CHEMWATCH

Bulletin Board

Contents

DEC. 03, 2021

(click on page numbers for links)

CONTACT US

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

1227 Glen Huntly Rd
Glen Huntly
Victoria 3163 Australia

Contents

DEC. 03, 2021

CHEMWATCH
Bulletin Board
Contents
DEC. 03, 2021

ASIA PACIFIC

IN FOCUS: The ongoing struggle to reduce air pollution in Jakarta and why the problem has persisted

2021-11-20

Jakarta's poor air quality prompted a group of residents to sue the government and they won. CNA explores the root causes and impacts of the smog which regularly blankets the city.

It has been months since Andy Rahman last rode his bicycle on the streets of Jakarta, a hobby he picked up last year when non-essential workers like himself were told to work from home to curb the spread of COVID-19.

"After about 30 minutes, my eyes were burning, my throat hurt and I began to cough," the 47-year-old marketing manager told CNA.

The coughing would persist even after he got home. It would only go away after he remained indoors for hours, he said.

Rahman noticed that whenever he went cycling, the air would smell like there was something burning. Visibility was sometimes so low that tall skyscrapers appeared as mere silhouettes against a greyish sky.

This led him to suspect that his coughing had to do with the worsening air quality.

According to air quality monitoring tools, the city of 11 million people consistently ranks as one of the most polluted cities in the world.

Data from the Jakarta Health Agency shows that in 2019, before the pandemic began, the city only had two days when the air quality was deemed "healthy". The rest of the year, the city was blanketed with toxic fumes and fine dust particles from vehicles, factories and coal-fired power plants surrounding the capital.

Read More

Chennel News Asia, 20 November 2021

https://www.channelnewsasia.com/asia/indonesia-jakarta-air-pollution-emissions-vehicles-factories-2285926

"After about 30 minutes, my eyes were burning, my throat hurt and I began to cough," the 47-year-old marketing manager told CNA.

CHEMWATCH
Bulletin Board
Regulatory Update
DEC. 03, 2021

Amendment 1:2021 of QCVN 20:2019/BKHCN National technical regulation on stainless steel

2021-11-23

This draft technical regulation stipulates the limit of content by mass of chemical elements and quality control requirements for stainless steel produced domestically, imported and circulated on the market.

The list of stainless steel and the corresponding HS code is given in the Appendix attached to the National Technical Regulation QCVN 20:2019/BKHCN and Amendment 1:2021 QCVN 20:2019/BKHCN The following articles are amended: 1.3.2, 1.3.3, 2.1, 2.3, Article 3, Article 4, Article 5.2, 5.3.4, 5.4, 5.5 and 5.6.

Some amendments are: Organizations and individuals importing stainless steel shall register for state inspection of quality at the inspection agency in accordance with Circular No. 27/2012/TTBKHCN and Circular No. 07/2017/TT-BKHCN

The documents related to goods, technical documents, test results, certificates of conformity shall be kept for at least 10 years. The products with the HS codes of 7306.40.20, 7306.40.90, 7306.61.10, 7306.61.90, 7306.69.10, 7306.69.90 is supplemented to the Appendix of QCVN 20:2019/BKHCN

Vietnam Directorate for Standards, 23 November 2021

http://www.tcvn.gov.vn

The documents related to goods, technical documents, test results, certificates of conformity shall be kept for at least 10 years.

China cracks down on monopolies in active pharmaceutical ingredient industry

2021-11-26

On Nov. 18, China issued the *Anti-Monopoly Guidance for Active Pharmaceutical Ingredients* (hereafter referred to as *API Anti-Monopoly Guidance* or *Guidance*), clarifying regulations against monopoly agreements, abuse of market power, and concentration of undertakings in the API industry.1

The *API Anti-Monopoly Guidance*, published by the State Council's Anti-Monopoly Committee, marks China's first detailed guidance for enforcing the *Anti-Monopoly Law* in the pharmaceutical industry.

This article is meant to introduce the *Guidance*'s application scope, interpret its highlight anti-monopoly regulations, and analyze its influence on China's pharma industry.

API Anti-Monopoly Guidance's Application Scope

The *Guidance* applies to

1. APIs: the active ingredients which serve as effective components in finished drug products, including chemical drug products' active ingredients and traditional Chinese medicines' raw materials. and
2. chemical raw materials and pharmaceutical intermediates used for producing APIs and pharmaceutical excipients in the upstream supply chain .

Read More

Baipharm, 26 November 2021

https://baipharm.chemlinked.com/news/china-cracks-down-on-monopolies-in-active-pharmaceutical-ingredient-industry

Taiwan extends 106 PECs registration deadline to the end of 2024

2021-11-25

On November 23, 2021, the revision to Taiwan's New and Existing Chemical Registration was published and took effect immediately. Compared with the previous draft version released on May 24, 2021 (ChemLinked news), the amendments are remained the same except for two adjustments in the final revision, including extending the deadline for the registration of 106 priority existing chemicals (PECs) to December 31, 2024 and maintain the official review period unchanged to reduce registrants' pressures associated with the time limit and to improve the registration efficiency.

On November 23, 2021, the revision to Taiwan's New and Existing Chemical Registration was published and took effect immediately.

CHEMWATCH
Bulletin Board
Regulatory Update
DEC. 03, 2021

Read More

Chemlinked, 25 November 2021

https://chemical.chemlinked.com/expert-article/taiwan-extends-106-pecs-registration-deadline-to-the-end-of-2024

AMERICA

No safe PFAS exposure level? EPA toxicity drafts point that way

2021-11-20

Is there no safe exposure level to certain PFAS chemicals?

Toxicologists in the advocacy arena suggest that may be the case after the U.S. Environmental Protection Agency (EPA) released draft toxicity analyses this week for two well-studied individual compounds, PFOS and PFOA, which dramatically reduce what's previously been considered a "safe" level of exposure to those chemicals in drinking water.

On Tuesday, Nov. 16, the EPA asked its Science Advisory Board (SAB) to review new analyses and data that suggest the two chemicals — which have been found in many drinking water supplies and surface waters in Michigan and around the country — are far more toxic than previously thought.

According to the analyses, PFOS and PFOA can cause health problems at far lower doses than what the existing EPA health advisory level of 70 parts-per-trillion (ppt) if based on. That's attributed to the inclusion of epidemiological studies that assess actual exposure in humans rather than reliance on studies of animals exposed to the chemicals in a lab.

Those studies indicate exposure may reduce the body's antibody response to vaccines, particularly in children — a big concern in the midst of a global pandemic. The EPA drafts also label PFOA as a "likely carcinogen," meaning sufficient exposure is suspected to cause cancer.

Read More

Mlive, 20 November 2021

https://www.mlive.com/public-interest/2021/11/no-safe-pfas-exposure-level-epa-toxicity-drafts-point-that-way.html

According to the analyses, PFOS and PFOA can cause health problems at far lower doses than what the existing EPA health advisory level of 70 parts-per-trillion (ppt) if based on.

PFAS: Health concerns and efforts to regulate "Forever Chemicals"

2021-11-19

Per- and Polyfluoroalkyl Substances (PFAS) are a group of thousands of manufactured chemicals widely used by a range of industries and commonly found in a large number of household products. One common characteristic of PFAS is that they persist in the environment and can accumulate in humans and animals. For this reason, they are often referred to as "forever chemicals."

Some PFAS have been linked to cancer, birth defects, liver disease, thyroid disease, decreased immunity, hormone disruption and a range of other serious health problems.

The U.S. Centers for Disease Control and Prevention (CDC) says that most people in the United States have been exposed to some PFAS. The chemicals have been documented in the blood of people and animals around the world, and also have been found to be pervasive in the environment, particularly in areas where manufacturers or other industrial users are actively handling PFAS.

In response to a Freedom of Information Act request, the U.S. Environmental Protection Agency (EPA) in 2021 released a spreadsheet of more than 120,000 facilities around the United States the regulatory agency fears are handling PFAS. Download that spreadsheet here.

Researchers have identified the following routes of exposure to PFAS:

- **Drinking water** – in public drinking water systems and private drinking water wells.
- **Soil and water at or near waste sites** – at landfills, disposal sites, and hazardous waste sites.
- **Fire extinguishing foam** – used in training and emergency response events at airports, shipyards, military bases, firefighting training facilities, chemical plants, and refineries.
- **Manufacturing or chemical production facilities that produce or use PFAS** – such as oil and gas drilling sites, chrome plating, electronics, and certain textile and paper manufacturers.
- **Food** – such as fish caught from water contaminated by PFAS and dairy products from livestock exposed to PFAS, and other foods.
- **Food packaging** – such as grease-resistant paper, fast food containers/ wrappers, microwave popcorn bags, pizza boxes, and candy wrappers.

Some PFAS have been linked to cancer, birth defects, liver disease, thyroid disease, decreased immunity, hormone disruption and a range of other serious health problems.

CHEMWATCH
Bulletin Board
Regulatory Update
DEC. 03, 2021

- **Household products-** such as stain and water-repellent used on carpets, upholstery, clothing, and other fabrics; cleaning products; non-stick cookware; paints, varnishes, and sealants.
- **Personal care products-** such as shampoos, dental floss, and cosmetics.

Read More

US Right to Know, 19 November 2021

https://usrtk.org/chemicals/pfas-health-concerns-and-efforts-to-regulate-forever-chemicals/

EPA denies TSCA Section 21 petition seeking the elimination of hazardous chemicals used in mixtures in cosmetics

2021-11-19

On November 17, 2021, the U.S. Environmental Protection Agency announced the availability of its response to an August 16, 2021, petition filed under Section 21 of the Toxic Substances Control Act (TSCA). 86 Fed. Reg. 64129. William D. Bush requested that EPA determine that the "chemical mixtures contained within cosmetics present an unreasonable risk of injury to health and the environment," and issue a rule or order under TSCA to "eliminate the hazardous chemicals used in mixtures [in cosmetics]." EPA states that after "careful consideration," it has denied the petition. EPA notes that TSCA Section 3(2)(B) excludes "cosmetic" from the definition of "chemical substance" when manufactured, processed, or distributed in commerce for use as a cosmetic. Cosmetics, and any combination of chemicals contained therein, are thus not chemical substances under TSCA when manufactured, processed, or distributed in commerce for use as a cosmetic. EPA states that to the extent the petition seeks a TSCA Section 6 action on "cosmetics" when manufactured, processed, or distributed in commerce as cosmetics, the requested actions are not within its jurisdiction under TSCA. In addition, according to EPA, to the extent the petition seeks action on "chemical substances" within the TSCA Section 3(2) definition of that term, EPA finds that the petition did not set forth facts establishing that it is necessary for EPA to initiate an appropriate proceeding pursuant to TSCA Section 21. In particular, according to EPA, the petition did not identify the

EPA notes that TSCA Section 3(2)(B) excludes "cosmetic" from the definition of "chemical substance" when manufactured, processed, or distributed in commerce for use as a cosmetic.

disposal of any particular chemical substance(s) or mixture(s) that could support a determination of unreasonable risk to the environment and, therefore, did not set forth sufficient facts establishing that it is necessary to issue a TSCA Section 6(a) rule addressing cosmetic disposal.

Read More

TSCA Blog, 19 November 2021

http://www.tscablog.com/entry/epa-denies-tsca-section-21-petition-seeking-the-elimination-of-hazardous-ch

A sport-fishing boat pollutes 'as much as 162 school buses.' Will boat businesses survive regulation?

2021-11-19

California's air pollution regulators have clamped down on big-rig trucks, buses, cargo ships and various manufacturers.

Their latest target is a far smaller industry: sport-fishing and whale-watching operators, whose aging diesel-powered boats are responsible for what officials say is an outsize amount of dangerous pollution that lingers over the state's marinas and bays.

The California Air Resources Board meets Friday to consider a measure that would require sport-fishing, whale-watching and other excursion boat owners to install the newest and cleanest diesel engines and potentially also a filter to reduce exhaust pipe emissions.

The boat owners are mostly mom-and-pop businesses that cater to blue-collar anglers and families. They say that they don't have the finances — unlike other big businesses — to meet the proposed regulations and that many may be forced to close up shop.

"I'm terrified. I'm supposed to learn a new trade now?" said Jeff Jessop, 46, part owner of three fishing boats and a landing in San Pedro who has been in the business since he was a teenager working as a deckhand. "I thought this was my future and my retirement."

"I thought this was my future and my retirement."

CHEMWATCH
Bulletin Board
Regulatory Update
DEC. 03, 2021

Read More

Los Angeles Times, 19 November 2021

https://www.latimes.com/business/story/2021-11-19/california-air-resources-emissions-regulator-sport-fishing-whale-excursions-rules

NAFRA comments on draft regulatory determinations report under safe products for Washington

2021-11-19

The American Chemistry Council's (ACC) North American Flame Retardant Alliance (NAFRA) issued the following statement in response to the Draft Regulatory Determinations Report to the Legislature from the Washington State Department of Ecology regarding its implementation of Safer Products for Washington.

"NAFRA is deeply disappointed by the Department of Ecology's Draft Regulatory Determinations Report, part of which proposes restricting the use of organohalogen flame retardants (OFRs) in plastic device casings for electrical and electronic equipment. Safety is a top priority for our industry, and we believe consumers deserve to have confidence in the products they purchase. Ecology's proposed restrictions would apply to numerous electronic and household items, including but not limited to televisions, laptops, mobile phones, kitchen appliances, washing machines, irons, and hair dryers.

"No state, federal, or international regulatory authority has proposed or implemented a ban on flame retardants in electronics as broad as the one being considered in Washington, making the state an outlier. Such a regulation would potentially decrease the availability of electronic and electrical products for purchase in the state and potentially increase the fire risk posed by the products that are available. Electronic casings present unique fire risks and restricting the use of flame retardants in electric and electronic enclosures could undermine overall product safety and performance.

Ecology's proposed restrictions would apply to numerous electronic and household items, including but not limited to televisions, laptops, mobile phones, kitchen appliances, washing machines, irons, and hair dryers.

"The Department of Ecology's approach for regulating OFRs goes against the recommendations of the National Academy of Sciences (NAS) that this diverse group of chemicals cannot be treated as a single class for purposes of assessment.[1] The best available science should be used in developing regulations to avoid a one-size-fits-all approach that is neither scientifically accurate, nor appropriate."

Read More

American Chemistry Council, 19 November 2021

https://www.americanchemistry.com/chemistry-in-america/news-trends/press-release/2021/nafra-comments-on-draft-regulatory-determinations-report-under-safer-products-for-washington

EUROPE

New analysis finds glyphosate contaminates Spanish surface and groundwater

2021-11-25

A new study published by Ecologistas en Acción, a member of the EDC-Free Europe coalition, reveals that surface and groundwaters in Spain are contaminated with the popular yet health-harming herbicide glyphosate.

The report, based on data from 2015 to 2019 provided by the Spanish Ministry for Ecological Transition in response to an official request put forward by Ecologistas en Acción, shows that glyphosate was detected in 31% of surface water samples. This percentage of contamination rises to 42% when looking specifically at AMPA, the main chemical produced when glyphosate is metabolised.

For groundwater, the environmental group found 11% of samples contained glyphosate and 0.3% of samples contained AMPA. Alarmingly, some surface and groundwater samples contained concentrations of glyphosate hundreds of times higher than the legal limit values.

Glyphosate is the most widely-used pesticide in the world. Exposure to glyphosate-based herbicides has been linked to certain types of cancer, as well as adverse effects on human development and the hormonal system. In 2015, the International Agency of Research on Cancer (IARC) classified glyphosate as "probably carcinogenic to humans".

This percentage of contamination rises to 42% when looking specifically at AMPA, the main chemical produced when glyphosate is metabolised.

CHEMWATCH
Bulletin Board
Regulatory Update
DEC. 03, 2021

The current EU approval of glyphosate expires on 15 December 2022. As part of this renewal assessment procedure, the four EU member states leading the assessment (France, the Netherlands, Sweden and Hungary) and forming the Assessment Group on Glyphosate released preliminary conclusions on the toxicity of glyphosate, according to which the substance has no harmful effects on human and animal health, or any unacceptable effects on the environment.

But now, a new analysis by the French environmental group Générations Futures has revealed that those member states' conclusions may have excluded 99% of existing scientific literature on the toxicity of glyphosate.

In October 2021, forty-one health and environment groups including many EDC-Free Europe coalition partners urged EU Health Commissioner Stella Kyriakides to guarantee that the ongoing assessment of the substance is based on updated independent scientific evidence and remains free from vested interests.

Read More

EDC Free Europe, 25 November 2021

https://www.edc-free-europe.org/articles/national-developments/new-analysis-finds-glyphosate-contaminates-spanish-surface-and-groundwater

Critical raw materials: The EU should secure its own supply

2021-11-18

To boost an autonomous and sustainable EU supply of materials needed to produce key technologies, MEPs call for diversification, more recycling and domestic sourcing.

Critical raw materials (CRMs) are crucial for producing a broad range of goods and technologies. The transition towards digital, highly energy-efficient and climate-neutral European economies will lead to a significantly higher demand for CRMs. The technologies requiring them, such as batteries and electric engines, will be key to achieving the goals under the Paris Agreement.

The technologies requiring them, such as batteries and electric engines, will be key to achieving the goals under the Paris Agreement.

Parliament calls for an EU strategy to boost Europe's strategic autonomy and resilience regarding the supply of CRMs, by creating a secondary market for recycled resources containing these materials. Under the Parliament's proposals, more CRMs will have to be sourced from within the EU and its neighbourhood, sources for these materials will need to be diversified, and more research should focus on sustainable alternatives to these scarce materials.

Recycling to play a key role

MEPs say that, in the short- to mid-term, focusing on recycling will not be enough on its own to meet the increasing demand for CRMs. They call for sustainable sourcing possibilities to be explored in CRM-rich member states. Parliament urges member states to make their authorisation processes for prospecting and sourcing projects more time-efficient and transparent, without lowering environmental and social standards.

CRM projects should also get better funding opportunities under the National Recovery Plans and the Taxonomy Regulation. Member states' efforts should be pooled via an Important Project of Common Interest (IPCEI), MEPs stress.

Waste recycling is crucial, MEPs say, given the significant presence of CRMs in electrical and electronic equipment. The Commission and member states should improve their efforts to properly collect and recycle end-of-life products with CRMs instead of stockpiling them in households and landfills, or incinerating them. Stronger controls of EU exports of key CRM waste products are needed, according to MEPs. A new task force should be set up to coordinate national CRMs activities.

They call on EU member states to consider the strategic stockpiling of CRMs in order to secure their supplies, and say that future EU free trade and partnership agreements should include specific provisions on CRMs.

Read More

European Parliament News, 18 November 2021

https://www.europarl.europa.eu/news/en/press-room/20211118IPR17620/critical-raw-materials-the-eu-should-secure-its-own-supply

CHEMWATCH
Bulletin Board
Regulatory Update
DEC. 03, 2021

INTERNATIONAL

IARC Monographs evaluation of the carcinogenicity of 1,1,1-trichloroethane and four other industrial chemicals

2021-11-12

The results of the recent *IARC Monographs* evaluation of the carcinogenicity of 1,1,1-trichloroethane, 1,2-diphenylhydrazine, diphenylamine, *N*-methylolacrylamide, and isophorone have now been published in *The Lancet Oncology*. This summary article presents the conclusions of *IARC Monographs* Meeting 130.

Three of these agents (1,2-diphenylhydrazine, diphenylamine, and isophorone) were evaluated by the Working Group for the first time.

1,1,1-Trichloroethane is a chlorinated hydrocarbon that was used widely before the implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer, but that since the 1990s has been used mostly as a chemical feedstock in closed systems and for essential purposes, e.g. medical devices and aviation safety. Diphenylamine, *N*-methylolacrylamide, and isophorone are chemicals with a high production volume that have diverse uses in industry, including as intermediates. 1,2-Diphenylhydrazine was primarily used as an intermediate in the manufacture of benzidine dyes, which has ceased in the USA and European Union, although such use may continue elsewhere. For all agents, data were sparse regarding exposure levels, but indicated that exposures are higher in occupational situations than in the general population.

Three of these agents (1,2-diphenylhydrazine, diphenylamine, and isophorone) were evaluated by the Working Group for the first time.

The Working Group evaluated 1,2-diphenylhydrazine, diphenylamine, *N*-methylolacrylamide, and isophorone as *possibly carcinogenic to humans (Group 2B)* mainly on the basis of *sufficient evidence of carcinogenicity* in experimental animals. 1,1,1-Trichloroethane was evaluated as *probably carcinogenic to humans (Group 2A)* on the basis of *sufficient evidence of carcinogenicity* in experimental animals and *limited evidence of carcinogenicity* in humans (positive associations were seen for multiple myeloma). For all agents, there was *limited mechanistic evidence*.

The full scientific assessment will be published as Volume 130 of the *IARC Monographs*.

IARC Monographs Volume 130 Working Group

Carcinogenicity of 1,1,1-trichloroethane and four other industrial chemicals

Read More

IARC, 12 November 2021

https://www.iarc.who.int/news-events/iarc-monographs-evaluation-of-the-carcinogenicity-of-111-trichloroethane-and-four-other-industrial-chemicals/

An eruption of air pollution

2021-11-19

If the past 18 months haven't already been enough to handle, late last month, La Palma, Spain experienced its first volcanic eruption in over 50 years. The eruption of the Cumbre Vieja volcano, which began in late September, has so far seen the forced evacuation of over 6,000 residents and the destruction of 1,300 homes and buildings.

The eruption itself isn't particularly surprising, at any one time there are around 40 active volcanoes and for billions of years, geological processes like volcanic eruptions have controlled the atmosphere and the state of our climate. However, what is different about this specific eruption is its close proximity to the general population of La Palma.

When we see pictures of the Cumbre Vieja eruption or other eruptions of a similar magnitude, we see ash-covered skies and rivers of lava flooding the land.

However, according to Sævar Helgi Bragason, an expert in air quality and climate for the Icelandic Environment Agency: 'Generally speaking, the lava itself is not really an issue, it's the gas pollution emitted from the volcano that is by far the biggest safety concern for everyone in the area.'

Health impacts

Volcanoes emit a cocktail of chemicals, but one pollutant that is a major cause for concern is sulphur dioxide (SO2). Like with other more commonly known pollutants, SO2 is associated with a wide range of health impacts, from respiratory issues such as asthma and bronchitis to cardiovascular and lung disease.

The eruption of the Cumbre Vieja volcano, which began in late September, has so far seen the forced evacuation of over 6,000 residents and the destruction of 1,300 homes and buildings.

CHEMWATCH
Bulletin Board
Regulatory Update
DEC. 03, 2021

Dr Anja Schmidt, an expert in the impact that volcanic eruptions have on air quality at the University of Cambridge analysed the air pollution impact of the 2014 Bárðarbunga eruption in Iceland and found that the volcano emitted 12,000 tonnes of SO2 per day, this is three times more than all European industries combined.

In another study led by Dr Schmidt in collaboration with the University of Iceland, the researchers found that at the time of the eruption, incidents of respiratory disease rose by a quarter and the incidence of asthma medication dispensing increased by a fifth.

'This is the first study to convincingly show that there is a direct link between respiratory health and the presence of volcanic pollution,' Dr Schmidt tells *Air Quality News*.

The Cumbre Vieja eruption in La Palma is still ongoing and the complete air pollution picture is yet to be fully understood, however recent satellite images published by the European Space Agency revealed that SO2 emissions from the eruption were moving over the Atlantic Ocean towards Central America.

Read More

Air Quality News, 19 November 2021

https://airqualitynews.com/2021/11/19/feature-an-eruption-of-air-pollution/

REACH requirements need to be considered in chemical recycling

2021-11-11

Chemical recycling of plastic waste currently covers different technologies with varying potential for contributing to a circular economy, a new report finds. Following REACH registration requirements for recycled materials and finding ways to eliminate substances of concern from plastic waste streams are key to achieving non-toxic recycling.

Helsinki, 11 November 2021 – The report commissioned by ECHA investigates the current knowledge on chemical recycling of polymeric materials such as plastics and rubber from waste. It introduces conclusions and recommendations that should be considered to further develop chemical recycling and reduce plastic pollution – particularly as the global production of plastics is expected to quadruple by 2050.

The conclusions and the potential solutions can be summarised as follows:

Regulatory issues in chemical recycling are currently not discussed in scientific papers. The opportunities and challenges posed by REACH and other chemicals, waste and product safety legislation are specific to each chemical recycling technology. As such, the report recommends that the regulatory issues are studied on a case-by-case basis, separately for each type of chemical recycling technology. It also summarises the feedback from operators on the challenges for each recycling technology.

There is little knowledge about the abilities of different chemical recycling processes to eliminate substances of concern. To make sound conclusions, investigations at chemical recycling plants should be carried out.

Chemical recycling technologies differ in their potential to ensure the circularity of plastics. The potential of specific technologies should be evaluated case-by-case to avoid false generalisations on the pros and cons of one technology for the whole field of chemical recycling.

Digital technologies contribute to improving the traceability of substances of concern in recycling. However, their implementation requires substantial efforts between and inside organisations.

The report commissioned by ECHA investigates the current knowledge on chemical recycling of polymeric materials such as plastics and rubber from waste. It

CHEMWATCH
Bulletin Board
REACH Update
DEC. 03, 2021

Erwin Annys, Head of ECHA's Support and Enforcement Unit says: "It is important to understand how the different chemical recycling techniques can reduce the presence of substances of concern in recycled materials to achieve toxic-free cycles under the circular economy. We also want to understand to what extent this will result in new REACH registrations. Finally the report gives an overview on the state of art of the different chemical recycling processes and the advantages and disadvantages of these techniques."

What is chemical recycling?

In chemical recycling, plastic polymers are chemically broken down to supply new products such as crude oil, naphtha or fuels, which can be used in new plastic production. Chemical recycling can complement mechanical recycling, i.e. mechanical crushing of plastic into granulate, as it can treat mixed and contaminated plastic waste that cannot otherwise be recycled.

Read More

ECHA, 11 November 2021

https://echa.europa.eu/nl/-/reach-requirements-need-to-be-considered-in-chemical-recycling

The Cure

2021-12-03

"Now that we've developed the side effects, let's go for the cure!"

https://danscartoons.com/toonblog/science-cartoons/

CHEMWATCH
Bulletin Board

Methyl Ethyl Ketone

2021-12-03

Methyl ethyl ketone (MEK), also known as butanone, is an organic compound with the molecular formula $CH_3C(O)CH_2CH_3$. This colourless liquid ketone has a sharp, sweet odour reminiscent of butterscotch and acetone. It is produced industrially on a large scale, and also occurs in trace amounts in nature. It is soluble in water and is commonly used as an industrial solvent. [1]

USES [2]

MEK is a liquid solvent used in surface coatings, adhesives, printing inks, chemical intermediates, magnetic tapes and lube oil de-waxing agents. It is also used as an extraction medium for fats, oils, waxes and resins. It is a highly efficient and versatile solvent for surface coatings. Because of its effectiveness as a solvent, MEK is especially valuable in formulating high solids coatings, which help to reduce emissions from coating operations. MEK is a natural component of many foods, including apple juice, beans, chicken, honey and a variety of cheeses.

SOURCES OF EMISSION & ROUTES OF EXPOSURE

Sources of Emission [3]

- Industry sources: The primary sources of MEK emissions are the industries that manufacture it or use it in production, such as the chemical industry, rubber manufacturers, pharmaceutical industry, the semiconductor industry, heavy equipment manufacturing, manufacturers of millwork, veneer and plywood and the manufacturers of paints, inks, varnishes and lacquers. These are emissions to the air unless there is a spill.
- Diffuse sources: Other possible emitters of MEK are commercial and household painting and paint, varnish and lacquer removal, tobacco smoke, and consumer products containing Methyl ethyl ketone. These are emissions to the air unless there is a spill.
- Natural sources: MEK occurs naturally in volcanoes, forest and bush fires, products of biological degradation, and in some foods.
- Transport sources: MEK is found in motor vehicle exhaust.
- Consumer products: Aerosol paints, architectural coatings, automobile and machinery paints and primers, household hard surface cleaners, household dyes and tints, inks, insecticides for yard and garden,

Methyl ethyl ketone (MEK), also known as butanone, is an organic compound with the molecular formula CH3C(O)CH2CH3.

laundry starches, lubricating greases and oils, automotive chemicals, markers, nail polish and polish remover, paints, varnish and paint and varnish removers and thinners, shoe polish, interior clear finishes, undercoats, and primers, waterproofing compounds, particleboard, and wood office furniture.

Routes of Exposure [4]

- Breathing contaminated air from the production or use of paints, glues, coatings, or cleaning agents containing it.
- Breathing contaminated air near hazardous waste sites.
- Breathing cigarette smoke.
- Sniffing glues.
- Drinking contaminated water from wells near manufacturing or hazardous waste sites.
- Skin contact with the liquid during production or use.

HEALTH EFFECTS [5]

Acute Effects

- Acute exposure of humans to high concentrations of MEK produces irritation to the eyes, nose, and throat.
- Other effects reported from acute inhalation exposure in humans include central nervous system depression, headache, and nausea.
- Dermatitis has been reported in humans following dermal exposure to MEK.
- Tests involving acute exposure of rabbits have shown MEK to have high acute toxicity from dermal exposure, while acute oral exposure of rats and mice has shown the chemical to have moderate toxicity from ingestion.
- Acute inhalation tests in rats indicate low toxicity from MEK exposure via inhalation.

Chronic Effects

- Limited information is available on the chronic effects of MEK in humans from inhalation exposure. One study reported nerve damage in individuals who sniffed a glue thinner containing MEK and other chemicals.
- Slight neurological, liver, kidney, and respiratory effects have been reported in chronic inhalation studies of MEK in animals.

CHEMWATCH
Bulletin Board
Hazard Alert
DEC. 03, 2021

- The Reference Concentration (RfC) for MEK is 1 milligram per cubic metre (mg/m3) based on decreased foetal birth weight in mice.
- The Reference Dose (RfD) for MEK is 0.6 milligrams per kilogram body weight per day (mg/kg/d) based on decreased foetal birth weight in rats.

Reproductive/Developmental Effects:

- No information on the reproductive or developmental effects of MEK in humans was located.
- An inhalation study in mice exposed to MEK reported decreased foetal weight and foetal malformations. Developmental effects have also been reported in rats following oral and inhalation exposures.

Cancer Risk

- No information on the carcinogenicity of MEK in humans was located.
- No studies were available on the carcinogenicity of MEK by the oral or inhalation routes. In a dermal carcinogenicity study, skin tumours were not reported from MEK.
- EPA has classified MEK as a Group D, not classifiable as to human carcinogenicity, based on a lack of data concerning carcinogenicity in humans and animals.

SAFETY [6]

First Aid Measures

- Eye Contact: Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.
- Skin Contact: In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.
- Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.
- Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
- Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If

breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.
- Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Fire & Explosion Information

- MEK is flammable
- Auto-Ignition Temperature is 404°C (759.2°F)
- MEK is highly flammable in presence of open flames and sparks, of heat.
- MEK is explosive in presence of oxidising materials.
- Small fires can be extinguished with dry chemical powder.
- For large fires, use alcohol foam, water spray or fog.
- MEK will ignite on contact with potassium t-butoxide.
- Vapour may cause a flash fire
- Reaction with Hydrogen Peroxide + nitric acid forms heat and shock-sensitive explosive product. Mixture with 2-propanol will produce explosive peroxides during storage.

Exposure Controls & Personal Protection

Engineering Controls

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

Personal Protective Equipment

The following personal protective equipment is recommended when handling MEK:

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

Personal Protective Equipment in Case of a Large Spill:

CHEMWATCH
Bulletin Board
Hazard Alert
DEC. 03, 2021

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

REGULATION

United States [7]

Exposure Limit	Limit Values	HE Codes	Health Factors and Target Organs
OSHA Permissible Exposure Limit (PEL) - General Industry See 29 CFR 1910.1000 Table Z-1	200 ppm (590 mg/m³) TWA	HE16	Irritation of the eyes, nose, and throat
OSHA PEL - Construction Industry See 29 CFR 1926.55 Appendix A	200 ppm (590 mg/m³) TWA	HE16	Irritation of the eyes, nose, and throat
OSHA PEL - Shipyard Employment See 29 CFR 1915.1000 Table Z-Shipyards	200 ppm (590 mg/m³) TWA	HE16	Irritation of the eyes, nose, and throat
National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) (REL listed under ketones)	200 ppm (590 mg/m³) TWA 300 ppm (885 mg/m³) STEL	HE8	Narcosis (central nervous system depression)
		HE16	Irritation of the eyes, nose, and throat

Exposure Limit	Limit Values	HE Codes	Health Factors and Target Organs
American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) (2001) (TLV listed under methyl ethyl ketone [MEK])	200 ppm (590 mg/m³) TWA 300 ppm (885 mg/m³) STEL BEI	HE7	Central nervous system effects and peripheral neuropathy
		HE16	Irritation of the eyes, nose, and throat
CAL/OSHA PELs	200 ppm (590 mg/m³) TWA 300 ppm (885 mg/m³) STEL	HE7	Central nervous system effects and peripheral neuropathy
		HE16	Irritation of the eyes, nose, and throat

Australia [3]

Safe Work Australia: For methyl ethyl ketone, it is allowable for workers to be exposed to concentrations of 150 parts per million over an eight hour workshift, with concentrations not greater than 300 parts per million.

REFERENCES

1. http://en.wikipedia.org/wiki/Butanone
2. http://www.americanchemistry.com/ProductsTechnology/Ketones/Methyl-Ethyl-Ketone-MEK.html
3. http://www.npi.gov.au/resource/methyl-ethyl-ketone
4. http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=342&tid=60
5. http://www.epa.gov/ttn/atw/hlthef/methylet.html
6. http://www.sciencelab.com/msds.php?msdsId=9927358
7. https://www.osha.gov/dts/chemicalsampling/data/CH_222300.html

Ants vomit into each other's mouths to form social bonds

2021-12-01

Ants have social networks just like humans do, but instead of exchanging information through posts and comments, they vomit into each other's mouths.

Most insects have a foregut, a midgut and a hindgut. "However, for social insects, the foregut has become sort of a 'social stomach,'" said Adria LeBoeuf, an assistant professor and leader of the Laboratory of Social Fluids at the University of Fribourg in Switzerland. Contents of the midgut and hindgut are digested, while contents of the foregut are meant to be shared, said LeBoeuf, lead author of a new study describing the findings.

Trophallaxis, or the act of regurgitating food into another organism's mouth, is very common in highly social species like ants. During a trophallaxis event, nutrients and proteins are passed from one individual"s social stomach to another's, and through a series of these exchanges, the ants create a "social circulatory system" that connects each member of the colony to everyone else, LeBoeuf said.

PLAY SOUND

Carpenter ants (Camponotus) constantly pass these nutrients to one another in this way. If you look at one colony, in a single minute you might see "20 trophallaxis events," LeBoeuf told Live Science. (An ant colony might hold at least thousands of ants.)

"About five years ago, we published a paper characterizing the fact that when ants do trophallaxis, they aren't just passing external food," LeBoeuf said, referring to a 2016 report in the journal eLife. "They are passing out hormones, nestmate recognition cues, small RNAs and all sorts of other things."

So, by vomiting into each other's mouths, ants aren't simply exchanging nutrients, the study authors wrote. Instead, the ants are creating a digestive social network in which energy and information circulate constantly throughout the colony to be collected by the individuals that need these resources. This is much like how your brain can secrete a hormone and pass it to your circulatory system and it will eventually reach your liver.

Lebouf thinks of a colony of ants not as a collection of individual ants, but instead as a "colonial superorganism," where the colony essentially

"They are passing out hormones, nestmate recognition cues, small RNAs and all sorts of other things."

functions as if it were a body. Much like how a body has tissues and organs that perform jobs in support of a common goal, groups of ants with different jobs can be thought of as the tissues and organs of the superorganism. The foragers gather food, the nurses take care of young, the workers dig tunnels, etc. Organs use the circulatory system to pass around much more than food, so is it possible that the social circulatory system does more as well?

"To help us understand why ants share these fluids, we explored whether the proteins they exchange are linked to an individual's role in the colony or the colony's life cycle," lead author Sanja Hakala, a postdoctoral fellow at the University of Fribourg, said in a statement.

For their most recent experiment, LeBoeuf and Hakala analyzed the social stomach contents of carpenter ants in both wild colonies and lab-raised colonies. Across their samples, they identified 519 proteins being passed around the ant colonies; 27 of those proteins were found in all of their samples, regardless of the colony's age, the colony's location or the individual ant's status.

The workers seem to be foraging for food, building that food into specific proteins and then passing those proteins around, LeBoeuf said. As a colony matures, more nutrient storage proteins — which act as a very concentrated food source — enter circulation, so older colonies have more of these proteins overall than younger colonies do, the team found.

"Often, adults in ant colonies don't even need to eat," LeBoeuf told Live Science. "Instead, they sort of slowly break down these nutrient-storing proteins."

Many adults in the colony don't have to eat because there are ants that eat on behalf of the colony.

"These findings show that some colony members can do metabolic labour for the benefit of others," Hakala said in a statement.

By analyzing what proteins were found where, LeBoeuf and colleagues could tell the difference between young and mature colonies, as well as differentiate wild and lab-raised colonies. which had a much lower diversity of proteins in their social stomachs than their wild counterparts.

The role an individual ant plays in the colony can be determined by its social stomach contents, too, the team found. So-called nurse ants that care for young tended to have higher amounts of anti-aging proteins than

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

other members of the colony, potentially to ensure that they survive to care for future generations.

"We know now that things are produced in certain individuals, and they end up in other individuals, which is super exciting," LeBoeuf said. However, there are still many questions left to answer, she said. For instance, the team found that foragers had higher concentrations of nutrient storage proteins than nurses did but that nurses produced those proteins faster. The researchers aren't sure why this is.

LeBoeuf thinks studying systems like nutrient exchange in ants may help scientists better understand how metabolic labor is divided within individual organisms, as in, between the cells that make up a body. "It is hard to measure how metabolic work is shared between cells," LeBoeuf said. "Here, the ants pass things around in a way that we can easily access what they are sharing."

The findings were published Nov. 2 in the journal eLife.

Originally published on Live Science.

livescience.com, 1 December 2021

https://www.livescience.com

Nurdles: the worst toxic waste you've probably never heard of

2021-11-29

When the X-Press Pearl container ship caught fire and sank in the Indian Ocean in May, Sri Lanka was terrified that the vessel's 350 tonnes of heavy fuel oil would spill into the ocean, causing an environmental disaster for the country's pristine coral reefs and fishing industry.

Classified by the UN as Sri Lanka's "worst maritime disaster", the biggest impact was not caused by the heavy fuel oil. Nor was it the hazardous chemicals on board, which included nitric acid, caustic soda and methanol. The most "significant" harm, according to the UN, came from the spillage of 87 containers full of lentil-sized plastic pellets: nurdles.

Since the disaster, nurdles have been washing up in their billions along hundreds of miles of the country's coastline, and are expected to make landfall across Indian Ocean coastlines from Indonesia and Malaysia to Somalia. In some places they are up to 2 metres deep. They have been found in the bodies of dead dolphins and the mouths of fish. About 1,680

I've seen some of the dolphins and they had plastic particles inside. There are 20,000 families who had to stop fishing - Hemantha Withanage, environmental campaigner

tonnes of nurdles were released into the ocean. It is the largest plastic spill in history, according to the UN report.

Nurdles, the colloquial term for "pre-production plastic pellets", are the little-known building block for all our plastic products. The tiny beads can be made of polyethylene, polypropylene, polystyrene, polyvinyl chloride and other plastics. Released into the environment from plastic plants or when shipped around the world as raw material to factories, they will sink or float, depending on the density of the pellets and if they are in freshwater or saltwater.

They are often mistaken for food by seabirds, fish and other wildlife. In the environment, they fragment into nanoparticles whose hazards are more complex. They are the second-largest source of micropollutants in the ocean, by weight, after tyre dust. An astounding 230,000 tonnes of nurdles end up in oceans every year.

Like crude oil, nurdles are highly persistent pollutants, and will continue to circulate in ocean currents and wash ashore for decades. They are also "toxic sponges", which attract chemical toxins and other pollutants on to their surfaces.

"The pellets themselves are a mixture of chemicals – they are fossil fuels," says Tom Gammage, at the Environmental Investigation Agency (EIA), an international campaign group. "But they act as toxic sponges. A lot of toxic chemicals – which in the case of Sri Lanka are already in the water – are hydrophobic [repel water], so they gather on the surface of microplastics.

"Pollutants can be a million times more concentrated on the surface of pellets than in the water," he says. "And we know from lab studies that when a fish eats a pellet, some of those pollutants come loose."

Nurdles also act as "rafts" for harmful bacteria such as E coli or even cholera, one study found, transporting them from sewage outfalls and agricultural runoff to bathing waters and shellfish beds. The phenomenon of "plastic rafting" is increasing.

Yet nurdles, unlike substances such as kerosene, diesel and petrol, are not deemed hazardous under the International Maritime Organization's (IMO's) dangerous goods code for safe handling and storage. This is despite the threat to the environment from plastic pellets being known about for three decades, as detailed in a 1993 report from the US government's Environmental Protection Agency on how the plastics industry could reduce spillages.

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

Now environmentalists are joining forces with the Sri Lankan government in an attempt to turn the X-Press Pearl disaster into a catalyst for change.

When the IMO's marine environment protection committee met in London this week, Sri Lanka's call for nurdles to be classified as hazardous goods attracted public support, with more than 50,000 people signing a petition. "There is nothing to stop what happened in Sri Lanka happening again," says Gammage.

Last year there were at least two nurdle spills. In the North Sea a broken container on the cargo ship MV Trans Carrier lost 10 tonnes of pellets, which washed up on the coasts of Denmark, Sweden and Norway. In South Africa, a spill in August 2020 came after an accident in 2018, which affected up to 1,250 miles (2,000km) of coastline. Only 23% of the 49 tonnes that were spilled were recovered. In 2019, 342 containers of plastic pellets spilled into the North Sea.

Awareness is growing about the huge threat posed by the tiny pellets. Last year two environmental protesters in the US were charged under a Louisiana state law with "terrorising" a plastics industry lobbyist when they left a box of nurdles outside his house as part of a campaign to stop the Taiwan-based Formosa Plastics opening a factory in Louisiana.

The nurdles came from another Formosa plant in Texas, which had spilled vast amounts of the pellets into Lavaca Bay on the Gulf of Mexico (Formosa agreed to pay $50m to settle a lawsuit for allegedly violating the Clean Water Act). The charges against the activists, which carried a 15-year prison term, were later dropped.

Such incidents are preventable, campaigners say. "The sinking of the X-Press Pearl – and spill of chemical products and plastic pellets into the seas of Sri Lanka – caused untold damage to marine life and destroyed local livelihoods," says Hemantha Withanage, director of the Centre for Environmental Justice in Sri Lanka. Consumption of fish, the main protein source for 40% of Sri Lankans, has reduced drastically, he says. "It was a huge accident and unfortunately there's no guidance from the IMO."

Classifying nurdles as hazardous – as is the case for explosives, flammable liquids and other environmentally harmful substances – would make them subject to strict conditions for shipping. "They must be stored below deck, in more robust packaging with clear labelling," says Tanya Cox, marine plastic specialist at the conservation charity Flora & Fauna International. "They would also be subject to disaster-response protocols

that can, if implemented in the event of an emergency, prevent the worst environmental impacts."

But the nurdle can has been kicked down the road, with the IMO secretariat referring the issue to its pollution, prevention and response committee, which meets next year. Campaigners said it was disappointing that the Sri Lankan proposal was not properly discussed. The EIA's Christina Dixon said: "The attitude of the committee members was extraordinary and showed a callous disregard for plastic pollution from ships as a threat to coastal communities, ecosystems and food security. This is simply unacceptable."

Meanwhile, the cleanup continues in Sri Lanka. Some of the 470 turtles, 46 dolphins and eight whales washing ashore have had nurdles in their bodies, says Withanage. While there is no proof the nurdles were responsible, he says: "I've seen some of the dolphins and they had plastic particles inside. There are 20,000 families who have had to stop fishing. "The fishermen say when they dip [themselves] into the water, the pellets get into their ears. It's affected tourism, everything."

theguardian.com, 29 November 2021

https://www.theguardian.com

Toilet-trained cows could be a new pollution solution

2021-11-24

The greenhouse gases that cows release via their burps, farts and manure are posing a big problem, and scientists have tried everything from face masks to seaweed diets to solve it. Now, a collaboration between German and New Zealander researchers has resulted in a brand-new approach that is likely familiar to parents everywhere: potty-training.

In their study, published in Current Biology in September, the researchers used a combination of rewards (a molasses mixture or crushed barley) and punishments (spritzes of cold water) to teach 11 of 16 calves to urinate in a latrine — called the "MooLoo" — in just under two weeks.

"Remarkably, the calves showed a level of performance comparable to that of children and superior to that of very young children," write the study's authors. They add that their success demonstrates the incredible cognitive capacities of cows — potty-training requires coordination of a complex chain of behaviors, including awareness of how full the bladder is, control

Now, a collaboration between German and New Zealander researchers has resulted in a brand-new approach that is likely familiar to parents everywhere: potty-training.

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

over the immediate reflex to urinate and then intentional urination in the designated area later.

Bathroom Benefits

The study is also good news for air quality. There are some 1.5 billion cattle worldwide, and each can urinate four to eight gallons per day; when that urine mixes with cow droppings in the field or on the floor of a barn, it produces an indirect greenhouse gas called ammonia that affects the health of people living nearby. "Ammonia is one of those pollutants that has harmful effects on the lungs directly," says Jason Hill, a biosystems engineer at the University of Minnesota who was not involved in the study. "It's a component of fine particulate matter, which is the pollutant that's largely responsible for loss of life with respect to poor air quality in the U.S. and globally."

These microscopic particles, measuring less than 2.5 micrometers in diameter, or about 100 times thinner than a human hair, can lead to cardiovascular and respiratory problems when they're breathed in. They can be released from hundreds of different sources, including car exhaust and wildfires, but are also created when gaseous ammonia from animal waste undergoes chemical changes in the atmosphere.

"Modeling exercises have calculated that capture of about 80 percent of cattle urine in latrines could lead to a 56 percent reduction in ammonia emissions," write the study's authors. From there, waste can be converted into more useful things like fertilizer. The MooLoo also improves the welfare of livestock by contributing to improved hygiene in living areas, the researchers note.

At the beginning of the study, they placed each calf in a small pen with green paneling and faux green grass. Every time a calf urinated there, it was rewarded with a tasty treat from an opening in the wall. After a while, many of the calves could successfully replicate this action even when placed in an alleyway adjacent to the pen. Large-scale implementation of the MooLoo, which would be necessary to see an environmental impact, could potentially involve automation to reduce the burden on farmers.

"I'm sure that one of the next things that they're going to be exploring is the scale of this particular system, because there are labor costs, equipment costs and so forth associated with it," Hill says. "They

demonstrated that it can be done. Now, as with any technology, at what cost and at what benefits?"

discovermagazine.com, 24 November 2021

https://www.discovermagazine.com

In a warming world, deforestation turns the heat deadly, Borneo study finds

2021-11-25

A new study published in Lancet Planetary Health reports how localized deforestation and global warming are contributing to an increase in heat-related deaths in Berau, a district in Indonesia's East Kalimantan province on the island of Borneo.

Researchers from the University of Washington and Mulawaran University in Samarinda, the East Kalimantan capital, used publicly accessible satellite data to calculate changes to forest cover and ground temperature between 2002 and 2018 in Berau. They concluded that a deforestation-induced rise in mean daily maximum temperatures of 0.95° Celsius (1.71° Fahrenheit) over the 16-year period resulted in the additional deaths of 101-118 people annually.

"When you consider it has taken the wider world 150 years to warm by +0.95°C, compared with just 16 years in Berau … the dramatic impacts of deforestation on this region's climate become clear," said lead author Nicholas Wolff, a climate change scientist with global NGO The Nature Conservancy (TNC), which also worked on the study.

Heat has long been considered an environmental and occupational hazard, with rising global temperatures posing numerous public health concerns in the form of a potential epidemic of chronic kidney disease, heat-exacerbated illness, and excess mortality. As the climate shifts, 1 billion people are threatened by a risk of heat stress, scientists say, with disproportionate health effects felt by those living in low-latitude tropical countries such as Indonesia.

Central to the study is the widely underestimated role rainforests play in cooling surrounding landscapes, in addition to their role on a global scale in stimulating cycles of energy, water and carbon.

In localized regions, tropical rainforests increase humidity, generate rainfall and produce wind currents, all with substantial cooling effects. In addition,

They concluded that a deforestation-induced rise in mean daily maximum tempera-tures of 0.95° Celsius (1.71° Fahrenheit) over the 16-year period resulted in the additional deaths of 101-118 people annually.

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

the shade cast by a forest canopy produces cooler ground temperatures compared to cleared areas directly exposed to sunlight.

Satellite data indicate that 4,375 square kilometers (1,689 square miles) of forest, covering 17% of Berau's total area, were cleared between 2002 and 2018, according to the study. More than 28% of the cleared land sits at an elevation of less than 200 meters (660 feet), where 98% of the population lives. While the average temperature increase in Berau was just below 1°C, in some localized deforested areas immediate temperature increases higher than 5°C (9°F) were observed.

Moreover, the research team observed that these temperature increases due to deforestation already exceed the projected post-industrial high-emission warming scenario of 2.2-5.1°C (4-9.2°F) warmer than the present day by the end of the century.

The researchers say the study establishes a clear link between deforestation and heat-related mortality. Even under favorable work conditions in Berau, working in deforested areas, compared to forested areas, for 90 minutes can lead to elevated core body temperatures higher than 38.5°C (101.3°F).

"While +0.95°C may not sound like much in isolation, extrapolated across whole populations and coupled with a rise in unsafe working conditions in rural communities where many people have no choice but to work outdoors, the wider implications for human health and livelihoods are worrying and definitely justify further research to find solutions," Wolff said.

Between 2002 and 2018, work time deemed as "unsafe" due to heat exposure saw an increase by almost 20 minutes per day in deforested areas, according to the study. This was compared to less than 2 minutes per day in areas that maintained forest cover.

Citing predictive climate warming models, the researchers wrote that with 2°C (3.6°F) of additional future global warming, Berau could experience an estimated 17-20% increase in "all-cause mortality," or deaths from any cause (corresponding to an additional 236-282 deaths per year) and a jump of almost five unsafe work hours per day, according to the study.

"Having spent the past five years exploring the impacts of global warming on human health, we believe this latest study represents one of the first-ever to highlight how deforestation and climate change are increasing mortality among low and middle-income communities in lower-latitude

countries, while also contributing to a potentially even more serious increase in unsafe working hours," said senior co-author Yuta Masuda, another TNC scientist.

The study highlights the immediate and drastic effects of deforestation on heat exposure. Where global climate change unfurls over decades or centuries, deforestation is happening much more quickly.

"Previous research into the health implications of climate change has tended to focus on city-dwellers and the Global North," Masuda said. "We sincerely hope our study's findings will prompt greater awareness and support for those frontline rural communities in latitudes where temperatures and humidity levels are already so close to human heat-stress thresholds."

news.mongabay.com, 25 November 2021

https://www.news.mongabay.com

4-legged 'snake' fossil is actually a different ancient animal, new study claims

2021-11-28

A dinosaur-age fossil heralded as the first four-legged snake known to science might actually be an entirely different beastie, a new study claims.

The tiny fossil, about the length of a pencil at 7.7 inches (19.5 centimeters) long, is likely a dolichosaur, a now-extinct marine lizard with an elongated body that lived during the Cretaceous Period (145 million to 66 million years ago), the researchers of the study found.

After studying the remains of the creature, known as Tetrapodophis amplectus (the genus in Greek means "four-legged snake", while the species is Latin for "embracing") the new team found that the specimen doesn't have key anatomical features characteristic of snakes, said study lead researcher Michael Caldwell, a professor in the Department of Biological Sciences and the Chair of the Faculty of Science at the University of Alberta in Edmonton, Canada.

Moreover, the new study blasts the treatment of the Tetrapodophis fossil, which may have been illegally exported from Brazil and whose original study didn't include any Brazilian researchers, despite a Brazilian law stating that their country's researchers need to be included in the study of Brazilian specimens.

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

But Tetrapodophis, whose discovery was announced in 2015 in the journal Science, remains the only four-legged snake fossil on record.

Scientists have long postulated that snake ancestors had four legs; two 2016 studies in the journal Cell that looked into snake genetics suggested that snakes lost their limbs about 150 million years ago due to genetic mutations, and other research has even found fossil evidence of a two-legged snake. But Tetrapodophis, whose discovery was announced in 2015 in the journal Science, remains the only four-legged snake fossil on record.

The 2015 study suggested that when it was alive 120 million years ago, Tetrapodophis used its four limbs, each with five digits, not for walking but for grasping partners during mating and gripping combative prey while hunting, Live Science previously reported. This animal was likely part of the shift from ancient lizards to modern-day snakes, and probably evolved from terrestrial-burrowing animals, the researchers said.

But that interpretation of the fossil didn't sit well with Caldwell and Robert Reisz, a co-author of the new study and a vertebrate paleontologist at the University of Toronto. So, they flew to Germany, where the privately owned fossil was on display at the Solnhofen Museum (formerly known as the Bürgermeister-Müller-Museum) to do their own microscopic evaluation of Tetrapodophis, which they first presented at the Society of Vertebrate Paleontology annual meeting in 2016.

New findings

The new team found evidence that Tetrapodophis was more lizard-like than serpentine, especially in the skull, the researchers reported in the new study, published online Nov. 17 in the Journal of Systematic Palaeontology. Most of the skull's bones were "crushed like an eggshell," with pieces of shattered skull on one slab and the natural mold of the skull on the counterpart, Caldwell said. "The one thing that was completely ignored by the original authors is the counterpart of the skull," he said. "It's in the natural mold where we see some other features that are lizard-y, not snake-y."

The researchers found that Tetrapodophis' body was also not snake-like. For instance, the skinny Tetrapodophis fossil is missing zygosphenes and zygantra, the stabilizing systems in the vertebrae that help a snake slither back and forth, and it has long, straight ribs, indicating that it was a swimmer, not a burrower, as the original study said. "Burrowing critters tend to be long and tubular," Caldwell said.

Dolichosaurs are closely related to snakes, said study co-author Tiago Simões, a postdoctoral fellow at the Museum of Comparative Zoology at

Harvard University. So, perhaps it's no surprise that the original authors thought that Tetrapodophis was a snake, the researchers said.

However, it's not an open-and-shut case. "Tetrapodophis is a fantastic fossil, showing a unique combination of features not seen in any other squamate [lizards, snakes and amphisbaenians]," said Bruno Gonçalves Augusta, an associate researcher at the Museum of Zoology at the University of São Paulo and Southern Methodist University in Texas, who was not involved in either study. But some of the new conclusions drawn from the fossil counterpart, or mold, should be handled with caution, he said.

"For instance, I disagree with their interpretation of the quadrate [skull bone] morphology, since the actual bone is not preserved on the fossil, only a natural impression (a mold) is present … which I don't think is a reliable source of information," Gonçalves Augusta told Live Science in an email.

Other scientists can't get an independent look at the fossil because the privately owned specimen is not available to scientists, Gonçalves Augusta added. "It is not even possible to make firsthand observations and properly study the specimen anymore," he said.

Ethical quandary

The original researchers are standing by their interpretation of the fossil, which they believe shows "that the animal is the oldest and most primitive known snake," David Martill, study co-researcher of the 2015 study and a professor of paleobiology at the University of Portsmouth in the United Kingdom, told Live Science.

The fossil is from the Crato Formation in Brazil, which was largely excavated in the 1970s and the following decades. This means that Tetrapodophis was likely removed from the country after the Decree Law of 1942, which states that holotypes (the first discovered specimen of a new species) must stay in Brazil, and that paratypes (subsequently discovered fossils of a species) can be exported only with permits, the researchers of the new study said. Because the provenance of Tetrapodophis is unknown but highly suspect, the Brazilian Federal Police have launched an investigation into it, the researchers wrote in the new study.

Martill noted that "We'd be happy to see the fossil returned to Brazil, but it was not our fossil, and therefore not our decision to make." But he said

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

that the law surrounding fossil exports from Brazil wasn't always enforced in the 1970s and 1980s (which the new team says is no excuse for violating the law).

"I've got no problem with these fossils going back to Brazil, provided Brazil doesn't burn its museums down," Martill said. "I mean, they had that massive tragedy when their Museum of Natural History in Rio [de Janeiro burned down."

But it's unlikely that the 2018 fire played a role in this case, the new study's authors said. "Unless Dr. Martill is prescient, I have a hard time believing he was predicting future museum fires while standing in a private museum in Solnhofen seeing the fossil for the first time two or three years before his 2015 paper," Caldwell told Live Science in an email.

Others supported the fossil's return to Brazil.

"I agree when the authors state how important it is to the fossil to be returned to a public research institute in Brazil," Gonçalves Augusta said. "Fossils are a significant part of a country's heritage, and they should be available for any scientific study, which is not the case for Tetrapodophis at this moment."

Originally published on Live Science.

livescience.com, 28 November 2021

https://www.livescience.com

Mefentanyl: Fentanyl's evil cousin

2021-11-29

Remember when the term "designer drug" was used in the 1980s? One of the drugs included in that group was called 3-methylfentanyl, aka, mefentanyl. Although not widely used, it killed groups of people who tried it. Fast forward 4 decades and it's now one of the 30 fentanyl analogs that are responsible for the fentanyl crisis. And it's also one of the worst. What a difference a methyl group can make.

In a sense, we are fortunate. That is if you can call 100,000 overdose deaths per year, mostly due to fentanyl, fortunate. I say this because things could be far worse; the addition of just one little methyl group and fentanyl becomes mefentanyl aka 3-methylfentanyl – an entirely different beast. It's also called "China White." (1)

It is more potent than fentanyl and more dangerous. How much more so? A lot.

If you look at the chemical structures of the two, you might conclude that they are more or less the same drug. They sure look alike (Figure 1).

But, as any competent medicinal chemist will tell you, the absence or presence of one carbon atom, even within a much larger molecule, can make quite a difference. Here are two other examples (Figure 2).

Some facts about mefentanyl

It is more potent than fentanyl and more dangerous. How much more so? A lot. Consider the following.

- Binding

Binding experiments can only tell you so much about a drug, but here's one that tells you plenty. A 1991 study published in the journal Neuropharmacology examined mefentanyl's crazy-high potency (more on that later.) The NIH researchers found that when mefentanyl was incubated with opioid receptors and then the drug washed off (a typical procedure for binding experiments), some of the mefentanyl stayed behind. This is not typical; fentanyl, as well as several other analogs, washed off the receptors. The authors used the term "pseudo-irreversible inhibition" and speculated that this "might contribute to the extraordinary potency" of the drug. Although binding experiments may or may not correlate with the strength of an opioid, it seems likely in this case.

- Most antibody detection methods for fentanyl fail for mefentanyl

It's a damn good thing that mefentanyl isn't one of the common fentanyls pouring into this country. Both because of its potency and as a recent paper in the Journal of Analytical Toxicology concluded, antibody-based detection methods (such as the standard (2) fentanyl test strips) do not effectively detect mefentanyl – something that would not be intuitively obvious to a chemist. This is more than a bit strange. Some highlights from the paper demonstrate the strangeness. For example, most analogs that differ only by the group attached to the amide carbonyl (green arrow) were recognized by the antibodies that detect fentanyl (Figure 3). (Acetylfentanyl, second from the left, is one of the common fentanyl analogs circulating in the US. It is similar to fentanyl but weaker.)

But this trend does not necessarily hold up for other fentanyl analogs that differ by the addition of one methyl group. The fentanyl strips detect both alpha-methylfentanyl (Left) and 4-methyl-acetyl fentanyl, (2) but 3-methylfentanyl (mefentanyl) is only "modestly detected." This is why we

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

are "fortunate." Imagine if a much more potent analog of fentanyl widely circulating in the US with no way to detect it preemptively. Nightmare. (3)

How much stronger is mefentanyl?

Unfortunately, this question has no simple answer because the drug consists of four different 3-methylfentanyl isomers, each with a different profile. Because I like most of you (and am not in the mood to hang myself), I will not segue into a discussion of stereochemistry – a truly hideous but essential facet of organic chemistry. You're just going to have to assume that I know what I'm talking about – perhaps a stretch – and accept that there are four of the SOBs that make up what is called 3-methylfentanyl. But their real chemical names are all different, so I'm just going to focus on the most potent one, which has the unfortunate name of N-[(3R,4S)-3-Methyl-1-(2-phenylethyl)-4-piperidinyl]-N-phenylpropanamide, aka cis-(+)-3-methylfentanyl. Its potency is scary [emphasis added].

The median effective dose (ED50) of cis-(+)-2, which is the most potent among the four isomers, was found to be 0.00767 mg/kg (in mice, ip., hot plate) with 2600 times as potent as morphine (4)

Wang ZX, Zhu YC, Chen XJ, Ji RY. [Stereoisomers of 3-methylfentanyl: synthesis, absolute configuration and analgesic activity]. Yao Xue Xue Bao. 1993;28(12):905-10. Chinese. PMID: 8030414.

Oh, my. Since the potency of fentanyl is routinely given as "50-100 times stronger than morphine," let's call it 75-times. This would make mefentanyl something like 35-times more potent than fentanyl. This puts mefentanyl close to the potency of carfentanil – the elephant tranquilizer.

These numbers are consistent with the relative blood levels of the drugs measured in overdose victims. A 2020 review reported that the mean blood concentration in people who died from fentanyl was 24 ng/mL while the concentration of mefentanyl in three overdose victims was 0.5 ng/mL, suggesting a ~50-fold difference in potency between the two drugs.

Let's split the difference and assume that mefentanyl is 40-fold more potent. Since a lethal dose of fentanyl is 2 mg this would make the lethal dose of 3-methylfentanyl 0.05 mg (50 micrograms). You cannot possibly see .05 mg of anything. Want proof? A grain of salt weighs 0.3 mg. If you're Superman maybe you can see one-sixth of a grain of salt.

Or not...

Mefentanyl and Chechen terrorists?

Perhaps you remember the 2002 hostage crisis in Moscow where Chechen terrorists stormed a theater and held 800 people – a full house – hostage, demanding an independent Chechnya. Vladamir Putin's handling of the hostage situation was not subtle. Russian special forces pumped a really powerful narcotic gas into the theater, which certainly ended the standoff but left 120 hostages dead. The Russians were not forthcoming about what drug they used, leading to speculation at the time that it was mefentanyl. Some history books say it was fentanyl. Both are wrong. An analysis of two clothing samples and one urine sample of survivors showed a mixture of carfentanil and remifentanil. This makes sense since both drugs have medical uses and were commercially available, while mefentanyl, which was referred to as a "designer drug" at that time, has no approved medical use.

Bottom line

I have written before that the combination of chemistry and biology to understand the behavior of drugs is endlessly fascinating. Seemingly small changes in structure can result in substantial differences in drug properties. The comparison of fentanyl and mefentanyl is a quintessential example of structure-activity relationships – the cornerstone of drug discovery.

NOTES:

(1) Other drugs are also referred to as "China White," including heroin and fentanyl. And a Benjamin Moore paint color.

(2) 4-Methylfentanyl, the direct comparator to fentanyl, was not one of the analogs tested, so I used the 4-methyl-acetylfentanyl instead.

(3) A new product from an organization called Dance Safe claims that its test strips do detect 3-methylfentanyl. Of course, thanks to our idiotic drug laws, fentanyl test strips are illegal. See Fentanyl Test Strips Are Illegal. This Is Obscene.

(4) The paper reads "(ED50) of cis-(+)-2," but it clearly refers to 3-methyl fentanyl. I don't know if this is a typo error or the authors are using a different numbering system.

acsh.org, 29 November 2021

https://www.acsh.org

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

Exquisitely-preserved mammoth tusk found 10,000 feet underwater

2021-11-30

Researchers have discovered a Columbian mammoth's (Mammuthus columbi) tusk 185 miles (300 kilometers) off the coast of California. Scientists estimate that the tusk, which was found at a depth of about 10,000 feet (3,070 meters), is well over 100,000 years old.

"You start to 'expect the unexpected' when exploring the deep sea, but I'm still stunned that we came upon the ancient tusk of a mammoth," Steven Haddock, a marine biologist at the Monterey Bay Aquarium Research Institute (MBARI) and one of the researchers who found the tusk, said in a statement.

PLAY SOUND

In 2019, Haddock and submersible pilot Randy Prickett, also with the MBARI, were scanning the deep ocean off California using a remotely operated vehicle (ROV) when they came across a strange object: a 3-foot-long (1 m) tube that looked suspiciously tusk-like. The pair tried to collect the object, but they were initially only able to obtain a small piece that broke off from the tip, The New York Times reported.

From this fragment, researchers found that the object was a tusk from a female mammoth. But they couldn't confirm how old it was or pinpoint the exact species.

Two years later, Haddock and Prickett returned to the site with a full team of paleontologists and genomics experts. This time, using the ROV's robotic arm, they collected the entire tusk, which was coated in a thick black crust of naturally deposited iron-manganese. Preserved mammoth tusks are usually discovered in Arctic permafrost, but in this instance, the combination of very cold water and high pressure acted like a refrigerator for a slab of meat, keeping the tusk in relatively pristine condition for thousands of years, according to Insider.

"If the tusk had been found on land, deciphering its history would not be as straightforward," Terrence Blackburn, a geologist at the University of California, Santa Cruz (UCSC) who was involved in the research, said in a statement.

Thanks to its exquisite preservation, the scientists were able to recover DNA from the tusk's inner tissue. Katherine Moon, a paleogenomicist at UCSC, called this the team's "'Jurassic Park' moment" in an interview with

From this fragment, researchers found that the object was a tusk from a female mammoth.

the New York Times. So far, the team has determined the mammoth's species, sex, age at death, and even its geographic range during its lifetime. The results are not yet published.

Thousands of similar discoveries may await scientists on the deep ocean floor. But human activities, such as undersea oil drilling, have the potential to destroy these natural treasures.

"In this really unique, underexplored and largely underappreciated environment, there is a lot of value in having habitat that is undisturbed," Haddock told the New York Times.

Originally published on Live Science.

livescience.com, 30 November 2021

https://www.livescience.com

Mango season is here but be warned—a small squirt of its sap is enough to lang you in hospital

2021-11-28

The humble mango. It's delicious, it's nutritious, and it grows in abundance in Australia.

It could also land you in hospital.

Georgia Carter knows this from painful experience. She's a victim of "mango burn".

The rash or burn occurs when fruit sap squirts onto exposed skin, leaving huge welts, pustules and scabs.

About 10 years ago, 77 workers in the Northern Territory found this out the hard way, ending up in Katherine Hospital with mango burns.

Georgia's experience was so bad it sent her to hospital.

"I think the problem was that I had put the mangoes in my front pockets, all over me ... I didn't even think that would happen," she said.

A day later, Georgia noticed a small mark near her collarbone.

"It genuinely started looking like I had burnt it with a [hair] straightener. That's what it first looked like, but over the next few days it kept spreading and getting worse and worse," she said.

It took Georgia a few days to figure out that the rash came from sap.

The rash or burn occurs when fruit sap squirts onto exposed skin, leaving huge welts, pustules and scabs.

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

While backstage at the popular Kimberley Girl fashion show, the humidity in the air made her rash unbearable.

"It was so itchy and horrible; it was all over my neck and throat and everything was swollen."

"I was on the headset like, 'OK I think I need to go to hospital,'" she recalled.

After a three-hour wait in the emergency department, she was discharged and given some medication to ease the flare-up, but it didn't help.

"It kept spreading over the weekend. Luckily, I went to the Broome Regional Aboriginal Medical Service, and they gave me everything I needed, like steroid cream."

President of the Rural Doctors Association of Western Australia Brittney Wicksteed said mango rash was also common in the Kimberley.

"it's not something we necessarily get taught a great deal about in medical school, but I think any doctor who's worked up in the Kimberley learns about it in their first week or two," she said.

"It's essentially a form of contact dermatosis, it's quite common for people to have an allergy to the sap itself ... if you do get mango sap in your eyes, I'd advise you seek medical treatment right away."

Chris Robinson has run a mango orchard in Kununurra for around thirty years, and he learnt quickly that sap burns aren't just painful, they're also unprofitable.

"Mangoes that get sap squirted onto them, they will burn, and they will become unmarketable from a week or ten days later. It does the same thing to your skin ... you learn very quickly to not burn the mangoes, or yourself," he said

"You gotta take them off with long stems. We've developed a technique to avoid sap burn but it still does happen occasionally, and we suffer through it."

For Georgia, there's a small white scar on her neck, but that's not the only thing that she's been left with. The fear of going through the pain again has left her anxious when it comes to eating the fruit.

"Everyone should know how much it hurts, it's like a full-on burn and not fun at all. The thing is people might not realise it's mango sap as well; it came up a day later and I didn't even realise what it was."

Dr Wicksteed says burns aren't the only mango-related emergency incidents she sees.

"Mango rash is the most common one, but up in the Kimberley you do get the odd person hit on the head by the odd mango or coconut coming through the door."

abc.net.au, 28 November 2021

https://www.abc.net.au

First child's skull of a Homo naledi unveiled

2021-11-05

The first partial juvenile skull of the enigmatic species Homo naledi has been found deep in a cave in South Africa, Science News reports. Researchers found 28 pieces of an orange-size skull and six teeth, which belonged to a small child who lived 240,000 to 335,000 years ago, they report this week in PaleoAnthropology. Although the teeth and bones of almost two dozen other H. naledi individuals have been found in the depths of the Rising Star cave system since the first were uncovered in 2015, the child's skull was found alone in a narrow fissure, and no remains of its body have been recovered. That location—and the lack of evidence that it was moved by animals or washed into the cave by water—suggests it was buried there by other members of H. naledi, the authors write; that idea is controversial.~sscience.org, 5 November 2021

https://www.science.org

Only two out of 11 herbicide studies given to EU regulators deemed 'reliable'

2021-11-26

Only two out of a group of 11 industry studies given to European regulators in support of the re-approval of the main ingredient in Roundup herbicide are scientifically "reliable", according to a new analysis of corporate-backed studies on the chemical glyphosate.

Glyphosate is the world's most widely used herbicide and is not only the main ingredient in Roundup herbicide but also in hundreds of other products. It is extensively used by farmers in growing common food crops.

In a report released on Friday, researchers from the Institute of Cancer Research at the Medical University of Vienna in Austria said their review of a set of safety studies submitted to EU regulators by Bayer AG and a

Researchers found 28 pieces of an orange-size skull and six teeth, which belonged to a small child who lived 240,000 to 335,000 years ago, they report this week in PaleoAnthropology.

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

coalition of other chemical companies showed that the vast majority do not meet current international standards for scientific validity.

While two of the corporate studies were considered reliable, six were considered partly reliable and three were not reliable, according to the report.

The "reliable" studies were from 2016 and 2020 and both were sponsored by Monsanto, the original patent holder on glyphosate and maker of Roundup. Those considered not reliable were done more than a decade ago: two were sponsored by the former DuPont Co and one by the plant biotechnology firm Verdia Inc.

The corporate studies analyzed in the report concern the genotoxic properties of glyphosate. The companies maintain that glyphosate is not genotoxic, meaning it doesn't cause DNA damage, which is a well-recognized factor in cancer development.

But Siegfried Knasmueller, the lead author of the report, told the Guardian that not only are most of the studies lacking in quality, but that the industry research does not include new and "probably better tests for the detection of genotoxic carcinogens". He said there is evidence in published research that glyphosate may cause DNA damage in human-derived liver cells.

He said that while several industry studies were "correct from a methodological point of view at the time when they were conducted", they are "not in agreement with the current strategy".

In July, Knasmueller authored a similar report looking at 53 glyphosate studies submitted to regulators.

The new report alleging flaws with the corporate glyphosate studies comes at a critical time as the European Chemicals Agency (ECHA) and the European Food Safety Authority (EFSA) are evaluating whether or not to renew the license for glyphosate in the EU when current approval expires 15 December 2022.

In August, authorities from France, Hungary, the Netherlands and Sweden weighed in on the renewal question with a draft report concluding that glyphosate is not carcinogenic.

ECHA and EFSA allowed other "interested parties" to consult on the renewal question until 22 November. The Knasmueller analysis, which was

requested by the SumOfUs non-profit advocacy group, was submitted as part of that consultation.

An ECHA spokesperson declined to comment on the Knasmueller report. The agency said it would "develop its opinion" on the glyphosate classification by June. An EFSA spokesperson said the Knasmueller report would be considered alongside all other comments submitted as part of the consultation.

Bayer, the lead registrant for the European renewal request, also did not offer a comment on the report.

Two independent scientists asked about Knasmuller's report said it is not surprising that studies done years ago may not meet current guidelines, but that would be true of independent studies as well as corporate studies. They also said such studies should not necessarily be ignored.

For the last few years there has been a heated global debate about whether or not glyphosate herbicides such as Roundup should be restricted or banned because some scientific research shows that exposure to the weedkiller causes health problems.

In 2015 the World Health Organization's International Agency for Research on Cancer pointed to several independent research studies in concluding that there was strong evidence of genotoxicity with the weedkiller, and glyphosate should be considered a probable human carcinogen.

Bayer, which bought Roundup maker Monsanto in 2018, denies there is any valid evidence the herbicides cause cancer. But the company has agreed to pay about $14bn to settle US litigation brought by more than 100,000 Roundup users alleging exposure to the weedkiller caused them to develop non-Hodgkin lymphoma. Bayer has also agreed to stop selling glyphosate to US consumers by 2023.

The report by Knasmueller and colleague Armen Nersesyan underscores growing concerns about a history of regulatory reliance on corporations to provide safety studies on the chemicals they are making and selling. A new system should be developed to eliminate corporate bias that could influence results, many scientists say.

"The government shouldn't rely on industry studies," said Peter Infante, former senior epidemiologist and director of the US office of carcinogen identification and classification for the Occupational Safety and Health Administration. "If the industry wants to do studies they should put the

CHEMWATCH
Bulletin Board
Gossip
DEC. 03, 2021

money into a pool and distribute it to independent scientists that don't have conflicts of interest. That is the way it should be."

theguardian.com, 26 November 2021

https://www.theguardian.com

Why are trees dropping so many nuts? Climate may drive erratic 'masting'

2021-11-23

Stroll the sidewalks of the eastern United States this fall and you might think you're walking on ball bearings, as a bumper crop of acorns rolls under your feet. Pine and spruce drip with cones, and rafts of maple seeds twirl toward the ground. This is a mast year, in which tree species reproduce prolifically and in sync, creating a bounty that will reverberate through the ecosystem for years.

The phenomenon mystifies and awes ecologists. "It seems like a superorganism that covers the entire continent that takes a big breath every couple of years," says Michał Bogdziewicz, a forest ecologist at Adam Mickiewicz University in Poland.

Now, they are exploring a once-ignored idea about its trigger: that masting occurs in years when seeds are likely to have favorable weather for sprouting the next spring or even in the next year or two. It's not that trees have crystal balls. Instead, researchers suggest trees are alert to large-scale, long-term climate patterns, which can cause, for example, wet weather one month and dry weather months or a year later.

The basic idea dates back decades, but until recently, scientists have had little luck correlating major climate oscillations with masting. Now, inspired by the potential of a large database that will be published early next year, a group of researchers has explored this idea, called the environmental prediction hypothesis, in several papers appearing in the 1 December issue of the Philosophical Transactions of the Royal Society. If climate swings are as important as this hypothesis suggests, "we could have the basis for a large-scale 'pacemaker' of global forest ecosystem dynamics," says plant ecologist Andrew Hacket-Pain of the University of Liverpool, lead developer of the database. "This would be a tremendously exciting result, and we now have the data in place to test it."

By concentrating resources, masting has powerful impacts on species, including humans. In some years, beech and spruce mast together throughout Europe. The seeds—up to 500 per square meter from beeches—dump enough organic matter to effectively double the nitrogen in the ground, fueling fungal and microbial growth. Rodent densities soar, followed within 1 year by rising numbers of predators like foxes and owls.

In upstate New York, 2018 was a big mast year. The bounty of acorns caused white-footed mice to surge in 2019—and Lyme disease–

"It seems like a superorganism that covers the entire continent that takes a big breath every couple of years[.]"

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

transmitting ticks to proliferate in 2020. "That sequence is something seen over and over" across the globe, says Richard Ostfeld, a disease ecologist at the Cary Institute of Ecosystem Studies. In Switzerland, for example, a study published in 2020 found an 82% rise in infected ticks 2 years after a big masting year.

Researchers have tried to explain masting for decades. They have noted, for example, that by overwhelming mice, squirrels, and other seed predators, masting helps ensure that at least some seeds survive. Other scientists have suggested fluctuations in nutrient availability and even sunspot activity might trigger it. But Davide Ascoli, a forest management ecologist at the University of Turin, wondered whether large-scale climate patterns might be at work, as earlier biologists had hinted.

So he, Hacket-Pain, and colleagues compiled 17,000 records, some going back centuries, of nut production in beeches and cone production in Norway spruce, creating a database called MASTREE. Comparing the data with climate records, they found masting events in beeches coincided with climate patterns produced by the North Atlantic Oscillation (NAO), in which high and low air pressure flip-flops between the eastern United States and Europe. The seesaw affects the jet stream and weather, with the "positive" NAO phase favoring both masting and seedling growth in the eastern United States and Central and Northern Europe, as he, Giorgio Vacchiano from the University of Milan, and colleagues reported in 2017 in Nature Communications.

Tracking years of plenty

European beeches produce piles of nuts during high mast years (orange), synchronized across Northern and Central Europe. That's also often when the positive phase of the North Atlantic Oscillation (NAO) brings warm, wet winters and dry springs to the region. The opposite climate pattern often leads to masting failures (teal), suggesting the decadal trend in masting (wavy line) is led by this climate oscillation.

Trees have good reason to track major climate oscillations, Ascoli argues. For example, in the NAO+ phase, warm wet winters favor seed production and dry springs favor seedling growth. In North America, conditions fostered by the El Niño-Southern Oscillation (ENSO) can promote both masting in white spruce and forest fires, which open up space for seedlings to grow. For the special issue, the team tracked down about 40 studies that support the environment prediction hypothesis to some degree. Their synthesis suggests the NAO and ENSO help synchronize masting in temperate and tropical regions, says Akiko Satake,

a mathematical biologist at Kyushu University, who was not part of the work.

Satake saw a link between climate patterns and reproduction in her own study in Southeast Asia. Common timber trees in the family Dipterocarpaceae in Malaysia appear to respond to the weather created by ENSO, with several species responding simultaneously in what's called general flowering. Satake and colleagues compared weather data with 14 years of data on flowering and seedling growth for five species. El Niño events brought cool, dry weather in January and February, which prompted general flowering in spring, followed by wet fall weather that encouraged seedling survival in those species, the researchers reported last year in BioTROPICA. The ENSO is "driving flowering cues through space and time," Satake says.

The researchers make a good evolutionary argument, adds Gabriela Marie Garcia, a graduate student at Tufts University. Because the climate modes align conditions for seed germination and flowering, natural selection could favor individuals that flower in sync with those modes.

However, the environmental prediction hypothesis doesn't explain all masting, cautions Mario Pesendorfer, an ecologist at the University of Natural Resources and Life Sciences, Vienna. Another idea—that a burst of nuts uses up so many resources that it takes a tree more than 1 year to restore them—can also help explain why masting is erratic, says Tufts ecologist Elizabeth Crone, whose work backs that idea. And David Kelly, an ecologist at the University of Canterbury who studies masting in alpine grasses, says environmental prediction is "an appealing idea that doesn't work."

He says masting in many species doesn't match the big climatic patterns. He agrees selection could, in principle, favor plants that made accurate predictions, but he points out that even the best supercomputer can't forecast weather months ahead. "There's nothing for selection to work on if predictions are just not possible," he says.

Instead, he has another hypothesis related to weather. He works in New Zealand, where southern beech trees turn hillsides red with blossoms during masting events and produce a bounty of nuts. The next spring, introduced mice multiply; later, so do the introduced stoats that prey on them. Once the beech nuts are gone, the mice dwindle, and conservationists have to poison the stoats so they don't kill native birds.

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

Kelly thinks summer temperatures orchestrate this ecological dance. He suggests they temporarily modify a plant's DNA—a process called epigenetics—such that the plant "remembers" how hot the weather was the previous summer. For some reason, masting occurs when the second summer is much warmer than the previous summer, he says. He's transferring alpine grasses to different elevations and therefore temperatures to test his idea. Already, he has shown that temperature can predict when beech masting will occur and stoat control will be needed.

More data on the global waves of tree reproduction could help winnow the ideas. At Duke University, researchers have developed the Mast Inference and Prediction database, which compiles annual masting data from research plots, most of them in the United States. And Hacket-Pain and Ascoli's team is building a new database, MASTREE+, with 65,000 records on 715 species across 63 countries. To be published in Global Change Biology, it's "the most comprehensive plant reproduction database that exists," says Jalene LaMontagne, a population ecologist at DePaul University. Researchers are using it to see how species vary in the intensity and geographic extent of their masting and whether climate change is breaking down masting patterns.

Meanwhile, don't slip on the acorns.

science.org, 23 November 2021

https://www.science.org

How the jerboa got its enormous feet

2021-11-24

With its large ears and whiskered nose, you'd be forgiven for mistaking the jerboa for a mouse … at least from the stomach up. The animal's legs are another story, with gigantic feet that enable it to hop like a kangaroo through hot desert environments in Africa and Asia. Now, researchers say they may have figured out how these stunning appendages evolved.

Now, researchers say they may have figured out how these stunning appendages evolved.

The insight comes thanks to a comparison of the "transcriptome"—essentially the sum total of all of the genes being used at a given time by an organism—from mice and jerboas, creatures separated by about 55 million years of evolution. Researchers started with an appendage that's similar between the two: their forelimbs, or arms. By comparing the messenger RNA (mRNA) made by cartilage cells in developing mice and jerboas' arms, the team aimed to establish a baseline set of genetic differences between the two animals that probably weren't related to the

jerboas' big feet. (To make a protein, an active gene first makes an mRNA "transcript.")

Then, the scientists looked at cartilage cells from the two animals' growing feet. From those transcriptomes of mouse and jerboa feet, they were able to narrow the pool of potential genes tied to foot size down by 90%, leaving a total of 1755.

Finally, the researchers used a series of so-called network analyses to try to pinpoint which genes might have outsize effects in shaping the jerboa's feet. Scientists have been cataloging genes, their function, and what chemical pathways they influence in the body for decades now. But nothing operates in a vacuum in the cell. Most every pathway is intertwined with others, and the end result is the product of many gene networks operating in parallel and individual genes that have many associations with others.

The total picture painted by the jerboa network analysis is one that highlights how complex the developmental process is. There is no one gene responsible for the rodent's feet, but many different, overlapping networks of genes, the researchers report this month in Current Biology. "It's like pulling on a ball of spaghetti," says study author Kim Cooper, a developmental evolutionary biologist at the University of California, San Diego. "You pull on one spot and everything that's connected to it is going to move, too."

Still, there were some spaghetti strands that were particularly important. The team identified a gene called shox2, for example, that is expressed in the jerboa feet, but not in mouse feet. Shox2 makes a transcription factor, a protein that dictates what other genes are turned on or that specifies what part of a gene's DNA is actually made into protein. Transcription factors can have huge cascading effects that change whole networks of genes, and shox2 has previously been shown in humans to be associated with diseases such as Turner syndrome, which causes short stature and disproportionate limbs.

Other genes with different expression in the jerboa were ones that are ordinarily associated with turning off bone growth in mice. This type of "cutting the brakes" approach seems to be another key component of the jerboa's huge hindlimbs, the team reports.

The paper's network analysis illustrates a new way of trying to understand the genetics behind a biological process, says Henry Kronenberg, an endocrinologist at Massachusetts General Hospital who specializes in

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

bone development but who was not involved in the study. Most of our understanding of gene function relies on mutations and knocking genes out, he notes. Here, however, the authors have leveraged the evolutionary changes between two animals to try to uncover the genes involved in a physical difference, he says. "I thought it was quite a virtuoso performance."

science.org, 24 November 2021

https://www.science.org

Albatrosses divorce more often when ocean waters warm

2021-11-23

When it comes to fidelity, birds fit the bill: Over 90 percent of all bird species are monogamous and — mostly — stay faithful, perhaps none more famously than the majestic albatross. Albatross couples rarely separate, sticking with the same breeding partner year after year. But when ocean waters are warmer than average, more of the birds split up, a new study finds.

But when ocean waters are warmer than average, more of the birds split up, a new study finds.

In years when the water was warmer than usual, the divorce rate — typically less than 4 percent on average — rose to nearly 8 percent among albatrosses in part of the Falkland Islands, researchers report November 24 in Proceedings of the Royal Society B. It's the first evidence that the environment, not just breeding failure, affects divorce in wild birds. In fact, the team found that during warmer years, even some females that had bred successfully ditched their partners.

The result suggests that as the climate changes as a result of human activity, higher instances of divorce in albatrosses and perhaps other socially monogamous animals may be "an overlooked consequence," the researchers write.

Albatrosses can live for decades, sometimes spending years out on the ocean searching for food and returning to land only to breed. Pairs that stay together have the benefits of familiarity and improved coordination, which help when raising young. This stability is particularly important in dynamic, marine environments, says Francesco Ventura, a conservation biologist at the University of Lisbon in Portugal.

But if breeding doesn't work out, many birds — mostly females — leave their partner and try to find better luck elsewhere (SN: 3/7/98). Breeding is more likely to fail in years with more difficult conditions, with knock-on

effects on divorce rates the following years. Ventura wanted to find out whether the environment also has a direct impact: changing the rate of divorce regardless of whether the breeding had gone well.

Ventura and his team analyzed data collected from 2004 to 2019 on a large colony of black-browed albatrosses (Thalassarche melanophris) living on New Island in the Falkland Islands. The team recorded nearly 2,900 breeding attempts in 424 females, and tracked bird breakups. Then, accounting for previous breeding success in individual pairs, the researchers checked to see if environmental conditions had any noticeable further impact on pairings.

Breeding failure, especially early on, was still the main factor behind a divorce: Each female lays just a single egg, and those birds whose eggs didn't hatch were over five times as likely to separate from their partners as those who succeeded, or those whose hatched chicks didn't survive. In some years, the divorce rate was lower than 1 percent.

Yet this rate increased in line with average water temperatures, reaching a maximum of 7.7 percent in 2017 when waters were the warmest. The team's calculations revealed that the probability of divorce was correlated with rising temperatures. And surprisingly, females in successful breeding pairs were more likely to be affected by the harsher environment than males or females that either didn't breed, or failed. When ocean temperatures dropped again in 2018 and 2019, so did divorce rates.

Warmer water means fewer nutrients, so some birds may be fueling up out at sea for longer, delaying their return to the colony or turning up bedraggled and unappealing. If members of pairs return at different times, this can lead to breakups (SN: 10/6/04).

What's more, worse conditions one year might raise stress-related hormones in the birds too, which can affect mate choice. A bird may incorrectly attribute its stress to its partner, rather than the harsher environment, and separate even if hatching was successful, the researchers speculate.

Such misreading between cues and reality could make separation a less-effective behavior, suggests Antica Culina, an evolutionary ecologist at the Netherlands Institute of Ecology in Wageningen who was not involved in the study. If animals divorce for the wrong reason and do worse the following season, that can lead to lower breeding success overall and possibly population decline.

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

Similar patterns could be found in other socially monogamous animals, including mammals, the researchers suggest. "If you imagine a population with a very low number of breeding pairs … this might have much more serious repercussions," Ventura says.

sciencenews.org, 23 November 2021

https://www.sciencenews.org

What is the speed of sound was as fast as the speed of light?

2021-11-28

The clouds are hanging low on the horizon; the air is sticky and sizzling with electricity. Suddenly, a silent bolt of lightning cracks open the sky. The boom follows a full four seconds later.

Compared with light, which moves at a stunning 186,000 miles per second (300,000 kilometers per second), sound waves are downright sluggish, moving through air at 0.2 miles per second (0.3 km per second). That's why you see lightning before you hear the thunder. But what would happen if the speed of sound suddenly were a million times faster — the same as the speed of light?

But what would happen if the speed of sound suddenly were a million times faster — the same as the speed of light?

Of course, thunder would reach you at the precise moment of lightning. But that bolt of lightning would also look pretty eerie. Sound waves are composed of particles, each moving slightly enough to collide into the next. That creates areas of higher and lower density within the wave, said George Gollin, a professor of physics at the University of Illinois at Urbana-Champaign. Just think of a slinky: as the toy moves, the coils continually bunch together and then spread out again. Sound waves are similar. At slow speeds, that change in density is imperceptible. At the speed of light, it's a different story. PLAY SOUND

"What would happen is you have pretty humid air [during a lightning storm], the sound wave comes through and squeezes stuff really hard, and then expands out and the pressure drops a lot," Gollin told Live Science. Because pressure corresponds to temperature, the sudden drop in air pressure after a clap of thunder would cause the humid air to freeze. You'd see the lightning bolt through a dense fog of ice crystals.

An ultra-fast speed of sound would completely change the way our world sounds. Voices would sound particularly strange, Gollin said. When we speak, our vocal cords vibrate to produce sound waves of many different

frequencies, pumping them into the larynx, or voice box. There, waves of the same frequency add together to produce much bigger waves — which translates to louder sound. However, not all frequencies add together in the same way. Some sync up perfectly, while others actually interfere with one another, producing a smaller wave and a quieter sound. If the sound moved faster in air, it would change the way waves added together, making certain frequencies louder and others quieter. In sound waves, frequency translates to pitch, so what you get is a very odd sounding voice.

To get a sense of what we'd sound like in a universe where the speed of sound moved ultra-fast, imagine how you sound when you take a deep breath out of a helium balloon — like Mickey Mouse. That's because sound waves move three times faster through helium, said William Robertson, a professor in the department of physics and astronomy at Middle Tennessee State University. "And we're talking about making the speed of sound a million times bigger," Robertson said.

And if the speed of sound were to suddenly speed up, it would wreak havoc on orchestras, Robertson said. When sound moves back and forth inside the cavity of an oboe or a trumpet, it produces a standing wave. These standing waves behave like those heavy ropes you see tethered to the wall at the gym. When a weight-lifter shakes them fast enough, waves begin oscillating up and down without appearing to travel across the rope. As the ropes are shaken faster and faster, the number of waves — in other words, their frequency — increases. Similarly, when the sound waves produced by wind instruments increase in speed, they increase in frequency. Because higher frequency means higher pitch, wind instruments would produce sounds so high in pitch, they'd be impossible for humans to hear. We would have to design wind instruments to be a million times longer to keep them in tune with the violins and cellos, Robertson said. (A change in the speed of sound as it moves through air wouldn't change the speed of sound along a string, he added.)

Alas, humans wouldn't survive to experience these spectacular changes. Even the soft whistle of a flute would blast anything in its vicinity to smithereens. Light travels in electromagnetic waves, which aren't composed of matter, but sound waves are mechanical — composed of particles colliding into one another. A molecule traveling at the speed of light would have "nearly infinite energy," Gollin said. It would blast through every particle it encountered, sending electrons flying and producing a "spray" of matter and antimatter — particles generated in ultra-high speed collisions that have properties opposite to those of matter.

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

"The effects would just be extraordinary," Gollin said.

Editor's note: Updated at 2:09 p.m. EST Nov. 30 to correct the article's explanation of how vocal cords and the voice box produce sound.

Originally published on Live Science.

livescience.com, 28 November 2021

https://www.livescience.com

Corals may stores a surprising amount of microplastics in their skeletons

2021-11-29

A surprising amount of plastic pollution in the ocean may wind up in a previously overlooked spot: the skeletons of living corals.

Up to about 20,000 metric tons of tiny fragments called microplastics may be stored in coral skeletons worldwide every year, says ecologist Jessica Reichert of Justus Liebig University Giessen in Germany. That corresponds to nearly 3 percent of the microplastics estimated to be in the shallow, tropical waters where corals thrive.

Corals have been observed eating or otherwise incorporating microplastics into their bodies (SNS: 3/18/15). But scientists don't know how much of the debris reefs take up globally. So Reichert and colleagues exposed corals in the lab to microplastics to find out where the particles are stored inside corals and estimate how much is tucked away.

Corals consumed some of the trash, or grew their skeletons over particles. After 18 months, most of the debris inside corals was in their skeletons rather than tissues, the researchers report October 28 in Global Change Biology. After counting the number of trapped particles, the researchers estimate that between nearly 6 billion and 7 quadrillion microplastic particles may be permanently stored in corals worldwide annually.

It's the first time that a living microplastic "sink," or long-term storage site, has been quantified, Reichert says.

Scientists are learning how much microplastic is being introduced to the oceans. But researchers don't know where it all ends up (SN: 6/6/19). Other known microplastic sinks, such as sea ice and seafloor sediments, need better quantification, and other sinks may not yet be known.

That corresponds to nearly 3 percent of the microplastics estimated to be in the shallow, tropical waters where corals thrive.

Reefs are typically found near coasts where polluted waterways can drain to the sea, placing corals in potential microplastic hot spots.

"We don't know what consequences this [storage] might have for the coral organisms, [or for] reef stability and integrity," Reichert says. It "might pose an additional threat to coral reefs worldwide."

sciencenews.org, 29 November 2021

https://www.sciencenews.org

What's the difference between arms and tentacles?

2021-11-29

Octopuses are famous for their eight sucker-covered arms, whereas squids, from giant Architeuthis dux to the appetizer-size critters served at restaurants, swim with even more appendages: eight arms and two tentacles. So, what's the difference between these different types of boneless limbs?

Squids, octopuses and their hard-shelled nautiloid relatives are all big-brained members of the class Cephalopoda. With the exception of ancient nautiloids, all living cephalopod species fall under the category of either eight-legged Octopodiformes or 10-legged Decapodiformes, and have muscular, sucker-laden arms. However, only squids, cuttlefish, bobtail squids and other members of Decapodiformes have tentacles, and only vampire squid sport stringy appendages called filaments, according to a paper published in 2017 in the Journal of Molluscan Studies. The difference between all of these cephalopods' limbs, it turns out, largely comes down to shape and sucker placement.

"The basic difference is arms have a line of suckers going down them, whereas tentacles don't have suckers until you get to the tentacular clubs, which are the kind of large part at the end," Morag Taite, a postdoctoral research associate at Aberystwyth University in Wales, told Live Science. PLAY SOUND

Broadly speaking, suckers help cephalopods adhere to or sense the world around them. For instance, having eight sucker-covered arms enables octopuses to walk, grab prey, hang onto surfaces such as coral reefs, and "taste" through a sense called chemotactility. In contrast, the more free-swimming squids use their tentacles primarily for hunting. Their tentacular clubs can also feature hooks — thick, ensconced in muscle and curved, sometimes as sharply as a fisherman's hook — which many squids use to snare prey they encounter in open water, or the water column.

So, what's the difference between these different types of boneless limbs?

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

"In the water column, they'd be feeding on things like shrimp, which are quite fast, so they need to grab them," said Taite, who employs DNA barcoding to study cephalopod evolution and family trees. "And the hooks also help them to pull the prey to them, whereas the octopods would mostly use their arms for walking."

Some squids, like colossal squid (Mesonychoteuthis hamiltoni) — which weigh a whopping 1,100 pounds (500 kilograms), almost twice as heavy as giant squid — have hooks that line both their arms and tentacles. In the case of colossal squid, which live in the cold waters of the Southern Ocean around Antarctica, the arm hooks are rigid and set into dense musculature, whereas the tentacular hooks can rotate in place. Despite that degree of armament, colossal squid are ambush predators, preferring to sit and wait for unsuspecting prey to come close enough to be grabbed. The strategy isn't restricted to squids of their size or habitat, either — Hawaiian bobtail squid (Euprymna scolopes), which average just over an inch in length, bury themselves in the sand of shallow waters, where they wait to attack shrimp, prawns and even small octopuses with their tentacles.

Even stranger than hook-filled clubs are the lengthy filaments boasted by vampire squid (Vampyroteuthis infernalis). Vampire squid are the only cephalopods that spend their entire lives in the ocean's lightless oxygen minimum zone, which occurs about 656 to 3,280 feet (200 to 1,000 meters) under the water's surface, according to the Monterey Bay Aquarium Research Institute in California. Because vampire squid live at such extreme depths, they're challenging to study — researchers discovered the function of their filaments only in 2012, as detailed in the journal Proceedings of the Royal Society B: Biological Sciences.

By using remotely operated vehicles to monitor the dietary habits of wild vampire squid and the Monterey Bay Aquarium's dark, cold room to observe the habits of collected specimens, the team learned that vampire squid use their two filaments to catch decaying matter that drifts down from shallower regions of the ocean. Vampire squid, which are named for the cape-like webbing between their arms (not their dietary habits), are more closely related to modern octopuses than to squids and spend most of their time floating on ocean currents, waiting to detect a snack with the filaments that complement their eight webbed arms.

"They can put the filaments out, and there are these hairs on them so they can move the food up towards their mouth," Taite said. Despite possessing two filaments, vampire squid typically deploy only one filament at a time, according to the 2012 study. After they retract a filament and drag it across

their arms, which secrete a mucus that binds to the foods, vampire squid gobble up the mucus-coated morsel.

Nautiloids, which have striking shells and have changed very little since they emerged more than 440 million years ago, have the most tentacles of any living cephalopod, though the appendages are morphologically different from those of their distant relatives, squids and octopuses. The "living fossils" sport close to 90 tentacles replete with adhesive ridges, rather than suckers, which they use to trap prey.

Meanwhile, like squid, cuttlefish have eight arms and two tentacles, which they rapidly deploy to catch fast-moving prey like shrimp and fish, according to a 1984 study published in the journal Behavioral Processes. And while the suckers of an octopus boast 10,000 chemoreceptors each, allowing it to taste what it touches, a cuttlefish's suckers contain only about 100 each, according to a 1996 study published in the journal Marine and Freshwater Behaviour and Physiology.

Given this variety of both form and function, Taite said it isn't really possible to compare the benefits of cephalopod tentacles and arms.

"I wouldn't say it's more like pros and cons," she said. "You can't really put them against each other because they live in different environments, so they need different methods [of survival]."

Originally published on Live Science.

livescience.com, 29 November 2021

https://www.livescience.com

Global warming is coming for our beauty bags

2021-11-22

When Nancy Gagnon, a formulator at the Designer Beauty Lab in Santa Ana, California, ventured out into a summer heat wave wearing a full face of makeup, the final look wasn't quite what she was going for: "Half of my brows melted off, leaving me looking like some character from a sci-fi movie," she recalls.

Carrying out real-world tests of cosmetics from competitor brands like this is a key part of product research for Gagnon. It's not the only time she has come across makeup that is no match for the hot spells which regularly scorch her city—and she's not alone.

"Half of my brows melted off, leaving me looking like some character from a sci-fi movie," she recalls.

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

As extreme climate events sweep the globe, melting makeup, evaporating eau de cologne, and stylers that liquefy in sunlight have become commonplace. Many of our products just aren't built for the record temperatures we've seen this summer and last summer, this winter, and the winter before. But with sweltering heat forecasts to make frequent future appearances, how will brands adapt?

At Antrim Cosmetic Solutions in Toronto—a city which broke its own heat record in June— chemist Anjali Hardikar has first noticed changes in consumer habits.

"People are leaning towards products like sheet masks and hydrating mists which provide moisture and nourishment, along with cooling relief to the skin in heat," she says. "Paper soaps and shampoo or soap bars are also well-accepted as they are not affected by heat." And while these sturdier products should see us through the heatwaves to come, other staples are a little more delicate. "Creams can break at higher temperatures, either because the water phase is lacking a water-binding agent like a polymer, or a suitable hydrocolloid, like xanthan gum," Hardikar explains. "Or, the emulsifier type or amount is not enough to keep the cream together."

Thanks to its complex blends of oils and UV filters, sunscreen, the ultimate hot weather staple, is extremely heat-sensitive. And even when our lotions and potions seem to be holding up, the actives inside them may not be. Naturally volatile essential oils can vaporize and oxidize easily, reducing beauty benefits and leaving fragrances unrecognizable. Hyaluronic acid starts to break down at around 99F, while just a day in 104-degree heat—11 degrees below the record-breaking temperatures that hit the Pacific northwest this summer—will dramatically degrade some peptides.

And if it's so hot it seems like even your lipstick is sweating, it probably is: high temperatures often cause syneresis, where the liquid part of a product gets squeezed out, leaving sweat-like droplets on the surface.

So why are our products so susceptible to the weather? "Big corporations already test their products at elevated temperatures," says Andreas Nievergelt, a pharmaceutical scientist and formulator. The problem is, in countries which aren't usually that hot, those stability tests still assume a product will be stored at a room temperature of 68-75F. This is right—most of the time. But recent weather has made it seem less like the norm.

But in some places, extreme temperatures are the new normal. Gagnon, whose company often manufactures for overseas brands, already has to

take this into account. "We've conducted projects with extreme climates or unique climate factors since day one," she says, "It's part of our basic R&D."

Formulators who create products for extreme weather often use extreme testing methods to ensure they go the distance: from incubators to simulate 122-degree heat, to hundred-mile car trips with products rattling around in the trunk. Their ingredients can differ too, often including extra, more powerful emulsifiers to help resist heat.

But manufacturers in regions which are new to extremes might be reluctant to change their formulas just yet: "If one adjusts a foundation to withstand or work at higher temperatures it will under-perform at lower, normal ones," explains Andreas, adding, "These will still be the majority of the time."

Luckily, some products are already adapted to extreme heat. "If I'm going to be in the high heat of the day, I'm going to use the longer wear formulas," says Gagnon, who frequently works on this product type. "Some formulas in this same category, you could go swimming with them on."

When it comes to moisturizer, gel creams are ideal, says Anjali, "they are very light and easily absorbed to provide a non-greasy skin feel in hot, humid climates."

For your strands, conditioners formulated for tropical climes, like Brazil and the Dominican Republic, can make heatwave haircare a little easier.

But climate change doesn't just affect what's inside the jar; containers might need to adapt too. "The main problem is high temperatures and temperature changes," Matteo Mariani, a packaging designer at the Milan-based MAIS Project tells me. "If the packaging is not designed for this, these two situations can seriously damage the integrity of the product. With plastics, "heat can change the stiffness, it can create cracks on the surface, it can change the color or the shape."

In turn, heat-damaged packaging changes the amount of air inside the product, setting off all kinds of new chemical storms. "The solution is a sealed container," says Andreas, though the extra cost might put off companies who don't already seal.

For brands who do, 'sealing' can happen at a microscopic level too: encapsulating fragile ingredients protects them from higher temperatures in the packaging, says Anjali. "Customers get the full benefit of the actives when the product is applied to the skin."

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

Meanwhile, climate change isn't just making us hotter. The rise in global temperature produces all kinds of erratic weather. This year has seen devastating hurricanes, cyclones, wildfires, and flooding which climate scientists have quantitatively linked to warming.

Droughts are yet another consequence already impacting the beauty industry, leaving many brands looking to decrease their water footprint, to ease the pressure on freshwater supplies brought low by climate change, pollution, and overuse.

"Being in California, which is having a water crisis, I have fallen in love with multi-functional products," Gagnon says. "For instance, I use a 3-in-1, rinse-free, micellar formula that was designed to not need a sink." Water-free products like dry shampoos and conditioning bars are becoming more commonplace, too, with some brands opting for face masks in tablet-form, which also prevents their products from drying out in hot weather. And where H2O can't be eliminated, ingredient manufacturers have come up with a tantalizing solution: algae-based waters. Internally filtered by the algae themselves, the water is usually a marine industry waste product but can be used to replace freshwater in cosmetics.

Still, adapting our products to resist heat and handle water scarcity isn't enough. Climate change isn't only affecting our haircare and skincare products, it's also changing our hair and skin.

Vijay Limaye is an environmental epidemiologist who investigates the health consequences of our rapidly-changing climate. He's already seen how climate change can tangle with the pollution that causes it, compounding the negative effects.

"Fossil fuels are enormously polluting to the climate and they also degrade air quality," he says. "Toxic dust can be unleashed into the environment through wildfires and powerful storms, often triggered by climate change."

That dust frequently contains particle pollutants, which break hair and breach the skin barrier. Extreme heat can push up ozone levels, multiplying free radicals which damage cells and have long been linked to wrinkles, premature greys, and hair loss. Demand for anti-pollution skincare and haircare products is already here, but the effects go much deeper: Vijay's research also reveals links between climate change, chronic disease and shorter lifespans.

This is why adapting to climate change and building resilience will only take us so far. We have to address the root causes, too.

Like others, the beauty industry relies heavily on fossil fuels. They're used to source cosmetic ingredients, run plants, transport goods, and also to create a staggering amount of plastic packaging every year. Researching emission-reducing alternatives, the MAIS team discovered several plant-based materials with better technical characteristics than plastic. "We have all the right cards to deal with this overheating," Matteo says, "but what if we take sustainability into account? The product is there, the technology is there, but the price is different, and when it comes to packaging, it becomes a main driver."

At least some major players are listening. Beiersdorfer, the makers of Nivea, are the latest to announce renewable packaging, with a pledge to go completely carbon-neutral by 2030.

Still, Andreas cautions against being lulled into a green comfort zone. "Big corporations know how to calculate or green-wash their carbon footprint," he says. "We have to change our attitude and simply produce, use and waste less."

Vijay agrees: "It's great if consumers choose green beauty products over less sustainable options," he says. "It's also wise to stop and pause before making purchases to remember that all sorts of elements of the product chain, from manufacturing to water use to transportation, distribution and disposal can have adverse environmental impacts."

So when can we expect climate-resilient, sustainable beauty products to be de rigueur? Maybe not just yet.

"Mean temperature is 'only' rising by a degree or two," Andreas notes. "Even a few heat peaks in between won't change that. While local hotspots may develop, and the extreme weather events we saw this year can happen again, I don't think that the cosmetic industry will do something in the near future. The cost for change is likely higher than living with some losses now and then."

Gagnon is more optimistic: "You have some incredible professionals in this industry who have big hearts, [who] do what they do to be a change in the industry and remain dynamic, versus making the same, dated formulas for the past 30 years." But, she admits, "change doesn't occur overnight."

elle.com, 22 November 2021

https://www.elle.com

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

Legendary New Zealand giant eagle was a killer that ate like a vulture

2021-12-01

Cave paintings in New Zealand's South Island depict the majestic bird known as Te Pouākai, or Te Hōkioi.

Key points:

- Haast's eagle lived on New Zealand's South Island until around 500 years ago
- While it had the talons and beak of an eagle, it had the head of a vulture so it was unclear whether it was mainly a hunter or scavenger
- A study reveals it killed like an eagle, but had the table manners of a vulture

According to Māori legend, the bird, thought to be Haast's eagle (Hieraaetus moorei), could swoop down and carry off adults and children.

Weighing up to 18 kilograms, or around three times as much as the wedge-tailed eagle, and with a 3-metre wingspan, it was the largest eagle that has ever lived.

While it had the talons and beak of an eagle, it had the head of a vulture, leading some people to speculate it might have been more of a scavenger than a hunter.

But either way, the bird was worthy of its fearsome reputation, according to a new study.

While it used its tiger-claw-sized talons to kill, it had the table manners of a vulture, with a skull designed to dive deep into the juicer parts of its catch, the analysis published in Proceedings of the Royal Society B found.

"This was undoubtedly the biggest, baddest eagle ever," said zoologist and study co-author Steve Wroe of the University of New England.

"It couldn't have picked you up and carried you away, unless you were a child perhaps, but there's not much doubt it could have got its talons into your brain."

A quirk of rapid evolution on island

The bird's curious mix of features is likely to have developed as a result of its rapid evolution.

Weighing up to 18 kilograms, or around three times as much as the wedge-tailed eagle, and with a 3-metre wingspan, it was the largest eagle that has ever lived.

The closest relative of Haast's eagle today is the Australian little eagle (Hieraaetus morphnoides).

"[Haast's eagle] evidently blew in from Australia sometime within the last 1 to 2 million years, then very rapidly evolved to be a giant," Professor Wroe said.

"It's probably the most extreme example of rapid evolution in size that we know of in any vertebrate.

"It's basically gone from being a 1-kilo bird to an 18kg bird."

Landing on an island with no predators, it quickly evolved features and behaviours that allowed it to rule the roost.

Until humans arrived in Aotearoa in the 13th century, the giant eagle feasted on moa, a hefty flightless bird that weighed up to 200 kilograms.

To see how it was possible to take down such a big bounty, the international team built 3D computer models of the eagle's skull and talons and simulated feeding and killing behaviours to compare its performance with that of living eagles and vultures.

The analysis showed the bird's talons could easily withstand high loads and take down prey much bigger than itself.

"Birds of prey rarely try to kill things bigger than themselves," Professor Wroe said.

"Any time you get in there and wrestle with anything bigger than yourself, you risk breaking a wing, which is almost invariably fatal for a bird."

Taking down a moa would have been risky.

"A 200kg bird would have had a hell of a kick on it," Professor Wroe said.

But it was a risk that could have paid off without any competitors, except for other eagles, to steal its food.

"If it took out a moa, it's got food for itself and its family for days."

Rather than tearing flesh by gripping it with its beak and shaking it side to side like an eagle, the bird's skull was designed to rip and pull flesh from deep inside a carcass like a vulture.

An image of the bird in the Cave of the Eagle on New Zealand's South Island also tied in with the hypothesis that the eagle had a vulture-like head.

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

"It's a very dark body but ... the head appears to be bald," Professor Wroe said.

"Vultures almost universally have bald heads, and it's almost certainly so they don't accumulate too much blood and guts in the feathers on their head, which are very hard to clean."

Despite its appearance though, Professor Wroe said the bird was still very much an eagle.

"It's an example of convergence, which is where two unrelated animals converge with respect to morphology because they've got similar habits."

Battle of the big birds

Haast's eagle was probably both a killer and a scavenger, said palaeontologist Trevor Worthy of Flinders University, who was not involved in the study.

"Like most other birds of New Zealand, they became generalists and not very specialised, so they were able to take on multiple roles," Dr Worthy said.

"It could quite happily dispense with a very large animal, but it could fly around and look for a dead one and eat that."

There is no doubt it took down moa with its talons, he said.

"I've looked at moa pelvises where you can line up great rips in the bones.

"Those claws were powerful to cut through the feathers and skin, then 5 centimetres of flesh, then 5 millimetres of the pelvis.

"Under that pelvis is the kidney, so once you start ripping that up, you die pretty quickly," he said.

But, Dr Worthy said, adult moa was unlikely to be the eagle's primary source of food.

"The moas we've seen that have been killed were already mired in a swamp, so they couldn't actually run anywhere.

"If a young moa was walking across a clearing, then the eagle could swoop down and get it, but it probably wouldn't tackle an adult moa.

"In reality, eagles are in the swamps too, which means they actually got killed in the process of dealing with a moa."

In the end, neither the eagle nor the moa were a match for humans.

Both birds became extinct around 500 years ago.

abc.net.au, 1 December 2021

https://www.abc.net.au

he Omicron variant: What we know so far

2021-11-30

On Nov. 26, the World Health Organization (WHO) named a new coronavirus variant "Omicron" and designated it as a "variant of concern."

But what makes this SARS-CoV-2 variant different and why are scientists worried about it? Because the variant has only been recently identified, there's a lot we don't know about it.

Scientists are concerned that Omicron has a very high number of mutations, many of them in genes that code for the spike protein, which the coronavirus uses to latch onto and invade human cells. Early evidence suggests that people who previously recovered from COVID-19 may have a higher risk of reinfection with Omicron compared with prior variants, according to a statement from the WHO.

PLAY SOUND

But it's not yet clear how severe or transmissible Omicron is, nor is it clear how current COVID-19 vaccines will fare against it. Experts say it's likely that the vaccines will be less effective due to these mutations, but they will likely still confer some protection. From its origin to its likely impact, here's everything we know so far about Omicron.

Origin

Officials in South Africa first reported Omicron (B.1.1.529) to the WHO on Nov. 24, following a sharp increase in cases in Gauteng province in the previous weeks. The first known and confirmed infection with Omicron was from a sample taken on Nov. 9, and now, the number of Omicron cases is rising across South Africa, according to a WHO statement.

Though South Africa was the first to report Omicron to the WHO, it's not clear what country the variant emerged from, according to NPR. Many countries have since put travel bans on many southern African countries including South Africa. "There is very little utility of these kinds of bans," Saad Omer, director of the Yale Institute of Global Health, told NPR.

Scientists are concerned that Omicron has a very high number of mutations, many of them in genes that code for the spike protein, which the coronavirus uses to latch onto and invade human cells.

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

Omicron has also been detected in Canada, Austria, Belgium, Denmark, England, France, Germany, Italy, The Netherlands, Portugal, Scotland, Botswana, Israel, Australia and Hong Kong, according to The Washington Post.

Common PCR tests can detect the Omicron variant and easily distinguish it from other variants due to a mutation in one of the three genes that the test targets. "Using this approach, this variant has been detected at faster rates than previous surges in infection," according to the WHO.

Mutations

Omicron has more than 30 mutations in the genes that code for the spike protein, according to Nature. Of these mutations, 10 are in the "receptor binding domain," or the part of the spike protein that latches onto human cells, according to The Guardian.

Meanwhile, other mutations, some of which were previously found in past variants, are "concerning" and could be linked to higher transmissibility or could help the virus evade immune defenses, according to a technical brief released by the WHO on Nov. 28.

"The likelihood of potential further spread of Omicron at the global level is high," according to the brief.

Severity

It's not yet known whether Omicron causes more severe disease compared with previous variants.

Early evidence suggests hospitalization rates are increasing in South Africa, "but this may be due to increasing overall numbers of people becoming infected, rather than a result of specific infection with Omicron," according to the WHO. Only about 24% of South Africa's population is fully vaccinated against COVID-19, according to Our World in Data.

The first reported infections in South Africa were in university students, who are "younger individuals who tend to have more mild disease." However, only about 6% of the population of South Africa is older than the age of 65, according to the Telegraph. So it's unclear whether the variant will cause more severe disease in those who are at increased risk, such as older people.

No solid evidence suggests that symptoms of Omicron differ from those of previous variants, according to the WHO.

But Dr. Angelique Coetzee, a private practitioner and chair of South African Medical Association, told the BBC that the patients she's seen so far with the new variant have had "extremely" mild symptoms.

Of the few dozen patients she's seen recently who tested positive for COVID-19, most were healthy young men who turned up "feeling so tired," Coetzee told the Telegraph. None of her patients had loss of taste or smell, and none needed to be hospitalized, according to the BBC.

However, these early anecdotal reports can be misleading and it's still too early to say whether Omicron causes milder or more severe disease than earlier variants.

Transmissibility

It's not yet clear if Omicron spreads more easily from person to person compared with previous variants.

The number of people in South Africa who have been testing positive for COVID-19 has increased in areas battling Omicron, but it's not yet clear if the rise can be explained by the spread of the new variant or other factors, according to the WHO.

Vaccine effectiveness

It's also not known how effective current COVID-19 vaccines will be against Omicron.

Most COVID-19 vaccines, including those used in the U.S., prime the immune system specifically against the spike protein. Because Omicron has many mutations in the spike protein, experts are worried that current vaccines may be less effective at training the immune system to recognize it.

"Based on lots of work people have done on other variants and other mutations, we can be pretty confident these mutations are going to cause an appreciable drop in antibody neutralization," or the ability of antibodies to attach to the viruses and stop them from invading human cells, Jesse Bloom, an evolutionary biologist at the Fred Hutchinson Cancer Research Center in Seattle, told the New York Times.

But experts told The Guardian that while vaccines may be somewhat less effective against Omicron compared with previous variants, they will probably still confer some protection.

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

"I think a blunting rather than a complete loss [of immunity] is the most likely outcome," Paul Morgan, an immunologist at Cardiff University told the Guardian."While some of the antibodies and T cell clones made against earlier versions of the virus, or against the vaccines may not be effective, there will be others, which will remain effective."

What's more, T cells, or immune cells that attack virus-infected cells, may be more "impervious" to differences among variants compared with antibodies, Danny Altmann, professor of immunology at Imperial College London told The Guardian.

Researchers around the world — including those at Pfizer-BioNTech and Moderna, the developers of the two mRNA COVID-19 vaccines widely used in the U.S. — are working to understand how effective vaccines are against the variant, according to The Times.

"If we have to make a brand new vaccine, I think that's going to be early 2022 before that's really going to be available in large quantities," Paul Burton, Moderna's Chief Medical Officer said on BBC's Andrew Marr Show on Sunday (Nov. 28). Moderna and Pfizer-BioNTech's COVID-19 vaccines are based on mRNA technology, which is quicker to develop and edit compared to previous vaccines, Live Science previously reported.

"The remarkable thing about the mRNA vaccines, the Moderna platform, is that we can move very fast," Burton said.

Originally published on Live Science.

livescience.com, 30 November 2021

https://www.livescience.com

The evidence is piling up that pregnant people should get vaccinated

2021-11-23

There's a long list of things pregnant people are taught to avoid: soft cheeses, cat feces, sushi.

So perhaps it's no surprise so many expectant mothers are wary of a new vaccine: Only 34% of pregnant women are vaccinated against COVID-19, according to estimates from the Centers for Disease Control and Prevention, even as nearly 70% of the general population has received a covid shot.

Only 34% of pregnant women are vaccinated against COVID-19, according to estimates from the Centers for Disease Control and Prevention, even as nearly 70% of the general population has received a covid shot.

But now, experts say, that needs to change.

When I wrote about my decision to get vaccinated while pregnant in April, the choice was still a hard one for many. Pregnant women had not been included in clinical trials for the vaccine, as they are almost always excluded from new drug trials. And, while waiting to amass safety data, health organizations such as the CDC recommended only that pregnant women be given the option to take it.

But since then, the safety data on vaccines and pregnancy has continued to pile up. And experts' calls for pregnant women to get the shot have grown louder and louder. In August, the CDC urged expectant mothers to get the vaccine as soon as possible.

That's because all the studies and data "have demonstrated repeatedly that the vaccine is safe and effective, has no harm to the pregnant woman herself, has no concerns for the fetus," said Dr. Geeta Swamy, a professor of obstetrics and gynecology at Duke University. "There is no reason to delay."

Hundreds of thousands of pregnant women in the U.S. have now been safely vaccinated against COVID-19. Studies have found that vaccinated women had similar miscarriage rates as unvaccinated women. And scientists have found that vaccines are working for pregnant women: Early reports show that vaccinated mothers have a lower risk of coronavirus infection as well as covid antibodies in their umbilical cords and breastmilk. This means mothers are more likely to provide some protection to newborns.

There's another reason experts' pleas to the public have grown more urgent: the ferocity of the delta variant. Pregnant women who get infected are more likely to die or give birth too early. Twenty-one pregnant women died in August alone from COVID-19, the CDC said.

"It is horrifying to watch these young, healthy women not be able to breathe and their babies lose oxygen levels," said Dr. Linda Eckert, a professor of obstetrics and gynecology at the University of Washington. "If people want to have fear, they should have fear of that and not of the vaccine."

Obstetricians know the threat has real-life consequences.

"It's simply devastating to watch a family take a baby home without the mother when you know it could have been prevented," said Swamy, noting that nearly every physician working in a major medical center has now witnessed a pregnant patient die of COVID-19.

CHEMWATCH
Bulletin Board
Curiosities
DEC. 03, 2021

Eckert said patients often bring up concerns about future infertility — fueled by online misinformation — as a reason they would not get the shot. Her typical response is two-fold. First, she tells them that naysayers have warned about infertility for every vaccine since the polio vaccine and then, she tries to answer specific concerns.

"There's just a lot of unfounded fears," Eckert said. "We have a really good understanding of how the vaccine works. We have a really good understanding of what happens to the components of the vaccine."

Major medical organizations, including the American Academy of Pediatrics and the American Society for Reproductive Medicine — which represents fertility doctors — have all recommended that prospective parents take the vaccine.

Swamy urges those hesitant to get it to talk to trusted vaccinated friends or doctors about their choice. She said she often hears the unvaccinated say they have done their own research, and she pushes back. "What does that word 'research' mean? Because in our world, research means systematic investigation to answer a scientific question," she said. "It doesn't mean reading about it."

Given the current mountain of safety data and how bad the delta variant has turned out to be, I'm confident I made the right choice to get the shot. And as far as I know, I've avoided COVID-19 infection. My baby, born earlier this summer, is happy and healthy. I'm glad to be doing my part to reduce transmission in my community.

I'm also glad to no longer be giving a second thought to cats or sushi.

publicintegrity.org, 23 November 2021

https://www.publicintegrity.org

CHEMWATCH

Bulletin Board

Technical Notes

DEC. 03, 2021

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

CHEMICAL EFFECTS

Which of the (Mixed) Halogenated n-Alkanes Are Likely To Be Persistent Organic Pollutants?

Updating the European Union's regulation on classification, labelling and packaging of substances and mixtures (CLP): A key opportunity for consumers, workers and stakeholders with interests in the legislation and toxicology of hazardous chemicals

Persistent organic pollutants (POPs) - QSPR classification models by means of Machine learning strategies

ENVIRONMENTAL RESEARCH

Toxic chemicals from uncontrolled e-waste recycling: Exposure, body burden, health impact

New Models to Predict the Acute and Chronic Toxicities of Representative Species of the Main Trophic Levels of Aquatic Environments

Environmental Health Risk Evaluation Model for Coastal Chemical Industry

Pharmaceuticals in the Environment: Just One Stressor Among Others or Indicators for the Global Human Influence on Ecosystems

OCCUPATIONAL

Short-Term Acute Exposure to Wildfire Smoke and Lung Function among Royal Canadian Mounted Police (RCMP) Officers

Body Composition, Anemia, and Kidney Function among Guatemalan Sugarcane Workers

PHARAMACEUTICAL/TOXICOLOGY

Association between Maternal Exposure to Chemicals during Pregnancy and the Risk of Foetal Death: The Japan Environment and Children's Study