 years are five times more common at current warming levels. And as warming levels rise, so will the frequency of deadly extreme heat events.

rollingstone.com, 4 October 2021

https://www.rollingstone.com

Tardigrade trapped in amber is a never-before-seen species

2021-10-06

Scientists discovered an incredibly rare fossil suspended in 16 million-year-old amber: a never-before-seen species of tardigrade, a pudgy, aquatic critter that rarely crops up in the fossil record.

Modern-day tardigrades, also known as water bears or moss piglets, can be found in just about any environment with liquid water, from the depths of the ocean to the thin water films that coat terrestrial mosses. The tiny creatures are famous for their survival skills; by expelling most water from their bodies and drastically slowing their metabolism, tardigrades enter a state akin to suspended animation in which they can withstand extreme temperatures, pressure and radiation.

But although tardigrades are nearly impossible to destroy when alive, their small size and lack of hard tissue mean that very few tardigrade fossils have ever been discovered — only three, to be exact. The species of two of these fossils, found in Canada and New Jersey, have been formally named; the other, found in West Siberia, remains unnamed. PLAY SOUND

But now, in a new study published Tuesday (Oct. 5) in the journal Proceedings of the Royal Society B: Biological Sciences, scientists have introduced a newfound species of tardigrade that they discovered in amber from the Dominican Republic. The fossil dates to the Miocene epoch (23 million to 5.3 million years ago) and is so well preserved that the team was able to place the newfound water bear, named Paradoryphoribius chronocaribbeus, within the tardigrade "tree of life."

"There's really only two clear tardigrades from the fossil record," referencing the two fossils whose species are known, "so this is really exciting to find a third," said Frank Smith, an evolutionary developmental biologist and assistant professor at the University of North Florida who was not involved in the new study.

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"There's really only two clear tardigrades from the fossil record," referencing the two fossils whose species are known, "so this is really exciting to find a third," said Frank Smith, an evolutionary developmental biologist and assistant professor at the University of North Florida who was not involved in the new study. And thanks to the quality of the fossil, the researchers were able to apply the same techniques used to identify living tardigrades, which helped the team determine how the newfound species relates to modern-day water bears, Smith said.

The tardigrade measures less than 0.02 inches (0.6 millimeters) long, so how did the researchers spot it? It was really a matter of luck, first author Marc Mapalo, a doctoral student in the Department of Organismic and Evolutionary Biology at Harvard University, told Live Science.

Mapalo's collaborators at the New Jersey Institute of Technology initially acquired the amber to look for ants captured in the material; the team, led by evolutionary biologist Phillip Barden, studies the evolution of social insects such as ants and termites.

"They'd had the amber for months, but they'd only been looking at ants," Mapalo said. But at some point, a sharp-eyed lab member noticed a stumpy, caterpillar-like shape with teeny, clawed legs jutting out of its underside. Lo and behold, they'd found a tardigrade floating in the amber, alongside three ants, a beetle and a flower.

"It was more luck that they saw it … because it's not something they look for," Mapalo said. Upon learning about the fossil, Mapalo said he was "really surprised," since the chances of finding a tardigrade fossil are so slim. As someone who loves water bears so much that he once wrote a song about them, he was eager to examine one of the few known tardigrade fossils.

In addition to finding the fossil, the team lucked out in that the tardigrade sat fairly close to the surface of the amber, meaning that light from their microscopes could easily reach the sample. Using techniques called transmitted light and confocal fluorescence microscopy, the researchers examined both the external anatomy, such as the tardigrade's claws, and some internal morphology, including various hard structures found in the critter's foregut — roughly akin to its "throat."

"This is the first tardigrade fossil where we were able to visualize the internal morphology," Mapalo said.

Based on the shape and placement of the tardigrade's claws, the researchers identified the water bear as part of the Isohypsibioidea

superfamily, a diverse group of modern-day tardigrades. This makes P. chronocaribbeus the oldest known member of the superfamily.

However, aspects of the water bear's internal anatomy set it apart from related tardigrades. In particular, a hard structure located between the mouth and esophagus, called a macroplacoid, bore a unique shape; whereas other Isohypsibioidea members have two to three thick macroplacoids, the new tardigrade fossil had only a single thin one, marked with a ridge.

"Because of this, it does not correspond to any extant genus within this superfamily," Mapalo said. And for this reason, the team created a brand-new genus and species to accommodate P. chronocaribbeus.

In its heyday, P. chronocaribbeus probably lived in similar conditions to modern-day water bears, hanging out on moss cushions and slurping liquid from plant cells, Smith said. "If we went back 16 million years to this locale, we'd probably find this species all over the place." And in theory, more tardigrade fossils might be lurking in Dominican amber from the same region, as well as in other amber deposits around the world, he said.

As of now, very few people are on the lookout for tardigrade fossils in amber, so if more scientists joined the hunt, more tardigrade fossils might be found, Mapalo said.

To the naked eye, "I don't even know if it'd look like a speck of dust; you probably wouldn't see it at all," Smith said. So to spot the pudgy sea critters, scientists would need to carefully inspect all their amber samples under a microscope. But generally speaking, "if you find amber, more than likely, there were tardigrades living somewhere near the tree that was producing that amber … So it's worth looking in any amber sample for tardigrades," he said.

Until more tardigrade fossils are found, Mapalo plans to study the genetic and molecular mechanisms that drive growth and development in living tardigrades. Currently, he's visiting Smith's lab in Florida to study how tardigrade claws develop; this line of research could help reveal what forces drove tardigrade evolution, causing tardigrades to adopt the familiar, plump body plan we now know and love.

In addition, Mapalo wants to study the first fossil tardigrade ever found, which happens to be housed at Harvard. The fossil, identified as the species Beorn leggi, was found in 1964 near Cedar Lake in Manitoba and is about 78 million years old, meaning it dates to the Upper Cretaceous, the

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authors noted in their report. Because high-resolution imaging techniques were not available at the time, however, the water bear's exact relationship to modern-day species has yet to be determined.

Originally published on Live Science.

livescience.com, 6 October 2021

https://www.livescience.com

The controversial quest to make cow burps less noxious

2021-10-04

It's an oppressively hot morning in the barnyard, even in the shade of the long open-air structure where the cows come to feed. On a typical farm, they would gather around a trough, but here at UC Davis they chow from special blue bins, which detect when and how much each one eats. It's like Weight Watchers, only researchers here aren't so much interested in these cows' figures, but how much they burp.

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realclearscience.com, 4 October 2021

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Why do so many people have back pain?

2021-10-04

Back pain is incredibly common, with 26% of Americans reporting at least one full day of lower-back pain within a three-month period, according to a 2006 study in the journal Spine. It's also the leading cause of disability across the globe, according to a 2014 study in the journal Annals of the Rheumatic Diseases.

So why do humans have so much back pain?

"Because we walk on two legs," said Jeremy DeSilva, a paleoanthropologist at Dartmouth University. Before humans began walking upright, our mammal ancestors had been running around on four legs for tens of millions, or even hundreds of millions, of years, he told Live Science. Mammals with this body shape have a horizontal spine that acts as a suspension bridge, holding up their torso.PLAY SOUND

About 7 million years ago, human ancestors evolved a more upright posture, DeSilva said. Their spine became vertical, allowing them to

It's like Weight Watchers, only researchers here aren't so much interested in these cows' figures, but how much they burp.

move around on two feet. Experts don't agree on why humans evolved to become bipedal, but one of the major theories is that it helped to transition from the jungles to the savanna. Although this adaptation helped humans flourish, it came with some costs.

"Because evolution can only work with pre-existing anatomies and pre-existing forms, we have this spine that evolution has tinkered with," DeSilva said. "And it's made it good enough. I mean, we're still here. But it doesn't mean we don't have problems. Evolution leads to being just good enough to survive. It doesn't lead to your comfort."

Bruce Latimer, a physical anthropologist at Case Western Reserve University in Ohio, described the spine as a series of cups (vertebrae) and saucers (disks between the vertebrae) balanced on top of each other. Most people have 24 of these cups and 23 disks. Ligaments and muscles help stabilize the stack, but because it's vertical, the disks are prone to slippage.

"Humans are the only mammal that we know of that as we age, we can get spontaneous fractures of our vertebrae just from having that weight on top of each successive vertebra," DeSilva said.

The natural curve of the human spine also causes issues. The spine curves to balance weight, to allow for flexibility and to avoid blocking the birth canal. But because of this bend, people are susceptible to developing more severe curves, such as kyphosis (an outward curvature of the upper spine) or scoliosis (a lateral curvature of the spine), DeSilva said. At each curve, the spine is also prone to fractures.

Modern life in industrialized countries also plays a role. Core muscles stabilize the back, but many people have weak midsections. "If you're sitting at a desk all day, slouched over, and you're not working the lower back muscles, then they're easily strained," DeSilva said.

Although there are multiple factors, evolution is the major culprit, DeSilva said. After all, our ancient ancestors, including the famous Australopithecus Lucy, had back problems, too, according to a 1983 study in the American Journal of Physical Anthropology.

Not all bipeds have as much back pain as humans, however. Some large terrestrial birds, such as ostriches, walk upright on two limbs without much of an issue.

"As far as I know, ostriches don't have to go to the chiropractor very often," DeSilva said. One reason why is that the bird's spine is more diagonal than vertical, so it can act more as a suspension bridge rather than a tower of

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cups and saucers. The ostrich also had significantly more time to evolve a high-functioning back. "They've had a roughly 200 million-year head start on us," DeSilva said. "When it comes to a bipedal skeleton, we're kind of the new kids on the block."

Originally published on Live Science.

livescience.com, 4 October 2021

https://www.livescience.com

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