CHEMWATCH

Bulletin Board

Contents

MAR. 26, 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

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

Copyright Chemwatch 2021 ©

Contents

MAR. 26, 2021

HAZARD ALERT

GOSSIP

CURIOSITIES

CHEMWATCH
Bulletin Board

Contents

MAR. 26, 2021

TECHNICAL NOTES

ASIA PACIFIC

Survey reveals Asian consumers' concerns on packaging sustainability

2021-03-11

On March 8, 2021, consultancy *McKinsey & Company* published an article on a survey they conducted to better understand consumers' attitudes towards packaging and concerns around sustainability in emerging markets across ten Asian countries including China, India, and Indonesia.

The authors observed that the highest levels of concern for packaging sustainability issues as well as willingness to pay more for "green" packaging exist in consumers in China, India, and Indonesia. *McKinsey* points out that this demonstrates a relatively high consumer awareness and need for action by brands and packaging manufacturers. However, the authors also found that the consumers' top concerns in these countries focus more on water and air pollution and less on waste production, which ranks higher as a priority in other surveyed countries.

The survey also found that most consumers across the different countries agree on which they perceive as the least sustainable packaging materials, but they show country-specific views on what may be the most sustainable alternatives for different product categories, ranging from recyclable or compostable plastic films in China and Indonesia to more fiber-based and glass packaging in India. Overall, *McKinsey* reports that the surveyed consumers generally rank recyclable rigid plastics, glass, and metal more poorly.

The authors suggest as a start that companies reach for actions that can be taken without high impact on operating costs or capital expenditure such as decreasing complexity, reducing unnecessary packaging, a light redesign to improve recyclability as well as exchanging multi- with mono-layer materials. Following the successful implementation of these suggestions, it recommends that system-level changes requiring in-depth value-chain collaboration can be considered.

Read More

Food Packaging Forum, 11 March 2021

https://www.foodpackagingforum.org/news/survey-reveals-asian-consumers-concerns-on-packaging-sustainability

The authors observed that the highest levels of concern for packaging sustainability issues as well as willingness to pay more for "green" packaging exist in consumers in China, India, and Indonesia.

CHEMWATCH
Bulletin Board
Regulatory Update
MAR. 26, 2021

China customs return imported coatings with hazardous substances exceeding the standards

2021-03-18

Since the beginning of 2021, there have been several cases in which products were returned due to non-compliance with mandatory national standards.

Importers and manufacturers shall pay attention to the implementation date of the mandatory standards, to avoid the products being returned or destroyed.

Read More

Chemlinked, 18 March 2021

https://chemical.chemlinked.com/news/chemical-news/china-customs-return-imported-coatings-with-hazardous-substances-exceeding-the-standards

China MEE proposes to include 204 substances in IECSC

2021-03-18

On March 17, 2021, the Chinese Ministry of Ecology and Environment (MEE) published a notice to consult on the inclusion of 204 chemical substances [1] into the Inventory of Existing Chemical Substances (IECSC). The consultation is set to end on March 30, 2021.

Read More

Chemlinked, 18 March 2021

https://chemical.chemlinked.com/news/chemical-news/china-mee-proposes-to-include-204-substances-into-iecsc

Importers and manufacturers shall pay attention to the implementation date of the mandatory standards, to avoid the products being returned or destroyed.

AMERICA

PFAS alternatives for paper food packaging

2021-03-15

In March 2021, a research team led by Gregory Glenn from the *US Department of Agriculture (USDA)* published a review article in the journal *Comprehensive Reviews in Food Science and Food Safety* on alternatives for per- and polyfluoroalkyl substances (PFAS) in paper food packaging. In their article, the authors describe the availability, suitability, and

limitations of currently discussed alternatives for PFAS. A very common strategy identified includes adding waxes or lamination of paper with polymer films such as polyethylene (PE; CAS 9002-88-4), poly(ethylene-co-vinyl alcohol) (CAS 25067-34-9), and polyethylene terephthalate (PET; CAS 25038-59-9).

However, these laminates and waxes are neither biodegradable nor recyclable. Laminates with biodegradable polymers are discussed as well, such as poly-lactic acid (PLA; CAS 26100-51-6), polybutylene adipate terephthalate (PBAT; CAS 60961-73-1), polybutylene succinate (PBS; CAS 25777-14-4), and polyhydroxyalkanoates (PHA). In addition to laminates, surface sizing and coatings with materials such as starch (CAS 9005-25-8), plant protein, and chitosan (CAS 9012-76-4) represent other processing techniques that can provide "adequate oil barrier properties but have poor moisture resistance without chemical modification."

The authors emphasize the difficulties in finding a suitable replacement for PFAS chemicals, which will require more research efforts: "Numerous nontoxic chemicals with various processing methods have been proposed to replace PFAS [..] but a cost-effective, fully biodegradable, and environmentally friendly replacement which can be easily processed to attain the effectiveness of PFAS has remained elusive so far."

Read More

Food Packaging Forum, 15 March 2021

https://www.foodpackagingforum.org/news/pfas-alternatives-for-paper-food-packaging

CLEAN AIR ACT Whiff of the unthinkable at EPA: CO2 standards for states

2021-03-17

There's renewed hope among climate advocates for an ambitious federal rule to limit greenhouse gases using the same type of mechanism that penalizes states for exceeding air pollution thresholds.

The Clean Air Act sets national air quality standards to lower pollutants that cause smog, acid rain and other health dangers. It's never been used for greenhouse gases, but environmental groups now hope EPA might finally use it after ignoring the option for 11 years.

CHEMWATCH
Bulletin Board
Regulatory Update
MAR. 26, 2021

The Center for Biological Diversity and 350.org initially petitioned EPA in December 2009 to use the landmark environmental law to set National Ambient Air Quality Standards, or NAAQS, for greenhouse gas emissions.

Doing so could potentially open the door for a more ambitious and all-encompassing climate program than EPA achieved under former President Obama. It would require states to hold their climate-warming emissions to a specific level.

"In our view, the NAAQS program is the strongest and most far-reaching Clean Air Act tool for this work," said Maya Golden-Krasner, deputy director of the Climate Law Institute at the Center for Biological Diversity.

Read More

E&E News, 17 March 2021

https://www.eenews.net/stories/1063727659

The Clean Air Act sets national air quality standards to lower pollutants that cause smog, acid rain and other health dangers.

Natural by deadly: Huge gaps in the US rules for wood-smoked smoke exposed

2021-03-17

Glenn Helkenn lives in a spruce forest, in a tiny log cabin he built himself on the outskirts of Fairbanks, Alaska's third largest city.

Give him an hour and a handsaw and Helkenn says he can harvest enough firewood to heat his 96-square-foot home for a couple of days, even when the temperature drops to minus 40. For him, it's about more than free fuel.

"It is what I enjoy doing," Helkenn said. "You know, it's the fresh air. It's the time out in the woods. It's the snowshoeing. It's the exercise."

The trouble is about 12,000 other people in the Fairbanks area burn wood, too. Many buy it by the cord to heat much larger homes. On a cold winter day, when an air inversion sets in, smoke is trapped in low-lying neighborhoods for days or weeks.

Fairbanks has some of the dirtiest air in the country, in large part due to smoke from wood stoves. Wood smoke is a serious health threat. It emits high levels of fine-particle pollution that can be inhaled deep into the lungs, exacerbating respiratory problems like asthma, and increasing the risk of premature death from heart attacks and strokes.

In 2015, the U.S. government required that newer models of wood stoves perform better and has spent millions of dollars to subsidize the transition

The trouble is about 12,000 other people in the Fairbanks area burn wood, too.

away from older models. Now, an investigation by state environment officials is revealing a critical flaw in that plan: The latest stoves might not be any less polluting than the previous ones.

State air regulators conducted a review of 250 wood-burning stove certifications and found unexplained data omissions and atypical lab practices.

"We pulled the test reports that are supposed to be publicly posted and we compared — did this certification report meet all the rules? And we couldn't find any that actually met all the rules," said Cindy Heil, an air quality official with Alaska's department of environmental conservation. "So, that's a problem."

An association of New England air regulators called NESCAUM retested about a dozen new-model wood stoves in their own labs. They were not able to reproduce the certification results. Some stoves fell short of the standards set in 2015. One produced so much pollution that it wouldn't have met the U.S. Environmental Protection Agency's first-ever standards from 1988.

Read More

Alaska Public, 17 March 2021

https://www.alaskapublic.org/2021/03/17/natural-but-deadly-huge-gaps-in-us-rules-for-wood-stove-smoke-exposed/

EUROPE

Green Brexit didn't happen, says environmental coalition

2021-03-17

The so-called "green Brexit" promised by the government has not been delivered, a coalition of environment groups says.

In 2017, the Environment Secretary **Michael Gove promised:** "Leaving the EU gives a once-in-a-lifetime opportunity to reform agriculture and fisheries."

That, he said, would allow the UK to reshape the way it cares for its land, its rivers and its seas.

"In short," Mr Gove pledged, "it means a Green Brexit."

"In short," Mr Gove pledged, "it means a Green Brexit."

CHEMWATCH
Bulletin Board
Regulatory Update
MAR. 26, 2021

Over four years and 11 reports, an environmental coalition called Greener UK has tracked policies - and concluded that improvement across the board has not been realised.

Environment Secretary George Eustice said Brexit enabled the UK to create "world-leading legislation, delivering better environmental outcomes in an effective and efficient way".

Read More

BBC, 17 March 2021

https://www.bbc.com/news/uk-politics-56408138

Revamp of UK CRISPR regulation will require public trust

2021-03-16

The United Kingdom is considering innovative ways of regulating gene editing in food and farming. Robust processes and public confidence will be vital for success.

Thirty years ago, few would have dreamed of Nigel Halford's wheat.

On 26 February, the plant biologist at Rothamsted Research in Harpenden, UK, and his colleagues unveiled a line of wheat plants that produce less of an amino acid, known as free asparagine, that can serve as the precursor for acrylamide. This is a chemical that has been linked to cancer and is formed when some foods are fried, baked or toasted1. So far, the wheat has not been tested in the field, but the hope is that flour made from it could be used to bake breads that produce less acrylamide than does conventional bread when toasted.

To create their low-asparagine wheat, the researchers used the genome-editing technology CRISPR to do something comparatively simple: they created small changes — often deleting a snippet of DNA — in the gene responsible for asparagine synthesis.

Did Halford and his colleagues modify the wheat genome? Technically, yes, because they changed the plant's DNA. But should the wheat be called 'genetically modified', or 'GM wheat'? The European Union thinks so, but many geneticists say that with the advent of tools such as CRISPR, gene editing should no longer be synonymous with GM.

This is a chemical that has been linked to cancer and is formed when some foods are fried, baked or toasted1.

Historically, definitions of GM technology in agriculture have referred to transgenics, the insertion of foreign genes into plant cells, often with no control over where those genes land in the genome. These are among the reasons why commercialization of GM technology is effectively banned in the EU. But many researchers say that most current applications of gene editing using CRISPR produce the kinds of change that could have been achieved by conventional breeding, just much more efficiently.

Read More

Nature.com, 16 March 2021

https://www.nature.com/articles/d41586-021-00672-1

INTERNATIONAL

OECD guidance on key considerations for the identification and selection of safer chemical alternatives

2021-03-10

As the demand for safer chemicals and technologies grows, the field of alternatives assessment is becoming increasingly important in guiding the transition towards safer, less toxic alternatives. Throughout Organisation for Economic Co-operation and Development (OECD) delegations, alternatives assessments are being used to respond to government regulations, including the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) in the European Union (EU) and state-level regulations in the United States (U.S.), as well as industry, retailer, and consumer demands for products that do not contain harmful chemicals. The U.S. National Research Council (NRC) defines alternatives assessment as a "process for identifying and comparing potential chemical and nonchemical alternatives that could replace chemicals of concern on the basis of their hazards, comparative exposure, performance, and economic viability" (National Research Council 2014). Alternatives assessment generally takes place after a decision to substitute occurs and helps guide that process. The use and practice of alternatives assessment approaches have advanced considerably in the last decade. Alternatives assessment frameworks, guidance documents, tools, and data sources have been developed by governments and other organizations to assist practitioners in selecting safer alternatives. Businesses have successfully replaced chemicals with known hazards for human health and the environment

The use and practice of alternatives assessment approaches have advanced considerably in the last decade.

CHEMWATCH
Bulletin Board
Regulatory Update
MAR. 26, 2021

with lower concern alternatives. Leaders in industry, academia, and the research community continue to drive innovation towards chemicals, products, and processes that are "safer by design." In addition, new research and professional networks are advancing dialogue on best practices in the field.

Read More

OECD, 10 March 2021

https://www.oecd.org/chemicalsafety/risk-management/guidance-on-key-considerations-for-the-identification-and-selection-of-safer-chemical-alternatives.pdf

Food for thought

2021-03-17

Why do the pharmaceutical and food industries have different rules on genotoxic impurities?

The food and pharmaceutical industries each have a host of regulations and government agencies in place to ensure the safety of the items that we consume.1 Although their regulations are often similar, there are differences between them – possibly driven by a view that 'naturally derived molecules' are likely to be safer than new man-made ones.

In the early 2000s, pharmaceutical regulators began to be interested in trace impurities that could be potentially genotoxic (PGIs). This created a great deal of concern and activity, especially given that, as one of my colleagues remarked, it's pretty difficult to make organic molecules without using electrophiles.

Due to a significant amount of effort within the pharmaceutical industry and by regulators, a series of guidelines were developed (including ICH M7) that enabled the industry to pretty much deal with this new perceived risk. I say perceived, because like many within the industry, I think the premise that initially drove these guidelines – that there is no such thing as a safe dose of a genotoxic impurity – is likely flawed in most cases. Our bodies use a range of DNA-repair mechanisms to protect us from genotoxic compounds and each day we are exposed to levels of these compounds well in excess to that we are likely to be exposed to by taking any medicine. Indeed, if one looks at levels of PGIs in common foods, they are often at levels thousands of times above what is permitted in drugs.

On the threshold

In the early 2000s, pharmaceutical regulators began to be interested in trace impurities that could be potentially genotoxic (PGIs).

Current regulations have established a virtually safe dose, known as the threshold of toxicological concern (TTC). Notionally, this dose equates to increasing the risk of developing cancer over a lifetime by less than 1 in 100,000 for pharmaceuticals and 1 in 1,000,000 for foodstuffs. This is unlikely to add to the overall concern relating to cancer risk; according to the American Cancer Society, around 40% of people will develop cancer in their lifetime.

About three years ago samples of Valsartan, a drug used to treat high blood pressure, were found to have been contaminated with the potentially genotoxic N-Nitrosodimethylamine at levels above the TTC due to manufacturing error. Then, in 2020, the European Union, United States and Australia suspended the use of Ranitidine, a drug used to reduce the production of stomach acid, after a number of manufacturers detected low-level N-Nitrosodimethylamine impurities in their products.

Following these and other issues, the European Medicines Agency (EMA) asked manufacturers of active pharmaceutical ingredients to carry out risk assessments on all medicines sold in Europe to determine if any could contain nitrosamines. The limit set for these impurities has been taken to the extreme, with nitrosamine contamination being controlled to parts per billion; other PGIs are controlled to ppm levels. But nitrosamines arise in food, for example, through the use of nitrite as a meat-curing agent or during fermentation processes. Exposure to nitrosamines from foodstuffs, particularly from items such as bacon and smoked fish, is estimated to be much higher than that from pharmaceuticals.

Read More

Chemistry World, 17 March 2021

https://www.chemistryworld.com/opinion/why-are-impurity-regulations-different-for-food-and-drugs/4013357.article#/

"Forever chemicals" in turnout gear fan the flames of hazard against the health of firefighters

2021-03-17

Firefighters are disproportionately struck by cancer compared to the general population. A growing body of evidence points towards the PFAS – also known as "forever chemicals", since they don't degrade – in firefighting turnout gear, applied to make the clothing water-repellant.

According to two large studies conducted in the US, firefighters are 9% more likely to be diagnosed with cancer, and 14% more likely to die from the disease, compared to the general population.

CHEMWATCH
Bulletin Board
Regulatory Update
MAR. 26, 2021

They are the men and women who put their lives on the line to save other's every day. But being a firefighter entails an invisible occupational hazard that can be just as deadly as running into a burning building, caused by the very equipment meant to protect them from the roaring fire.

According to two large studies conducted in the US, firefighters are 9% more likely to be diagnosed with cancer, and 14% more likely to die from the disease, compared to the general population.

Or as Lieutenant Ron Glass, president of the Orlando Professional Firefighters union, who has been a firefighter for 25 years and lost two of his colleagues to cancer in the past year, put it in an article in The New York Times:

"When I first got hired, the leading cause of death was a line-of-duty fire accident, then it was heart attacks. Now it's all cancers."

There is no lack of occupational hazards in the firefighting profession. Initially, the blame for the high cancer rates was put on toxic fumes from the materials burning and the presence of harmful PFAS, short for per- and polyfluoroalkyl substances, in firefighting foam.

Could the answer be hidden in the clothes?

But the rates in which firefighters get testicular cancer, mesothelioma and non-Hodgkin's lymphoma – the three most common cancer forms for firefighters – have not declined, even though now use sophisticated smoke masks and air packs to protect themselves from toxic fumes.

"Then we started looking at our bunker gear [also known as turnout gear, editor's note]. The manufacturers initially told us there's nothing wrong, there's nothing harmful at all. But it turns out there's PFAS not only on the outer shell, but in the interior lining, which goes against our skin", Ron Glass says in The New York Times article.

Dr. Graham F. Peaslee, a professor in experimental nuclear physics, chemistry and biochemistry at the University of Notre Dame, led a study that was published last year, which found significant quantities of PFAS chemicals in firefighters' turnout gear, applied to make the clothes water-repellant, so they don't get soaked and heavy to work in.

The firefighter's wife became suspicious

Dr. Peaslee began the study in 2017, when he was contacted by Diane Cotter, whose husband – a veteran firefighter – had been diagnosed

with advanced prostate cancer. Paul Cotter was healthy and took care of himself, so Diane Cotter suspected that something other than smoke had caused the cancer.

Read More

Chemsec, 17 March 2021

https://chemsec.org/forever-chemicals-in-turnout-gear-fan-the-flames-of-hazard-against-the-health-of-firefighters/

IKEA and H&M work together for a smoother transition to circular economy

2021-03-17

IKEA and H&M Group are both transforming into circular businesses, committing to only use recycled, renewable or other sustainably sourced materials by 2030. But closing the recycling loop in a circular business model for materials like textiles presents many challenges.

To address the challenge around lack of knowledge about the chemical content in collected recyclable textiles, H&M Group and IKEA decided to collaborate in a large test study.

"The challenge of finding fact-based information about recyclable textiles on a large scale requires industry wide collaboration. We wanted to join forces with others to find innovative solutions, enabling meaningful and scalable changes", says Mirjam Luc, Project Leader for Recycled Textiles at IKEA.

She is spearheading the study together with Linn Farhadi, Project Leader for Recycled Textiles at H&M Group.

Linn nods at Mirjam's reasons for collaborating and continues:

Mirjam Luc, IKEA, and Linn Farhadi, H&M Group

"Our two companies have worked together in different projects before and have a history of sharing experiences within chemical management. It felt like a natural step to start working together in this area too."

The chemicals of cotton

The first – and concluded – part of the study concerned cotton. All textile materials can be divided into three categories: virgin, pre-consumer and post-consumer. The IKEA/H&M Group study included pre- and post-consumer cotton samples collected from recyclers.

But closing the recycling loop in a circular business model for materials like textiles presents many challenges.

CHEMWATCH
Bulletin Board
Regulatory Update
MAR. 26, 2021

Pre-consumer textiles are usually waste from production and therefore easier to control in terms of chemical content, while post-consumer textiles have been worn or used by consumers or industry.

"As a brand, you can be in much better control if you only use waste from your own production streams. Challenges might increase when adding industrial production waste with unknown origin", Mirjam explains.

Chemical differences between virgin, pre-, and post-consumer cotton

The team tested the cotton samples for 8 groups of chemical substances, such as APEO, azo dyes, formaldehyde, organotins, and PAH. They used the AFIRM RSL (Apparel and Footwear International Restricted Substances List) test matrix to make conclusions and define the probability of detection rate for the tested substances in the recycled cotton.

Some substances were not detected at all, whereas others were detected at very low levels. The results indicated that there is a difference between pre- and post-consumer textiles.

"For the post-consumer cotton, the test results indicated that APEO is the substance group with highest probability to be detected, while azo dyes and other allergenic and carcinogenic dyes have an almost negligible probability of being detected", says Linn.

The tests also revealed some interesting findings concerning the probability to find hazardous chemicals in recycled cotton compared to virgin.

"For example, we could see that the probability of detecting organotins is slightly higher in recycled pre-consumer cotton compared to virgin cotton, while the probability of detecting PAH and formaldehyde is potentially lower in recycled pre-consumer cotton compared to virgin", says Mirjam.

Read More

Chemsec, 17 March 2021

https://chemsec.org/ikea-and-hm-group-work-together-for-a-smoother-transition-to-circular-economy/

ECHA public consultation on proposing 4 FCCs as SVHCs

2021-03-16

On March 15, 2021, testing provider *SGS* reported on the *European Chemicals Agency (ECHA)* launching public consultations on eight proposals identifying new substances of very high concern (SVHCs).

Among the eight substances are four food contact chemicals (FCCs), including: 1,4-dioxane (CAS 123-91-1), bisphenol B (BPB; CAS 77-40-7; FPF reported), medium-chain chlorinated paraffins (MCCP), as well as phenol alkylation products with C12-rich branched or linear alkyl chains from oligomerization (PDDP).

1,4-dioxane, used as a solvent used during chemical synthesis, is also being considered to be reclassified as a Category 1B carcinogen and is present in the *Food Packaging Forum's* FCCdb database, which lists the chemical as a substance of high priority based on California's Proposition 65 regulation.

ECHA is calling for the public to submit comments and further information on the use, exposure, alternatives, and risks of the substances by April 23, 2021.

For more information about how to find and extract relevant information from the FCCdb, please see the resource's background page.

Read More

Food Packaging Forum, 16 March 2021

https://www.foodpackagingforum.org/news/echa-public-consultation-on-proposing-4-fccs-as-svhcs

Supporting Montenegro and Serbia to prepare for EU chemicals laws

YYYY-MM-DD

ECHA/NR/21/11

ECHA supports the accession countries to build capacity ahead of joining the EU. A study has assessed the gaps and needs of aligning to and implementing EU chemicals legislation in Montenegro and Serbia and proposes national action plans on how to move forward.

Helsinki, 16 March 2021 – For the past 10 years, Montenegro and Serbia have worked towards alignment between their legal chemicals

ECHA is calling for the public to submit comments and further information on the use, exposure, alternatives, and risks of the substances by April 23, 2021.

CHEMWATCH
Bulletin Board
REACH Update
MAR. 26, 2021

management framework and that of the EU. ECHA has supported this work since 2011. According to a new study commissioned by ECHA, both countries need targeted support to help them implement the EU's chemicals laws.

The main challenges lie with the limited financial, human and IT resources currently available for the accession countries to implement and enforce the REACH, CLP, BPR and PIC regulations. The study recommends strengthening the administrative capacity of the national authorities, ensuring enough financial resources to implement and enforce the legislation, facilitating cooperation with academia as well as increasing communication activities and IT capacity.

The national plans outline several actions for Montenegro and Serbia as well as EU Member States and ECHA ahead of a future membership. ECHA stands ready to continue supporting the countries through training and capacity building on risk assessment, IT security and tools, and enforcement.

Bjorn Hansen, ECHA's Executive Director says: "*We warmly welcome the steps taken by Montenegro and Serbia so far and are keen to help them on the road towards EU chemical standards. This supports the aims of the Chemicals Strategy for Sustainability – the transition to a toxic-free and circular economy, and managing chemicals safely throughout their life cycle.*"

The study was conducted and funded by the Instrument for Pre-Accession assistance of the European Union.

Read More

ECHA, 16 March 2021

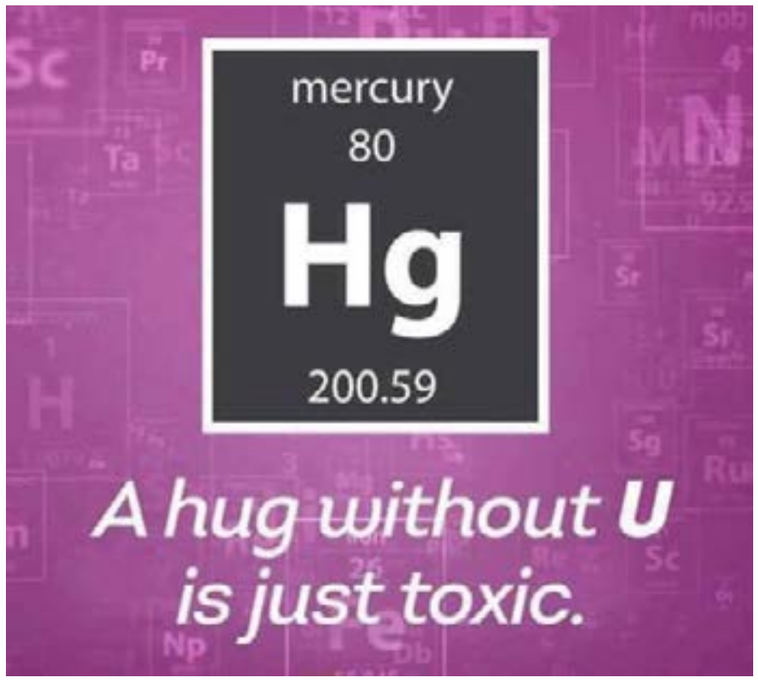
https://echa.europa.eu/-/supporting-montenegro-and-serbia-to-prepare-for-eu-chemicals-laws

Janet's Corner

MAR. 26, 2021

Toxic

2021-03-26



https://www.theodysseyonline.com/amp/science-jokes-for-the-nerd-all-2500728705

Hazard Alert

MAR. 26, 2021

Nickel

2020-03-25

Nickel is a hard, naturally-occurring silver-white metal, with a chemical symbol of Ni and an atomic number of 28. It is the fifth most common element found on Earth, where it is mostly found in the Earth's crust and core. It is highly resistant to corrosion and oxidation and can be fully recycled. Nickel is classed as a Class 1A carcinogen, as it is known to show cancer in humans. [1,2]

USES [1,2,3]

Nickel is used across multiple industries in varying capacities. It is primarily used in the making of alloys—mainly in stainless steel, but also in other metal alloys. Nickel alloys are used in many applications: from toasters and desalination plants, to turbine blades. It is also used in electroplating and in welding and soldering. Nickel is used in batteries and in many of the U.S. coins, including the nickel, dime and quarter. In Australia, all the silver coins (5c, 10c, 20c and 50c) are made from a copper/nickel alloy.

Nickel is a hard, naturally-occurring silver-white metal, with a chemical symbol of Ni and an atomic number of 28.

ROUTES OF EXPOSURE [1,4]

- The primary route of exposure to nickel is via inhalation
- Occupational exposure is common in workplaces where are mining, smelting, casting, grinding and welding nickel.
- The general population are exposed to low levels of nickel in their food, water, air and tobacco smoke.
- Nickel-plated materials—such as coins, jewellery and stainless steel utensils and cooking materials—could expose those who are using or wearing them.

HEALTH EFFECTS

Nickel poisoning affects a range of systems including the integumentary and respiratory systems.

Acute Effects [1]

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

- Skin contact with nickel can result in allergic contact dermatitis.
- Acute exposure to the metal could cause asthma, cancer of the nasopharynx and lung, or bronchitis.

- Nickel exposure could result in nausea, vomiting, headache, weakness, rash or itching on the hands or forearms, and decreased lung function.

Chronic Effects [1,5]

Nickel is toxic to multiple body systems. Long-term exposure to the metal could result in asthma, nasal septum perforations, rhinitis, sinusitis and chronic bronchitis. It can also cause inflammation and cancers of the lungs, noses and sinuses. The latter most often occurs in people who have breathed in the metal dust, while working in nickel refineries and nickel-processing plants.

SAFETY

First Aid Measures [6]

- Ingestion: DO NOT INDUCE VOMITING. Immediately contact a medical professional.
- Skin contact: Immediately wash affected area with plenty of water for at least 15 minutes. Remove contaminated clothing; do not re-wear until it has been thoroughly de-contaminated. Immediately contact a healthcare professional.
- Eye contact: Check for and remove contact lenses if easy to do so. Rinse eyes for at least 15 minutes; don't forget to wash under the eyelids. Immediate medical attention is required.
- Inhaled: Take victim to the nearest fresh air source and monitor their breathing. If they are not breathing (and you are qualified), perform CPR with the aid of a pocket mask or one-way valve. Contact a medical professional immediately.
- General: Never administer anything by mouth to an unconscious, exposed person.

Exposure Controls/Personal Protection [6]

- Engineering controls: Emergency eyewash fountains and safety showers should be accessible in the immediate area of the potential exposure. Ensure there is adequate ventilation. Whenever possible, material should be handled in a laboratory, underneath a fume hood.
- Personal protection: Safety glasses, protective and dustproof clothing, glove, an apron and an appropriate mask. For specifications on PPE, check regulations in your jurisdiction.

CHEMWATCH
Bulletin Board
Hazard Alert
MAR. 26, 2021

REGULATION [6]

United States:

The Occupational Safety and Health Administration (OSHA) has set an 8-hour time weighted average (TWA) concentration for nickel of 1mg/m^3.

Australia [1]

Safe Work Australia has set an 8-hour time TWA for nickel of 1mg/m^3.

REFERENCES

1. https://www.safeworkaustralia.gov.au/system/files/documents/2002/health_monitoring_guidance_-_nickel.pdf
2. https://www.nickelinstitute.org/about-nickel
3. https://www.rsc.org/periodic-table/element/28/nickel
4. https://www.cancer.gov/about-cancer/causes-prevention/risk/substances/nickel
5. https://www.atsdr.cdc.gov/phs/phs.asp?id=243&tid=44#:~:text=The%20most%20serious%20harmful%20health,refineries%20or%20nickel%2Dprocessing%20plants.
6. https://www.fishersci.com/shop/msdsproxy?productName=AC193610250&productDescription=NICKEL

More than 50 new environmental chemicals detected in people

2021-03-22

Researchers have detected more than 50 new environmental chemicals lurking in people's bodies, the vast majority of which are little known or unknown compounds.

These chemicals — which have never been observed in people before — were discovered in a study of pregnant women and their newborns.

The findings are concerning given that very little is known about these chemicals and their potential health effects, researchers from the new study say. What's more, pregnant women and their newborns are a particularly vulnerable population.

"We are very concerned about these exposures that occur during pregnancy because it's such a vulnerable period of development," said study senior author Tracey Woodruff, director of the Program on Reproductive Health and the Environment (PRHE) and the Environmental Research and Translation for Health (EaRTH) Center, both at University of California San Francisco. "It can influence the mom's health later. And it's a vulnerable period of development for the fetus, so it can have childhood and lifelong consequences."

Of these newly detected chemicals, two were perfluoroalkyl and polyfluoroalkyl substances, or PFAS. These chemicals, used in consumer products such as nonstick cookware and pizza boxes, stay in the human body for a long time and can accumulate, according to the Environmental Protection Agency (EPA). Ten of the newly detected substances were plasticizers, or chemicals used in the production of plastics. For example, one of the detected plasticizers, a group of chemicals called phthalates, are often found in fast-food packaging and have been associated with adverse health effects. Two of the newly detected chemicals are used in cosmetics; one in pesticides.

But most — 37 — of these newly detected chemicals are ones that researchers have little to no information on, the authors wrote in the study, published Tuesday (March 16) in the journal Environmental Science & Technology.

Mysterious chemicals

Despite pregnancy being a vulnerable period of development, there's been a lack of data on chemicals that mothers and fetuses are potentially

It can influence the mom's health later. And it's a vulnerable period of development for the fetus, so it can have childhood and lifelong consequences."

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

exposed to, due in part to a lack of methods for detecting those chemicals, Woodruff told Live Science. Current methods for monitoring human exposure to chemicals typically involve screening for only a few hundred of some 8,000 chemicals produced or imported into the U.S. every year, the authors wrote in the study.

For this study, the researchers recruited 30 expectant women seeking prenatal and delivery care at the Zuckerberg San Francisco General Hospital and UCSF Mission Bay Medical Center. Blood samples were collected from the mother during labor and delivery and from the newborn's umbilical cord (cord blood) just after birth.

The researchers then analyzed the blood samples using a relatively new technique called high-resolution mass spectrometry that involves determining the different masses of compounds to identify them. In this way, they were able to take snapshots of nearly all the chemicals present in blood samples from mothers and their newborn infants, said study co-author Dimitri Abrahamsson, a postdoctoral fellow at PRHE. "That allowed us in the end to find evidence for some chemicals that appear to not have been previously reported in people," he added.

The researchers identified 109 chemicals present in both the maternal and cord blood samples, including 55 that had never been found in people before. Others detected in the samples, such as phthalates, have previously been found in humans before and have been linked to adverse health effects, such as reproductive problems. The researchers also detected the two most-studied PFAS, known as PFOA and PFOS, in the maternal and newborn samples. PFAS and PFOA have been shown to cause developmental, liver, kidney, and immunological problems in laboratory animals and have also been linked to numerous health problems in human epidemiological studies, according to the EPA.

The researchers found traces of such chemicals in both the mothers and the babies, Woodruff said. "So that's a very important feature of this, because it shows that these exposures are also occurring in the womb," Woodruff said.

The umbilical cord, which connects the placenta to the fetus, is the conduit through which oxygen, and other nutrients pass between the mother and the fetus. If a chemical is present in the cord blood, the fetus has been exposed to it, Woodruff said. More research is needed to determine whether these particular chemicals are also present in fetal tissues and at what levels; however, previous studies have found that chemicals detected in cord blood also show up in fetal tissue, Woodruff said.

Because so little is known about these newly detected chemicals, including where the mothers may have been exposed to them, it's not clear what the potential health effects of them may be, the researchers told Live Science. This should signal not a sense of uncertainty but "alarm," Abrahamsson said. "We're being exposed to chemicals that we have very little information about. And these chemicals could potentially have harmful health effects that we don't know and can't predict," he said.

The researchers can determine whether these chemicals are present in the maternal and cord blood, but they can't tell at what levels, Woodruff said. For that reason, the researchers cannot say whether the chemicals detected are dangerous at the levels at which they are present in mothers and babies.

But that doesn't necessarily mean there's no reason to worry about adverse health effects from chemical exposures, Woodruff added. "We already know from other studies that pregnant women are exposed to chemicals, many of them at levels that have been associated with adverse health effects," such as exposure to phthalates being linked with problems with male reproductive development, she said. "These [newly detected] chemicals are in addition to chemicals we know are linked to adverse health outcomes."

In the future, Woodruff said, the researchers plan to study the toxicities of these newly detected chemicals in the human body and to learn how the chemicals affect various tissues with the long-term goal of using the information to prevent adverse health outcomes and disease. The researchers also need to confirm the identities of the newfound chemicals by comparing them, again using mass spectrometry, to "analytical standards," or pure samples of each chemical, the researchers said.

For consumers, the researchers have put together some tips on how to avoid exposure to substances that can be harmful to reproductive health, including cleaning with non-toxic products, using less plastics and avoiding canned foods.

livescience.com, 22 March 2021

https://www.livescience.com

Instead, the GRS slurped up its smaller cyclone siblings and was none the worse for wear.

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

Jupiter's Great Red Spot is a ruthless cannibal that devours smaller storms

2021-03-18

What's the secret to a long life? For the Great Red Spot, a massive storm that has churned on Jupiter's surface for at least 150 years, the answer may be cannibalism.

The Great Red Spot (GRS) is about twice as wide as Earth. But over time, it's been gradually shrinking, and the storm is currently half the size it was at the end of the 19th century. So when a string of smaller atmospheric storms collided with the GRS in recent years and caused bits of the bigger storm to "flake" off, scientists feared that the long-lived and iconic GRS might be torn to pieces.

Instead, the GRS slurped up its smaller cyclone siblings and was none the worse for wear. And much like the energy drinks consumed by human athletes, small storms may provide a much-needed boost to the GRS, ensuring that it keeps spinning for years to come.

Regular observation of the Great Red Spot began in 1850, but modern astronomers argue about who logged the first recorded sighting of the mighty storm. Some claim the honor belongs to Italian astronomer Giovanni Cassini, who described the storm in 1665, while others insist that the English scientist Robert Hooke did so one year earlier, according to the American Physical Society (APS).

The storm lies near Jupiter's equator in the southern hemisphere, and it rotates counterclockwise. Much like the hurricanes that form on Earth, the eye of the storm is relatively quiet. But winds that are farther from the center can reach speeds up to 425 mph (680 km/h), NASA says.

No one knows what lends the GRS its distinctive red color, or what spawned the enormous storm centuries ago. However, it may have lived so long because Jupiter lacks a solid surface under 44 miles (70 kilometers) of cloud layers. Land formations on Earth slow and dispel powerful hurricanes, so it's possible that the GRS rages on because there's no landmass below to stop it, Live Science's sister site Space.com reported.

But whatever fueled the storm's birth and growth may be slowly fading away. In 1879, the GRS measured approximately 24,850 miles (40,000 kilometers) wide; since then, it shrank to about 9,320 miles (15,000 km).

To learn more about the GRS and other Jupiter mysteries, NASA launched the Juno mission in 2011. With its arrival at Jupiter on July 4, 2016, Juno

became an orbiting eye in the sky for peering through the gas giant's dense cloud cover and capturing close-up images of the GRS and other phenomena, such as a hypnotizing vortex cluster at Jupiter's north pole.

A threat from the east

Between 2018 and 2020, when the GRS was smaller than it had been in 150 years of observations, it was bombarded from the east by dozens of anticyclones — storms that have high-pressure centers and spin counterclockwise — that ripped large red swaths from the spot's main body. Small vortices had slammed into the GRS before, but never so many in such a short time span, scientists wrote in a new study.

"Its structure and even its survival appeared to be threatened," researchers reported March 17 in the Journal of Geophysical Research: Planets.

For their study, they investigated the impact of these smaller storms on the GRS. They measured and mapped cloud features in images of the GRS, captured by the Juno spacecraft's JunoCam; by the Hubble Space Telescope; by the Calar Alto Observatory in Almería, Spain; and by amateur astronomers using ground telescopes, according to the study.

Though the GRS dwarfs these anticyclones, no they were still quite large, measuring about 10 times the size of hurricanes on Earth. As they drew closer to the GRS, they peeled away strips from the central part of the storm, creating red "streamers" that extended from the giant spot. The collisions also distorted the big storm's overall shape, lead study author Agustín Sánchez-Lavega, a professor of applied physics at the Basque Country University in Bilbao, Spain, said in a statement.

"All this significantly disrupted the red oval area of the GRS, and was even suspected of putting its long life at risk," the study authors reported.

However, the damage was superficial. The GRS extends to a depth of about 125 miles (200 km). Changes in structures and reflectivity in the GRS and the flakes of red, and simulations of the collisions revealed that the ripped streamers were just a few kilometers deep, "not affecting the full depth of the GRS," according to the study. "By October 2019, the visible red oval had almost recovered to its previous size."

What's more, the velocity of the Giant Red Spot's internal rotation increased after its "ingestion" of the smaller storms, suggesting that it was absorbing their energy, the researchers wrote.

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

Colliding with the anticyclones didn't drain the GRS's strength or nudge it closer to destruction. Rather, it demonstrated that a cannibal diet "can increase the GRS rotation speed, and perhaps over a longer period, maintain it in a steady state," Sánchez-Lavega said.

Originally published on Live Science.

livescience.com, 18 March 2021

https://www.livescience.com

Major coronavirus variant found in pets for first time

2021-03-19

The variants of SARS-CoV-2 that keep emerging aren't just a human problem. Two reports released this week have found the first evidence that dogs and cats can become infected by B.1.1.7, a recent variant of the pandemic coronavirus that transmits more readily between people and also appears more lethal in them. The finds mark the first time one of the several major variants of concern has been seen outside of humans.

The finds mark the first time one of the several major variants of concern has been seen outside of humans.

B.1.1.7 was first identified in the United Kingdom and that's where some of the variant-infected pets were found. The U.K. animals suffered myocarditis—an inflammation of the heart tissue that, in serious cases, can cause heart failure. But the reports offer no proof that the SARS-CoV-2 variant is responsible, nor that it's more transmissible or dangerous in animals. "It's an interesting hypothesis, but there's no evidence that the virus is causing these problems," says Scott Weese, a veterinarian at the University of Guelph's Ontario Veterinary College who specializes in emerging infectious diseases.

Since December 2020, scientists have identified multiple variants of concern that appear more transmissible or are able to evade some immune response. B.1.351, for example, was first detected in South Africa, and a strain called P.1 was first found in Brazil. The B.1.1.7 variant drew early attention because of its rapid rise in the United Kingdom; it now comprises about 95% of all new infections there.

So far the impact of these variants on pets has been unclear. Though there have now been more than 120 million cases of COVID-19 around the world, only a handful of pets have tested positive for the original SARS-CoV-2—probably because no one is testing them. Infected pets appear to have symptoms ranging from mild to nonexistent, and infectious disease experts say companion animals are likely playing little, if any, role in spreading the coronavirus to people.

The new variants might change that equation, says Eric Leroy, a virologist at the French National Research Institute for Sustainable Development who specializes in zoonotic diseases. In one of the new studies, he and colleagues analyzed pets admitted to the cardiology unit of the Ralph Veterinary Referral Centre in the outskirts of London. The hospital had noticed a sharp uptick in the number of dogs and cats presenting with myocarditis: From December 2020 to February, the incidence of the condition jumped from 1.4% to 12.8%.

That coincided with a surge of the B.1.1.7 variant in the United Kingdom. So the team—led by veterinarian Luca Ferasin, head of the hospital's cardiology service—looked at 11 pets: eight cats and three dogs. None of the animals had a previous history of heart disease, yet all had come down with symptoms ranging from lethargy and loss of appetite to rapid breathing and fainting. Lab tests revealed cardiac abnormalities, including irregular heartbeats and fluid in the lungs, all symptoms seen in human cases of COVID-19.

Seven of the animals got polymerase chain reaction tests, and three came back positive for SARS-CoV-2—all with the B.1.1.7 variant, team reported yesterday on the preprint server bioRxiv. SARS-CoV-2 antibody tests on four of the other animals picked up evidence that two of them had been infected with the virus. Earlier this week, researchers at Texas A&M University detected the B.1.1.7 variant in a cat and a dog from the same home in the state's Brazos county.

The Texas owner was diagnosed with COVID-19, and owners of five of the 11 U.K. pets tested positive for SARS-CoV-2—all before their animals developed symptoms. The Texas pets showed no symptoms at the time they were tested, though they both began to sneeze several weeks later. All of the U.S. and U.K. animals have since recovered, though one of the U.K. cats relapsed and had to be euthanized.

Leroy says it's unclear whether B.1.1.7 is more transmissible than the original strain between humans and animals, or vice versa. It's "impossible to say" that pets infected with B.1.1.7 might play a more serious role in the pandemic, he adds, but "this hypothesis has to be seriously raised."

Shelley Rankin, a microbiologist at the University of Pennsylvania School of Veterinary Medicine, points out that the researchers have shown only a correlation between B.1.1.7 infection and myocarditis, and that they didn't rule out other causes for the condition. "There is no evidence pets were sick because of the virus," she says.

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

Weese agrees that neither the Texas nor U.K. findings should sound any alarms about pets endangering their owners. "The risk of them being a source of infection remains very low," he says. "If my dog has it, he probably got it from me. And I'm much more likely to infect my family and neighbors before he does."

Still, he says scientists and veterinarians should do studies on what role, if any, SARS-CoV-2 and its variants play in myocarditis among pets. There is evidence that the virus can cause the condition in people, Weese notes, so it's worth exploring in companion animals. "It might be real," he says, "but there's no reason for people to freak out right now."

sciencemag.org, 19 March 2021

https://www.sciencemag.org

An alarming decline in sperm quality could threaten the future of the human race, and the chemicals likely responsible are everywhere

2021-03-22

The opening of epidemiologist Shanna Swan's new book sounds a bit like science fiction: We are half as fertile as our grandfathers were. And if the trend continues, we may very well reach a point where the human race is unable to reproduce itself.

In Count Down: How Our Modern World Is Threatening Sperm Counts, Altering Male and Female Reproductive Development, and Imperiling the Future of the Human Race, Swan's take on the procreative capabilities of the modern man is clear-eyed and terrifying. The data tells some of the tale. Sperm concentration—the number of sperm per milliliter of semen—has dropped more than 50% among men in Western countries in just under 40 years.

"Some of what we've been thinking of as fiction, from stories such as The Handmaid's Tale and Children of Men, is rapidly becoming reality," Swan, Ph.D., writes in Count Down. "I felt and remain genuinely scared by these findings on a personal level."

The question of human fertility, and sperm counts in particular, is one with which Swan is well versed. An environmental and reproductive epidemiologist at the Icahn School of Medicine at Mount Sinai in New York, Swan was one of the lead authors of a meta-analysis, published in 2017, that examined semen from 42,935 men over a 38-year period.

Sperm concentration—the number of sperm per milliliter of semen—has dropped more than 50% among men in Western countries in just under 40 years.

It found that the average man in places like the U.S. had 99 million per milliliter sperm in 1973; by 2011, that number had dropped to 47.1 million per milliliter. (For comparison's sake, the World Health Organization deems 15 million per milliliter the lowest sperm concentration compatible with fertility.) The work of Swan and her colleagues received widespread attention. GQ even gave it the feature treatment at the time.

Her new book is a continuation of these earlier efforts. The question now is what explains the decrease in sperm counts. Well, a lot of things: obesity, smoking, alcohol use, lack of exercise, even a daily sauna.

Yet the more insidious and worrying cause of these changes is likely an omnipresent class of chemicals called endocrine disruptors, which interfere with the body's production of the hormones testosterone and estrogen. Plastics have made many wonderful things possible, but, as we wrote in 2018, "it turns out that many of the compounds used to make plastic soft and flexible (like phthalates) or to make them harder and stronger (like Bisphenol A, or BPA) are consummate endocrine disruptors." Men with excess phthalates in their bodies, for instance, will produce less testosterone and, as a result, fewer sperm.

So what should we do? And, more specifically, what should men interested in having children one day do to keep their sperm in top health? GQ put those questions to Swan.

GQ: It's maybe the hardest number to avoid in the book: Sperm counts in the West have dropped by 50 percent. I don't mean to sound flippant, but should we be terrified? Are we doomed?

Shanna Swan: Doomed is kind of an emotional word. It's not a scientific word, right? But let me tell you what I think. I think that sperm counts are really low in many places in the world, and people should be very concerned. Yes, I take it seriously. Am I panicking? No.

Why should we be concerned but not panicked?

The bottom line is that we can do things to improve our reproductive function. We wrote about one guy in the book. This man was having his sperm collected routinely at a sperm bank. He was one of their prime donors, and then suddenly he didn't make the cut, and they said, "What's up?" And he said, "Well, let's see: I changed jobs; it's more stressful. I have a new girlfriend, she smokes," and so on. And so he went back and he cleaned up his act, and then after a couple of months, his sperm count returned.

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

That's interesting: We can actually do things to affect our own sperm health. Any tips?

If you eat what's called the Mediterranean diet—that's a diet that has fruits, vegetables, chicken, fish, whole grains—that improves at least one, if not more, of your semen quality measures.

I seem to recall many instances in Count Down where you warned about the nature of those foods, though. How they were grown, in other words, and whether they were treated with certain pesticides. What's the connection to sperm health?

We have a study of young men in Rochester, New York. College students. And they filled out a really detailed food frequency questionnaire about what they ate in the last 24 hours and what they usually ate, and so on. And then we looked at how they answered on that food frequency questionnaire and related it to their semen quality. Men could improve their semen quality by eating more fruit and vegetables—as long as they had low pesticide residue.

We actually got a measure of pesticide residues for the foods they ate, and then looked to see how much they ate with a low or high pesticide residue—so, pesticides left on food. If they ate either organic or some other food that was likely to be low in pesticides, eating a lot of those fruits and vegetables improved their sperm count. But when they had high pesticide levels, it decreased their sperm count.

The book talked specifically about pesticides used on pineapples and their effects on sperm counts.

There was a pesticide used in the harvesting of pineapple; it's called dibromochloropropane. [Better known as DBCP, it was banned from use in the U.S. in 1979.] That pesticide actually totally wiped out men's sperm. Women were comparing notes, and they were saying that they couldn't get pregnant—the wives of these men. They tested the men, and they had zero sperm. And you can't get more dramatic than that. But what they found was that when they stopped using the product, in a couple of months, their sperm count returned.

A lot of your research, and a lot of the book, focuses on these types of chemicals, these endocrine disruptors. Some are found in pesticides. Many of them are found in common objects, like plastic food containers and plastic bags. What's the big deal here?

The plastics revolution, or the chemical revolution, which I date, and many people date, from the end of the Second World War. So let's say 1950. If you look at the production of chemicals after that time, it goes up exponentially. It's a huge climb. For a long time, people paid no attention at all. The initial alarm, I think, was about pesticides. Now people are getting very aware that plastics in the environment—single-use plastics, throwaway plastics—are harming wildlife. We're used to seeing the poor sea creatures with these plastics all over their necks and in their bodies. But we don't have those pictures of ourselves.

And that's why we don't know.

That's what we have to see: We are also getting exposed. Maybe we don't have a plastic ring around our neck, but we do have plastics coming into our bodies that affect our sperm and, in women, our eggs. That translation is what's so difficult, and that's what I'm trying to work on with this book, to educate people on the risk that we're facing from these plastics. And then we want to pressure the government to demand safer chemicals, so we don't have chemicals that alter our testosterone and our estrogen racing through our bodies.

Let's talk about that for a moment. For example, when I'm holding a plastic bag, or using some sort of aftershave cream that comes in a plastic bottle—are these chemicals just leaching into my body and then messing with my sperm?

One of the properties of these plastics is that they do increase absorption. And they're put into our personal care products specifically for that reason. When you put a cream on your arm or your hand, you don't want it to be there a half hour later. The phthalates in that product actually increase that absorption.

Unfortunately, the other ways they come in is through our food and our drinks. There's so many ways that they get into our food, and food is the primary source of exposure to phthalates. If you have a soft plastic tube, you pass food through it, it's got phthalates in it; that's what makes it soft. The phthalates are not chemically bound: They leave the plastic; they enter the food; they go into the container; they go into us. Any processed food has the high risk of having phthalates in it.

Hence your message about the Mediterranean diet, when it comes to what we should eat to ensure healthier sperm.

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

That's sort of the biggest general takeaway. It's not that different a message we get for overall health.

Is this decrease in sperm count really related to a decrease in the overall fertility rate? Aren't humans just choosing to have fewer kids anyway?

It's a question a lot of people ask. Obviously, if you have no sperm, you can't have any children. Fertility, the way demographers measure it, is how many children a woman or couple has. That's called the fertility rate. If that number is at 2.1, then we say we are at replacement. Now the whole world is at 2.4. It was at five children per couple in 1960, and now it's at 2.4.

Is part of that due to choice? Absolutely. Is it all due to choice? Absolutely not. Another way to look at it is: The same problems that we're having with fertility, other wildlife species are having. And they're not choosing it. But they're subject to the same forces we are.

Forces, in this case, meaning this chemical-based conundrum.

Things like sexual libido, the frequency of sex, all these things are linked to hormones, and can be affected by the same chemicals that affect sperm count. Chemicals in commerce that get into our products, our household products, like our Teflon pan or our flame-retardant cushions and so on, are disruptive.

We are actually all participating in this study, this big study of people exposed to these chemicals, but you didn't sign up for this, and I didn't sign up for this.

In chapter 11 of Count Down, you carefully outline a punch list of what people can do to keep endocrine-disrupting chemicals out of their households. But to bring this back to men and sperm counts: Should we all just start getting screened? As part of our overall health, should we get semen analyses done and see what's going on with our own sperm?

I actually think that's a good idea, not only for making sure you'll be able to have a baby when you want to, but also because having poor semen quality actually is a predictor for later disease. There are a number of studies now that show that men with low sperm counts have higher heart disease rates, and higher rates of diabetes, and higher rates of reproductive cancers, and actually die younger. Given that there are things that you can do to increase your sperm count and sperm quality, why not proactively find out if you have a problem so you can take steps to turn it around?

This interview has been edited and condensed.

gq.com, 22 March 2021

https://www.gq.com

New Ebola outbreak likely sparked by a person infected 5 years ago

2021-03-12

An Ebola outbreak in Guinea that has so far sickened at least 18 people and killed nine has stirred difficult memories of the devastating epidemic that struck the West African country between 2013 and 2016, along with neighboring Liberia and Sierra Leone, leaving more than 11,000 people dead.

But it may not just be the trauma that has persisted. The virus causing the new outbreak barely differs from the strain seen 5 to 6 years ago, genomic analyses by three independent research groups have shown, suggesting the virus lay dormant in a survivor of the epidemic all that time. "This is pretty shocking," says virologist Angela Rasmussen of Georgetown University. "Ebolaviruses aren't herpesviruses"—which are known to cause long-lasting infections—"and generally RNA viruses don't just hang around not replicating at all."

Scientists knew the Ebola virus can persist for a long time in the human body; a resurgence in Guinea in 2016 originated from a survivor who shed the virus in his semen more than 500 days after his infection and infected a partner through sexual intercourse. "But to have a new outbreak start from latent infection 5 years after the end of an epidemic is scary and new," says Eric Delaporte, an infectious disease physician at the University of Montpellier who has studied Ebola survivors and is a member of one of the three teams. Outbreaks ignited by Ebola survivors are still very rare, Delaporte says, but the finding raises tricky questions about how to prevent them without further stigmatizing Ebola survivors.

The current outbreak in Guinea was detected after a 51-year-old nurse who had originally been diagnosed with typhoid and malaria died in late January. Several people who attended her funeral fell ill, including members of her family and a traditional healer who had treated her, and four of them died. Researchers suspected Ebola might have caused all of the deaths, and in early February they discovered the virus in the blood of the nurse's husband. An Ebola outbreak was officially declared on 13 February, with the nurse the likely index case.

"This is pretty shocking," says virologist Angela Rasmussen of George-town University.

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

The Guinea Center for Research and Training in Infectious Diseases (CERFIG) and the country's National Hemorrhagic Fever Laboratory have each read viral genomes from four patients; researchers at the Pasteur Institute in Dakar, Senegal, sequenced two genomes. In three postings today on the website virological.org, the groups agree the outbreak was caused by the Makona strain of a species called Zaire ebolavirus, just like the past epidemic. A phylogenetic tree shows the new virus falls between virus samples from the 2013–16 epidemic.

Until recently, scientists assumed Ebola epidemics start when a virus jumps species, from an animal host to humans. Theoretically, that could have happened in Guinea, says virologist Stephan Günther of the Bernhard Nocht Institute for Tropical Medicine, who worked with one of the three teams. But given the similarity between viruses from the epidemic and the new ones, "It must be incredibly unlikely."

Outside scientists agree but say it hasn't been proved that Ebola lay dormant in one person for 5 years. "From the tree, you'd conclude that it is a virus that persisted in some way in the area, and sure, most likely in a survivor," says Dan Bausch, a veteran of several Ebola outbreaks who leads the United Kingdom's Public Health Rapid Support Team. But it is hard to rule out scenarios such as a small, unrecognized chain of human to human transmission, Bausch adds: "For example, a 2014 survivor infects his wife a few years after recovery, who infects another male, who survives and carries virus for a few years, then infecting another women, who is then seen by a nurse who dies"—the index case in the new outbreak.

The nurse was not known to be a survivor herself, but she could have had contact with a survivor privately or through her job, or she might have been infected herself years ago with few symptoms. "Figuring out what exactly happened is one of the biggest questions now," Bausch says.

Another ongoing outbreak of Ebola in North Kivu, in the Democratic Republic of the Congo, was also started by transmission from someone infected during a previous outbreak, Delaporte notes. (The survivor had tested negative for Ebola twice after his illness in 2020.) Taken together, that suggests humans are now as likely to be the source of a new outbreak of Ebola as wildlife, he says. "This is clearly a new paradigm for how these outbreaks start." Outbreaks sparked by survivors may even become more likely, now that increasing mobility and other factors have caused each eruption of Ebola to become bigger, resulting in more survivors, says Fabian Leendertz, a wildlife veterinarian who was involved in the sequencing.

The cases raise important new research questions, Bausch says: "How do we need to change our response to escape from the cycle of outbreak-response-reintroduction-outbreak?" he asks. "Can we use new therapeutics to clear virus from survivors?"

But the most immediate question is what these results mean for Ebola survivors, who face a lot of hardship already. Many have not only lost friends and family to the virus, but also struggle with long-term aftereffects, such as muscle pains and eye problems. In a study published in February, Delaporte found that about half of more than 800 Ebola survivors in Guinea still reported symptoms 2 years after their illness, and one-quarter after 4 years.

On top of this, survivors have faced intense stigmatization. Many conspiracy theories swirled in the aftermath of the epidemic, including the claim that survivors had sold family members to international organizations to save themselves, says Frederic Le Marcis, a social anthropologist at the École Normale Supérieure of Lyon and the French Research Institute for Development, who is working in Guinea. One man, he says, was the only one to survive out of 11 family members and when he came back, no one wanted to work with him. "He was seen as someone untrustworthy." News that a survivor likely touched off the current outbreak could cause further problems for survivors, Le Marcis says: "Will they be highlighted as a source of danger? Will they be chased out of their own families and communities?"

Alpha Keita, a virologist who led the sequencing work at CERFIG, worries about stigmatization and even violence against survivors have occupied him since he first got the surprising results a week ago. One important message to the public should be that some people infected with Ebola show few symptoms, meaning people may be survivors without knowing it. "So don't stigmatize Ebola survivors—you don't know that you are not a survivor yourself," Keita says.

Bausch calls for an educational campaign explaining that unprotected sex with an Ebola survivor may pose a risk, but casual contacts such as shaking hands and working together do not. And although there needs to be some medical monitoring of survivors, it cannot just be about testing them for Ebola virus, he says. "We need to recognize and assist with all the other challenges, physical, mental, and social, that survivors and their families face." The key, Bausch says, is to "not just treat survivors as some hot potato risk of starting another outbreak." It also presents a challenge

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

to the country's health care system if every patient with fever and diarrhea has to be a considered potential Ebola case, Le Marcis says.

Fortunately, Ebola vaccines and treatments have become available in recent years. Already, several thousand contacts of the new Ebola patients, and contacts of these contacts, have been vaccinated. Health care workers are being immunized as well. Vaccinating survivors might even help clear latent infections, Rasmussen says. And the fact that viral samples were sequenced in Guinea this time around shows the country's scientific capabilities have improved, Delaporte says: "Seven years ago, when the epidemic started, there was no infrastructure in Guinea to be able to do this."

sciencemag.org, 12 March 2021

https://www.sciencemag.org

Queensland passes laws banning 'killer' single-use plastics

2021-03-11

Queensland has become the second Australian state to pass laws banning single-use plastics including straws and cutlery that are blighting the state's waterways and beaches and endangering wildlife.

Environmental groups congratulated the Queensland government after it passed legislation on Wednesday night that will ban single-use plastic items, including polystyrene food containers and cups, from 1 September.

The state's environment minister, Meaghan Scanlon, said the state had seen benefits from its 2018 ban on single-use plastic bags, which had dropped 70% in litter surveys.

The state's container deposit scheme that gives a 10c return on most plastic and glass bottles, also introduced in 2018, was now approaching 3bn returned items.

"Plastic pollution is spoiling our streets and parks, escaping into our ocean and waterways and killing our iconic wildlife," Scanlon said. "Half of all plastic produced is designed to be used only once and then thrown away and that litter is destroying our environment."

South Australia was the first state to introduce a ban on single-use plastics, in September, with a similar list of items banned.

The state's container deposit scheme that gives a 10c return on most plastic and glass bottles, also introduced in 2018, was now approaching 3bn returned items.

Last week the federal government launched a national plastics plan that includes a phase-out by 2022 of expanded polystyrene packaging and food containers.

Queensland's ban covers single-use plastic straws, stirrers, cutlery and plates, and polystyrene food containers and cups.

The laws exempt supply to people who need any of those items, such as people with disability or healthcare needs.

Exemptions have also been made for plastic straws and spoons attached to food packaging, including drink cartons and yoghurts, though the minister said this would be reviewed.

More items could be added under the legislation, Scanlon said, and consultation was continuing.

Toby Hutcheon, of the Boomerang Alliance of more than 50 environmental groups, said he hoped to see coffee cups and lids and other plastic takeaway items, and heavyweight plastic bags joining the banned list.

Hutcheon thanked the Liberal National party, the Queensland Greens and Katter's Australian party for backing the law.

The plastics included in the ban were among the most littered items in Queensland, he said, with the latest Clean Up Australia report from litter-pick days estimating 30% of all items collected were plastic packaging.

He said the Australian Capital Territory, Victoria and Western Australia have also announced single-use plastic bans but have yet to put those into law.

The best approach for the public, he said, was to avoid the use of single-use plastic items entirely, or to buy reusable or compostable versions.

Shane Cucow, of the Australian Marine Conservation Society, said the laws were "fantastic news for Queensland's turtles, whales and seabirds".

He added: "Every day we wait we lose more animal lives. We urge every state and territory to join Queensland and South Australia and ban single-use plastics this year.

"With Earth-friendly alternatives now widely available, it's time to ditch killer plastics throughout all of Australia."

theguardian.com, 11 March 2021

https://www.thegurdian.com

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

'Rarest of the rare' dinosaur fossil found brooding on its eggs

2021-03-17

About 70 million years ago, an ostrich-like dinosaur brooding atop a nest of blue-green eggs met its doom, perishing with its nearly-hatched babies in what is now southern China.

Now, the remains of that beast — an oviraptorosaur, or a giant feathered dinosaur that walked on two legs — represent the only dinosaur fossil on record to be found sitting on top of eggs that still contain dinosaur embryos, a new study finds.

"Dinosaurs preserved on their nests are rare, and so are fossil embryos," study lead researcher Shundong Bi, a paleontologist at the Center for Vertebrate Evolutionary Biology at Yunnan University in China, said in a statement. "This is the first time a non-avian dinosaur has been found, sitting on a nest of eggs that preserve embryos, in a single spectacular specimen."

PLAY SOUND

These eggs now join the ranks of another famous oviraptorid embryonic egg, known as Baby Louie, whose 90 million-year-old remains were also found in China. (Baby Louie wasn't found in a nest with an adult sitting on it.)

Oviraptorids, which are theropods — a group of mostly meat-eating bipedal dinosaurs that includes Tyrannosaurus rex and Velociraptor — flourished during the Cretaceous period (145.5 million to 65.5 million years ago). This brooding oviraptorid was discovered in rocks dating to the last age of the Cretaceous period, known as the Maastrichtian age (72 million to 65.5 million years ago), alongside the Ganzhou railway station in Jiangxi province.

The fossil isn't complete, as the adult's skull and a few of its bones, including parts of its vertebrae, are missing; but its nest is remarkably well-preserved with the remains of at least 24 oval-shaped eggs. At least seven of those eggs, each about 8.5 inches (21.5 centimeters) long and just over 3 inches (8.5 cm) across, contain bones or partial

The adult oviraptorid was sitting directly over the clutch, with its forelimbs (or arms) covering the edges of the nest, the researchers wrote in the study. Many of the embryos were about to hatch. This indicates that the adult was likely incubating its eggs, a behavior also seen in modern birds,

"This is the first time a non-avian dinosaur has been found, sitting on a nest of eggs that preserve embryos, in a single spectacular specimen."

the descendants of dinosaurs, rather than guarding its nest like a crocodile (crocodiles are archosaurs, meaning they are distant cousins of dinosaurs), the researchers said.

"This kind of discovery, in essence fossilized behavior, is the rarest of the rare in dinosaurs," study co-researcher Matt Lamanna, a paleontologist at the Carnegie Museum of Natural History in Pittsburgh, said in the statement. "In the new specimen, the babies were almost ready to hatch, which tells us beyond a doubt that this oviraptorid had tended its nest for quite a long time. This dinosaur was a caring parent that ultimately gave its life while nurturing its young."

Moreover, an analysis of the oxygen isotopes (atoms with varying numbers of neutrons in their nuclei) in the fossilized eggshells and embryonic dinosaur bones revealed that the eggs were incubated at high temperatures of about 86 to 100 degrees Fahrenheit (30 to 38 degrees Celsius), the researchers said. The team figured this out by comparing the oxygen isotopes in the eggshells, which would have matched the mother's oxygen isotopic makeup because she laid the eggs, with the chemistry of the embryonic bones, which would have changed over time because of the incubation heat applied to them. This finding adds another layer of evidence that the adult oviraptorid was sitting on the nest to keep the eggs warm. In contrast, reptiles tend to keep their eggs at cooler temperatures of about 79 to 90 F (26 to 32 C), the researchers said.

Some of the embryos were more developed than others, indicating that they were likely laid at different times, the researchers noted. Such asynchronous hatching seems to have evolved independently in oviraptorids and some modern birds, including owls and pelicans, in which eggs can hatch hours to weeks apart.

The adult oviraptorid revealed one more secret; the researchers found a cluster of pebbles near its abdominal region. These pebbles were likely gastroliths ("stomach stones" in Latin) that the dinosaur likely swallowed to help it grind and digest its food. This is the first instance of stones that are clearly gastroliths to be found in an oviraptorid specimen, the researchers said.

"It's extraordinary to think how much biological information is captured in just this single fossil," study senior research Xing Xu, a biologist at the Institute of Vertebrate Paleontology and Paleoanthropology at the Chinese Academy of Sciences, said in the statement. "We're going to be learning from this specimen for many years to come."

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

The study was published as a peer-reviewed pre-print online in December 2020 in the journal Science Bulletin.

Editor's Note: This story was updated at 1:57 p.m. EDT March 16 to correct the temperature conversions of the eggs.

Originally published on Live Science.

livescience.com, 17 March 2021

https://www.livescience.com

No uterus, no problem: Mouse embryos grown in bottles form organs and limbs

2021-03-17

Developmental biologists have devised a method for growing mouse embryos outside a uterus for longer than ever before, giving them an unprecedented view of how mammalian organs and limbs form—a process previously hidden inside a mother's body. Researchers in Israel report today that the new system, which includes rotating bottles filled with nutrients, kept the mouse embryos alive from roughly day five of development until day 11, about halfway through the animals' 20-day gestation. By that time the embryos have formed hind limbs and all their major organs.

"It looks very spectacular," says Max Planck Institute for Molecular Genetics developmental biologist Alexander Meissner, who was not involved in the work. "The fact that [the researchers] can culture these embryos and keep them alive for such a long time—it's amazing."

"The fact that [the researchers] can culture these embryos and keep them alive for such a long time—it's amazing."

To develop the new technique, Weizmann Institute of Science developmental biologist Jacob Hanna and his colleagues engaged in more than 7 years of trial and error. Previously, scientists could grow mouse embryos in the lab for the first 3 or 4 days of development. In normal mouse pregnancies, when the embryo implants in the wall of the uterus, the placenta starts to form, and the embryo's cells start to differentiate into more specific types of stem cells that will form different tissues. Beyond that point, it was difficult to grow developing mouse embryos outside the uterus for more than a day or two.

But the new system increased that time by nearly 1 week, Hanna and colleagues report today in Nature. Beyond nutrients in which they bathed embryos, the rotating glass bottles helped provide the tiny embryos with sufficient oxygen and atmospheric pressure. Keeping the air pressure and

oxygen saturation at the right levels was the hardest part, Hanna says. "We learned how to control the ventilation system," he adds with a laugh.

The team's two-step process starts by growing the embryos, extracted from a pregnant mouse just before implantation, on culture plates from day five to day seven of development. That is when the embryos undergo a process called gastrulation, in which they transform from a hollow ball of cells into a multilayered structure with specific cells destined to form different tissues. The researchers then transfer the embryos to a set of rotating jars, where they are able to keep them alive for an additional 4 days of development.

Hanna's team also introduced genetic tags to certain cells in the mouse embryos that let the scientists follow the fates of those cells as development progressed. Finally, they also showed that they could add certain kinds of human neural cells to the embryos, which partly incorporated them into the developing brain. Both techniques can be used to help understand how normal development happens—and how it sometimes goes wrong.

The technique "opens new doors by making embryos accessible for a detailed study of many aspects of their development," says Magdalena Zernicka-Goetz, a developmental biologist at the California Institute of Technology. She and her colleagues have also developed ways to culture mouse embryos through gastrulation, but Hanna's system pushes the process even further. "[It] will make a big contribution to the field, which we are certainly planning to exploit," Zernicka-Goetz says.

Hanna says the next step is to attempt to grow mouse embryos created by in vitro fertilization, rather than ones from natural pregnancies. That would "combine everything so we can go from day zero to day 11," he says.

Meissner doesn't think the technique could be stretched much longer. "There's a natural limit in terms of how big [the embryos] can get without nutrients and blood supply. It's not obvious to see how you can go from here to an actual ex utero delivery," he says. But the technique will make it possible to answer a range of new questions about development, he says. "The toolbox has become quite powerful."

The new finding comes as other researchers are developing systems to grow human cells into clusters resembling an early stage of embryo development, the relatively undifferentiated balls of cells called blastocysts. Two groups reported their techniques in Nature today.

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

Hanna says he has not yet attempted to use the rotating bottle method to grow human embryos—something that would violate guidance from the International Society for Stem Cell Research that recommends against culturing human embryos for longer than 14 days of development, when gastrulation takes place. Those guidelines are being revised, however, and updated recommendations are expected in May. "Of course it's scientifically very important to do such experiments with human embryos, because we have so little information about these stages of human development," Hanna says. Israeli law would not prohibit such experiments, he said, if they received ethical approval.

sciencemag.org, 17 March 2021

https://www.sciencemag.org

WHO thinks it knows where COVID-19 originated

2021-03-18

After a months-long investigation, the World Health Organization (WHO) has found that wildlife farms in China are likely the source of the COVID-19 pandemic.

These wildlife farms, many of them in or around the southern Chinese province of Yunnan, were likely supplying animals to vendors at the Huanan Seafood Wholesale Market in Wuhan, where early cases of COVID-19 were discovered last year, Peter Daszak, a disease ecologist on the WHO team that traveled to China, told NPR. Some of these wild animals could have been infected with SARS-CoV-2 from bats in the area.

The WHO is expected to release its findings in a report in the coming weeks.

In January, a WHO team of experts traveled to China to probe how the deadly pandemic, which has now infected more than 120 million people and killed 2.6 million worldwide, first started, Live Science previously reported. A rash of conspiracy theories have been spread about the origin of the virus, including that the virus escaped from a Wuhan lab. Last month, the WHO investigators dismissed that explanation.

The general consensus among scientists was that the coronavirus was circulating in bats and hopped to humans, likely through an intermediate species. That's exactly what the WHO investigations found: The virus likely passed from bats in southern China to animals in wildlife farms, and then to humans.

That's exactly what the WHO investigations found: The virus likely passed from bats in southern China to animals in wildlife farms, and then to humans.

The wildlife farms are part of a project that the Chinese government has been promoting for 20 years to lift rural populations out of poverty and close the rural-urban divide, according to Daszak and NPR.

"They take exotic animals, like civets, porcupines, pangolins, raccoon dogs and bamboo rats, and they breed them in captivity," Daszak told NPR.

But in February 2020, China shut down those farms, likely because the Chinese government thought that they were part of the transmission pathway from bats to humans, Daszak said. The government sent out instructions to farmers about how to bury, kill or burn the animals in a way that wouldn't spread disease, Daszak told NPR.

Many of these farms breed animals that can carry coronaviruses, including civets, cats and pangolins. Most are located in or near the Yunnan province in southern China, where scientists previously discovered a bat virus that's 96% similar to SARS-CoV-2, according to NPR. The WHO still doesn't know what animal carried the virus from bats to humans.

"I do think that SARS-CoV-2 first got into people in South China. It's looking that way," Daszak told NPR. The WHO also found evidence that these wildlife farms were supplying vendors at the Huanan Seafood Wholesale Market.

"China closes that pathway down for a reason," Daszak said. Namely, that they likely thought that this was the most likely path of transmission, which is also what the WHO report will conclude, he added.

You can read the whole story on NPR.

Originally published on Live Science.

livescience.com, 18 March 2021

https://www.livescience.com

Carbon-ring molecules tied to life were found in space for the first time

2021-03-22

Complex carbon-bearing molecules that could help explain how life got started have been identified in space for the first time.

These molecules, called polycyclic aromatic hydrocarbons, or PAHs, consist of several linked hexagonal rings of carbon with hydrogen atoms at the

"This is our window into a huge reservoir of them."

CHEMWATCH
Bulletin Board
Gossip
MAR. 26, 2021

edges. Astronomers have suspected for decades that these molecules are abundant in space, but none had been directly spotted before.

Simpler molecules with a single ring of carbon have been seen before. But "we're now excited to see that we're able to detect these larger PAHs for the first time in space," says astrochemist Brett McGuire of MIT, whose team reports the discovery in the March 19 Science.

Studying these molecules and others like them could help scientists understand how the chemical precursors to life might get started in space. "Carbon is such a fundamental part of chemical reactions, especially reactions leading to life's essential molecules," McGuire says. "This is our window into a huge reservoir of them."

Since the 1980s, astronomers have seen a mysterious infrared glow coming from spots within our galaxy and others. Many suspected that the glow comes from PAHs, but could not identify a specific source. The signals from several different PAHs overlap too much to tease any one of them apart, like a choir blending so well, the ear can't pick out individual voices.

Instead of searching the infrared signals for a single voice, McGuire and colleagues turned to radio waves, where different PAHs sing different songs. The team trained the powerful Green Bank Telescope in West Virginia on TMC-1, a dark cloud about 430 light-years from Earth near the constellation Taurus.

Previously, McGuire had discovered that the cloud contains benzonitrile, a molecule made of a single carbon ring (SN: 10/2/19). So he thought it was a good place to look for more complicated molecules.

The team detected 1- and 2-cyanonaphthalene, two-ringed molecules with 10 carbons, eight hydrogens and a nitrogen atom. The concentration is fairly diffuse, McGuire says: "If you filled the inside of your average compact car with [gas from] TMC-1, you'd have less than 10 molecules of each PAH we detected."

But it was a lot more than the team expected. The cloud contains between 100,000 and one million times more PAHs than theoretical models predict it should. "It's insane, that's way too much," McGuire says.

There are two ways that PAHs are thought to form in space: out of the ashes of dead stars or by direct chemical reactions in interstellar space. Since TMC-1 is just beginning to form stars, McGuire expected that any PAHs it contains ought to have been built by direct chemical reactions in space. But that scenario can't account for all the PAH molecules the team

found. There's too much to be explained easily by stellar ash, too. That means something is probably missing from astrochemists' theories of how PAHs can form in space.

"We're working in uncharted territory here," he says, "which is exciting."

Identifying PAHs in space is "a big thing," says astrochemist Alessandra Ricca of the SETI Institute in Mountain View, Calif., who was not involved in the new study. The work "is the first one that has shown that these PAH molecules actually do exist in space," she says. "Before, it was just a hypothesis."

Ricca's group is working on a database of infrared PAH signals that the James Webb Space Telescope, slated to launch in October, can look for. "All this is going to be very helpful for JWST and the research on carbon in the universe," she says.

sciencenews.org, 22 March 2021

https://www.sciencenews.org

CHEMWATCH
Bulletin Board

Machine learning helps identify cancerous cells by measuring their pH

2021-03-18

There are many differences that help us distinguish healthy cells from cancerous cells—from shape to growth to signaling. Another way is by their pH. The pH in a cancerous cell is not the same as the pH within a healthy cell. Previous studies have reported that the acidic environment helps tumor cells produce proteins that make them more aggressive. Now researchers from the National University of Singapore have developed a method of using machine learning to determine whether a single cell is cancerous by detecting its pH.

Their findings were published in the journal APL Bioengineering in a paper titled, "Machine learning-based approach to pH imaging and classification of single cancer cells."

"The ability to identify different cell populations in a noninvasive manner and without the use of fluorescence labeling remains an important goal in biomedical research," wrote the researchers. "Various techniques have been developed over the last decade, which mainly rely on fluorescent probes or nanoparticles. On the other hand, their applications to single-cell studies have been limited by the lengthy preparation and labeling protocols…."

On the other hand, their applications to single-cell studies have been limited by the lengthy preparation and labeling protocols…."

"The ability to identify single cells has acquired a paramount importance in the field of precision and personalized medicine," explained Chwee Teck Lim, PhD, professor at the department of biomedical engineering and director of the Institute for Health Innovation and Technology at the National University of Singapore and one of the article's authors. "This is because it is the only way to account for the inherent heterogeneity associated with any biological specimen."

The new method consists of treating the cells with bromothymol blue, a pH-sensitive dye that changes color depending on how acidic a solution is. Because a cancerous cell has a different pH than normal cells, bromothymol blue will result in a different color compared to a normal cell.

"Our method allowed us to classify single cells of various human tissues, both normal and cancerous, by focusing solely on the inherent acidity levels that each cell type tends to exhibit, and using simple and inexpensive equipment," Lim said.

"One potential application of this technique would be in liquid biopsy, where tumor cells that escaped from the primary tumor can be isolated in a minimally invasive fashion from bodily fluids," Lim added.

The researchers are looking forward to advancing the concept further to try to detect different stages of malignancies from the cells.

"This simple method opens up the potential to perform rapid noninvasive identification of living cancer cells for early cancer diagnosis and further downstream analyses," concluded the researchers.

genengnews.com, 18 March 2021

https://www.genengnews.com

NetZero mycelium orbs help increase carbon capture and more

2021-03-18

It seems whatever the question is in nature, mycelium is the answer. For the past 12 years, a duo of mycologists has singularly focused on replicating the wonders of mycelium in a way that can benefit the environment in every forest, field and yard.

Called mycelium orbs, the treatments can roughly double the amount of carbon captured by America's lawns. It's easy to use by simply adding the orb to a watering can or spray applicator. A single application can last at least 10 years. It can be used anywhere, from a commercial farming operation to a simple backyard lawn. The treatments rejuvenate the soil and help plants thrive. Treated plants can capture one ton of carbon per year or 10 tons per application. That's an estimated 20% increase in carbon reduction. Additionally, the mycelium orbs are pet and human friendly and require zero maintenance.

Additionally, the mycelium orbs are pet and human friendly and require zero maintenance.

NetZero, the company behind the orbs, began in 2008 when two scientists came up with a blend that boosts the carbon absorption of all living plants. The innovation was based on the historic symbiotic relationship between fungi and surrounding plants. Not only does mycelium act as an underground communication system throughout the forest floor, but it has also been shown to increase the land's resilience and health. This helps trees and plants readily absorb water and nutrients.

inhabitat.com, 18 March 2021

https://www.inhabitat.com

CHEMWATCH
Bulletin Board
Curiosities
MAR. 26, 2021

Hazardous chemicals in branded textile products on sale in 27 places during 2012

Textile manufacturing makes use of a diverse range of process and finishing chemicals, some of which have intrinsic hazardous properties. As a result, finished textile products can contain certain hazardous chemicals used during their manufacture. This may be because of their use as components of the products themselves, or due to residues remaining from their use within the manufacturing processes. Detection of chemical additives and residues in finished textiles can, therefore, provide an indication of chemicals used and potentially released during manufacture.

See more

academia.edu, June 2012

https://www.academia.edu

These adorable puppies may help explain why dogs understand our body language

2021-03-17

Few scientific mysteries can be solved with the help of nearly 400 adorably naughty puppies, but a new study is a pleasant exception. Researchers have used the furballs to show dogs' ability to understand human pointing—a rarity in the animal kingdom and key to social intelligence—appears to be hardwired in doggy DNA.

"Using puppies to answer this question is a great approach," says Heidi Parker, a geneticist at the U.S. National Institutes of Health's Dog Genome Project who was not involved with the work. "Behavior is the holy grail of dog genetics," she says. Before scientists go searching for genes that may have turned dogs into our faithful companions, they need to make sure they're there in the first place, she says. "I feel like this study shows that."

Scientists have known for more than 2 decades that dogs understand the logic behind a surprisingly complex gesture: When we point at something, we want them to look at it. That insight eludes even our closest relatives, chimpanzees, and helps our canine companions bond with us. But it's been unclear whether pooches acquire this ability simply by hanging out with us, or it's encoded in their genes. "It's the one piece of the puzzle we don't have evidence for," says Evan MacLean, director of the Arizona Canine Cognition Center at the University of Arizona.

As a result, finished textile products can contain certain hazardous chemicals used during their manufacture.

Enter puppies. If social intelligence is genetic, dogs should display it at a very young age. And there shouldn't be any learning required.

That's what MacLean and his colleagues found. The scientists partnered with Canine Companions for Independence, which breeds dogs to assist people in the United States with post-traumatic stress disorder and physical disabilities. The group loaned the researchers 375 8-week-old Labrador and golden retriever pups: They were just old enough to participate in the experiments, but young enough to have had very little interaction—and thus experience or learning—with people.

Things didn't go quite as pleasantly as they might sound. "Working with puppies is a lot like having young kids," MacLean says. "It's a balance between extraordinarily cute and rewarding moments, and frustration that leaves you at the brink of insanity. There is nothing that will not be chewed or peed on, including all of your research equipment, your clothes, and your body."

The researchers put the puppies through three tests. First, they performed a classic pointing experiment, placing the young dogs between two overturned cups—one containing a treat—and pointing to the one with the treat (see video, above). The animals understood the gesture more than two-thirds of the time, approaching the performance of adult dogs. But they didn't get any better over a dozen rounds, suggesting they were not learning the behavior, MacLean says.

In a second experiment, a researcher stood outside a large playpen and, for 30 seconds, engaged in the kind of high-pitched "puppy talk" familiar to almost anyone who has owned a dog: "Hey puppy, look at you! You're such a good puppy." The animals spent an average of 6 seconds staring at the person. Such eye contact is rare among mammals—including the pups' ancestors, gray wolves—and it's an important foundation for social interaction with people.

In a final test, the researchers taught the puppies to find food in a plastic container, then sealed it with a lid. In contrast to adult dogs, which usually give up after a few seconds and look to humans for assistance, the pups rarely gazed at their scientist companions for help. "Puppies seem to be sensitive to receiving information from humans," as the other experiments show, MacLean says, "but they may not yet know that that they can solicit help from us."

CANINE COMPANIONS FOR INDEPENDENCE

CHEMWATCH
Bulletin Board
Curiosities
MAR. 26, 2021

To confirm that the puppies' successful behaviors were genetic, the researchers analyzed their pedigrees to see how related each dog was to the others. Then they compared this relatedness with the dogs' performance on the tests. Approximately 43% of the variation in performance was due to genetics, the team reports today on the preprint server bioRxiv.

That's on par with the heritability of cognitive traits like IQ in people, MacLean says. "It's about as hardwired as things in psychology come."

"It's a really high number for a complex trait like behavior—it's a pretty big deal," agrees Noah Snyder-Mackler, an evolutionary biologist at Arizona State University, Tempe, who has collaborated with MacLean in the past, but was not involved with the current study. He says the finding suggests people strongly selected for these abilities in the past, paving the way for dogs to become the human mind readers they are today.

Parker notes that Labrador and golden retriever service dogs are "pretty amiable," and she'd like to see the study replicated with a wider variety of breeds. She also says doggy social intelligence is likely spread out over hundreds of genes, which could make the exact DNA sequences hard to nail down.

But MacLean says he's up for the challenge. His team has already begun a genomewide association study, which will scan puppies' DNA to look for genetic variants linked to these social skills. What he finds in dogs will likely hold true for complex behaviors in other animals, he says, including humans. At the very least, the work will have one upside: DNA can't pee on your leg.

sciencemag.org, 17 March 2021

https://www.sciencemag.org

North Face rejected an oil order for jackets. It went south

2021-03-18

The North Face received a surprising — and unwelcome — honor earlier this month.

The outdoor apparel maker was recognized by the Colorado Oil and Gas Association with a customer appreciation award — the first time in the trade group's history that it had given the prize.

"If you're wearing synthetics right now, you're inhaling [microplastics]," she said.

It wasn't sincere. The energy association was mocking a recent decision by the North Face, which since 2000 has been owned by the $30 billion clothing conglomerate VF Corp., to reject a holiday jacket order from Innovex Downhole Solutions.

Even though the North Face relies on petrochemicals to make many of its products, company officials last November told the Houston oil field services contractor they didn't want their well-known brand and famous logo — a stylized image of Yosemite National Park's Half Dome — associated with the fossil fuel industry.

The move to treat Innovex like a gun, tobacco or porn company — all of which are formally banned from applying their logos to North Face products — prompted dozens of incredulous headlines in industry publications and at conservative media outlets and, on March 1, the oil and gas award.

While the honor was given to the North Face in jest, it unintentionally highlighted a serious challenge for VF and other outdoor apparel companies: Their brands and business models depend on customers connecting with nature, but the polyester fleeces, nylon boots and spandex tights they sell rely on planet-warming fossil fuels and are major sources of microplastics — an emerging environmental threat that's been found in virtually every creature on Earth.

"Citizens don't realize that these synthetic materials that they are wearing are oil, and that's hugely problematic," said Anika Kozlowski, a fashion professor at Toronto's Ryerson University who studies sustainable design.

"If you're wearing synthetics right now, you're inhaling [microplastics]," she said. "You're going to ingest them as you're eating because they're floating around in the air and they're falling. And if you leave something out, even on your counter for a couple hours, you're going to have more microfibers than if you'd just eaten it right away."

Scientists have documented microplastics — defined as pieces of plastic less than 5 millimeters long — in everything from crustaceans in the Mariana Trench to the placentas of unborn children.

The breakdown of clothes woven with plastic threads, in washing machines and through everyday use, is contributing to that microplastic pollution problem. Synthetic textiles are the single largest source of microplastics released into the ocean, according to a 2017 study from the

CHEMWATCH
Bulletin Board
Curiosities
MAR. 26, 2021

International Union for Conservation of Nature and Natural Resources, an intergovernmental environmental group.

Scientists still are trying to determine how the accumulation and continued decomposition of all of these tiny plastic particles are impacting humans and other species. But many researchers are already troubled by the increasing prevalence of microplastics.

"I definitely think we should be concerned," said Linda Birnbaum, a toxicologist and microbiologist who formerly led the National Institute of Environmental Health Sciences. "There is growing evidence not only that we're all exposed all the time, but that some of the things that make up the plastic may leach out over time."

The chemicals inside or carried by microplastics can include familiar endocrine disruptors such as per- and polyfluoroalkyl substances (PFAS), bisphenol A or its derivatives, and phthalates, she said. Those substances mimic the body's hormones and can lead to fertility issues, developmental disorders and cancerous tumors.

"This is a growing problem," Birnbaum said. "It's one that I think more and more people are becoming aware [of]."

'A miracle resource'

Despite the health concerns, some oil and gas companies are diversifying into plastics as the rise of electric vehicles and renewable energy threatens to reduce demand for their fuels (Climatewire, Jan. 21, 2020).

Dan Haley, the president and CEO of the Colorado Oil and Gas Association, underscored that trend in announcing the group's award for the North Face, which VF moved to Denver last year along with JanSport, Smartwool and some of its other brands. The North Face was originally based in the San Francisco Bay Area, and the Grateful Dead played at the opening of its first store.

"We often forget just how many other things we have or enjoy in the 21st century that are made possible because of oil and natural gas," Haley said during a virtual ceremony, which didn't include any North Face representatives.

"If you think about it, everything from your cellphone, much of our clothing, our outdoor gear, equipment that's used in restaurants, schools and hospitals across the country — all of it begins with oil and natural gas," Haley said. "It is really a miracle resource that a lot of us take for granted."

By relying on petrochemicals for most of its products, the North Face and other outdoor companies are effectively aiding the oil and gas industry in its pivot to plastic, Kozlowski argued.

"Given the problems we see with plastics, we just need to find a way to really just move away," the Canadian fashion professor said.

The North Face and its parent company, VF, both of which didn't respond to interview requests or a detailed list of questions for this story, say they're reducing their plastic consumption and carbon footprint by using more recycled bottles as the feedstock for their synthetic fabrics.

But Kozlowski noted that recycling plastic is very energy-intensive. She said outdoor apparel companies instead should focus on finding new ways to use versatile natural fabrics like wool.

"You're still going to have impacts coming out from that process," she said. "Recycling is not the answer. Recycling is not going to get us out of this problem."

And recycled plastics do little to address the potential environmental and human health challenges posed by synthetic fabrics.

"There's a lot of movement to make fabric out of recycled plastics. But then what happens to it?" said Birnbaum, who also used to lead the National Toxicology Program. The microplastics they shed "are going to be with us for a very, very, very long time."

The Outdoor Industry Association, a trade group that counts many VF companies as members, didn't make any representatives available for an interview or respond to questions about microplastics and climate change.

But the association has previously said it recognizes "the outdoor industry's potential contribution to microfiber pollution" and supports implementing "appropriate solutions that are based on sound science."

Climate pledges and private jets

While North Face steers clear of oil and gas business, VF brands such as Bulwark Protection and Dickies cater to the industry.

But the 121-year-old company, formerly known as Vanity Fair Mills, has pledged to cut emissions from its operations and energy consumption 55% by 2030, from a 2017 baseline. It also aims to reduce emissions associated with its products and logistics 30% by the end of the decade.

CHEMWATCH
Bulletin Board
Curiosities
MAR. 26, 2021

At the same time, VF boss Steve Rendle's $16.6 million in total compensation last fiscal year included nearly $125,000 for his "personal use of company aircraft," the company disclosed in a June 2020 Securities and Exchange Commission filing.

He used the private jets for "commuting in connection with VF's headquarters relocating to Colorado from North Carolina," the filing said. The company, now one of the Centennial State's largest, was lured there by the promise of up to $27 million in tax incentives.

"Family members of executives and their invited guests occasionally fly on VF aircraft as additional passengers on business flights," the conglomerate told regulators.

At the oil industry event, Rendle's carbon-intensive trips were applauded by executives, who noted that VF is planning to build a hangar for its private jet fleet.

"They're a copious consumer of our very fine Colorado-produced jet fuel," said Alex Cranberg, the head of Aspect Holdings LLC, a Denver-headquartered multinational oil and gas exploration and production company.

Kozlowski found the North Face's image-focused rejection of the oil and gas industry and the Colorado association's cynical embrace of the company darkly comic.

"It just is kind of a funny green washing fight, each trying to point a finger even though they completely rely on each other," she said.

eenews.net, 18 March 2021

https://www.eenews.net

How dirt could help save the planet

2021-03-14

The American dust bowl of the 1930s demonstrated the ruinous consequences of soil degradation. Decades of farming practices had stripped the Great Plains of their fertile heritage, making them vulnerable to severe drought. Ravaging winds lifted plumes of soil from the land and left in their wake air choked with dust and a barren landscape. Thousands died of starvation or lung disease; others migrated west in search of food, jobs and clean air.

Both erosion and climate change can be mitigated by incorporating more carbon into soil.

Today, we again face the potential for extreme soil erosion, but this time the threat is intensified by climate change. Together, they create an unprecedented dual threat to the food supply and the health of the planet—and farmers can be key partners in averting the catastrophic consequences. Both erosion and climate change can be mitigated by incorporating more carbon into soil. Photosynthetic carbon fixation removes carbon dioxide from the air, anchoring it in plant material that can be sequestered in soil.

This process reduces atmospheric greenhouse gases and reduces soil erosion by enriching soil with carbon that feeds hungry microbes that produce sticky substances, which in turn bind soil particles into clumps that are less vulnerable to movement by wind and water. The Biden administration has the opportunity to avert both crises through domestic policy for U.S. agriculture and international policy that would restore U.S. leadership in the battle against climate change. Reducing greenhouse gas emissions is the central feature of most plans to slow climate change. Much less attention has focused on sequestering atmospheric carbon in soil.

As the largest terrestrial carbon sink, which stores three times more carbon than the entire atmosphere, soil offers a vast repository with immense, untapped capacity. Since the beginning of agriculture, food production has removed about half, or 133 gigatons, of the carbon once stored in agricultural soil, and the rate of loss has increased dramatically in the last two centuries, creating a large void to be filled. Restoring this carbon stockpile would sequester the equivalent of almost one fifth of atmospheric carbon, bringing greenhouse gas concentrations nearly to pre–industrial revolution levels and making soil less erodible. Let's be realistic—we're not going to restore 133 gigatons of carbon any time soon. But working toward this goal could be a centerpiece of a multifaceted plan to address both erosion and climate change.

Farmers know that soil is no longer a renewable resource. Many farms are simply running out of it. A 2018 inventory from the U.S. Department of Agriculture reports that the United States loses soil on average 10 times faster than it is generated; and in states such as Iowa, New Mexico and Nevada, erosion is much more rapid. In parts of Africa and Asia, soil erosion outstrips replenishment as much as a hundredfold.

And it's getting worse. Heavy rainstorms are a key cause of erosion, driving loosened soil particles into streams and rivers. Many parts of the world, including the U.S. Midwest, have experienced a dramatic rise in the

CHEMWATCH
Bulletin Board
Curiosities
MAR. 26, 2021

frequency and power of rainstorms, a trend likely to accelerate as climate change worsens. At current rates of erosion, some of the world's most productive farmland will lose most of its topsoil over the next few decades, rendering it worthless for food production just as the Earth's population reaches nine billion. In fact even the well-endowed soil of Iowa has been so ravaged that subsoil is revealed at the land surface at locations across the state. But there is a general principle worthy of attention: erosion is reduced by accumulation of soil carbon.

Carbon sequestration in agricultural soils was the goal of the "4 per 1000" proposal for food security and climate that was introduced by France during the 2015 Paris climate talks. The proposal contended that increasing the carbon content of soils worldwide by 0.4 percent annually would offset future emissions. Only 29 countries signed the agreement, and the United States was not among them. The proposal encompassed all soil on Earth, giving it an aspirational and unattainable nature that put off many potential signatories. So 4 per 1000 should be reformulated to pass a reality test, focusing only on agricultural soil for starters. As President Biden seeks to reestablish U.S. leadership in global climate policy, achieving broad ratification of a proposal to increase soil carbon should be high on his agenda.

To meet such soil carbon goals for the benefit of both the climate and soil, the United States would need to adopt different farming practices. One important step is to reduce plowing, which causes erosion by breaking up large clods and destroying the soil structure that prevents detachment and movement of particles. The alternative—no-till planting—involves drilling seed directly into the stubble of the previous crop rather than plowing the field after harvest and again before planting and dropping seeds into plowed furrows. Although no-till methods were shown to substantially reduce erosion in the 1970s, they have been adopted on only one third of U.S. cropland. Another highly effective practice is growing cover crops—plant species that enrich the soil between fall harvest and spring planting of the main crop. The cover crop anchors soil and prevents winter winds and spring rainstorms from removing fertile topsoil.

Cropland soil can be stabilized by interspersing strips of perennial prairie plants, the very species that generated the expanses of Midwestern soils that have produced abundant food since European Americans migrated to the center of the country in the 19th century. These perennials have massive root systems that feed the soil. Switchgrass roots, for example, can grow 14 feet deep and account for half of the plant's biomass at the end of the season, a reservoir that enables the plant to resprout in spring.

Corn, by contrast, has shallow roots and by the end of the growing season a negligible amount of root biomass remains after the plant has shuttled its carbon to the seeds. Replacing just 10 percent of a corn crop with strategically placed prairie plants reduces erosion 95 percent! Similarly, reforestation reduces erosion with large tree roots that anchor and enrich soil. All of these soil-protective practices accelerate carbon sequestration, reducing greenhouse gas accumulation.

Intensive regenerative grazing, a method for pasturing cattle that boosts carbon sequestration by stimulating plant growth, duplicates the effects of the herds of bison that once roamed the American plains, contributing to formation of some of Earth's most fertile soils. Regenerative grazing regimes involve moving cattle frequently—sometimes several times in a single day—to new pasture, thereby preventing the animals from cropping the vegetation close to the ground. The remaining plants recover and start growing again more quickly than those that have been reduced to nubs, enabling them to be more photosynthetically active over the growing season and accumulate more carbon. Some researchers estimate that regenerative grazing boosts carbon fixation through photosynthesis enough to cancel out most of the greenhouse gases released by beef production.

Eventually, soil will reach its carbon-holding capacity. But that would be a good problem to confront—it would mean that soil was packed with carbon and was therefore healthy and resistant to erosion. By the time carbon capacity is reached in soils worldwide, strategies to reduce carbon emissions will likely be more advanced.

Critics of 4 per 1000 argue that the benefits of incorporating carbon into soil would be canceled out by the increased needs for nitrogen fertlizers, which are produced by a fossil fuel–intensive process. But carbon sequestration can be accompanied by retention of nitrogen in plant material, reducing nitrogen needs of future crops. Moreover, nitrogen needs could be satisfied by biological nitrogen fixation, which is conducted by soil bacteria that need no fossil fuels to make nitrogen fertilizer.

We have the means to halt soil loss and mitigate greenhouse gas emissions, but we need policies that enable farmers to adopt new practices. Most farms survive with a fragile profit margin—although Americans enjoy one of the cheapest, safest and most abundant food supplies in the world, farmers receive only 15 cents of every dollar spent on food, and between 2013 and 2018 net farm income dropped nearly

CHEMWATCH
Bulletin Board
Curiosities
MAR. 26, 2021

50 percent. The USDA forecast that half of U.S. farms would lose money in 2020. Many farms persist only because a family member provides income from off-farm employment. And financial hardship drives many farms out of business, which is evident in the loss of half of U.S. dairy farms between 2001 and 2019.

To improve the profitability of farming and reduce both soil erosion and net carbon emissions, the Biden administration could restructure crop insurance to reduce premiums on land that is managed in a carbon-friendly manner. This strategy would pay for itself within a few years because even small increases in soil carbon reduce vulnerabilty to droughts and floods, and consequently, the likelihood of insurance payouts. The administration could build an alliance of key stakeholders—farmers, food retailers, consumers, indigenous communities, agribusiness, and environmental groups—to design certification and marketing strategies for food sold with a label indicating it had been produced under conditions that sequester carbon.

The label might read, "Produced by Carbon Heroes" to recognize the heroism of farmers who make it possible for millions to eat and would now add protecting the Earth to their list of contributions. Multinational retailers could demand such practices from their producers as they have already done with other practices friendly to animals and the environment. Current agricultural subsidies could be redirected to pay for both the food and the carbon sequestered during its production.

The United States experienced the impacts of extreme soil degradation during the dust bowl. We could avert a similar devastation of U.S. farmland by changing farming practices, which would generate ancillary benefits for climate. The stakes are too high to ignore the soil.

scientificamerican.com, 14 March 2021

https://www.scientificamerican.com

Arctic walrus takes a nap on an iceberg, wakes up in Ireland

2021-03-16

A walrus spotted on an Irish beach yesterday (March 14) may have floated there from the Arctic Circle after falling asleep on an iceberg.

A 5-year-old girl walking with her father spotted the blubbery newcomer.

He was massive. He was about the size of a bull or a cow, pretty similar in size; he's big, big."

The young girl, named Muireann, pointed out the walrus to her dad, Alan Houlihan, as they walked on Valentia Island in County Kerry. "I thought it was a seal at first, and then we saw the tusks," Houlihan said, according to IrishCentral. "He kind of jumped up on the rocks. He was massive. He was about the size of a bull or a cow, pretty similar in size; he's big, big."

Most walruses (Odobenus rosmarus) live near the Arctic Circle, where they hunt for shellfish in shallow water and clamber up onto the icebergs and beaches to rest, Live Science previously reported. The humongous creatures rarely crop up along the Irish shoreline. The first recorded walrus sighting there occurred in 1897, but no other walruses were seen until the 1980s, the Irish public service broadcaster RTÉ reported. Since then, fewer than two dozen additional walruses have been spotted in Ireland.

The washed-up walrus seen on Valentia Island is thought to be quite young, based on the length of the animal's tusks, RTÉ reported. Full-grown walruses can grow tusks as long as 3.3 feet (1 meter), while the recently sighted walrus's tusks were roughly 12 inches (30 centimeters) long. The walrus's body measured more than 6 feet (2 m) from snout to tail.

How does a young walrus end up in County Kerry? "I'd say what happened is, he fell asleep on an iceberg and drifted off, and then he was gone too far, out into the mid-Atlantic or somewhere like that, down off Greenland possibly," Kevin Flannery, a marine biologist with the Dingle Oceanworld Aquarium, told The Independent.

"He could also be island-hopping and went to Iceland and on to Shetland, but that's unlikely," Flannery said. I'd say he came in out of the Atlantic." After traveling thousands of miles, the walrus is likely exhausted and hungry, he added.

"Hopefully, he'll get a few scallops around Valentia," Flannery said. "If he regains his strength, hopefully he'll make his way back up" to the Arctic.

Houlihan said the sleepy walrus still gave him and his daughter "a bit of a show" when they spotted it, according to The Irish Examiner. "It's brilliant. He was sitting on the rock now, kind of posing; at one stage there, he threw up a fin, and it looked like he was giving us all the birdie," he said.

PLAY SOUND

Originally published on Live Science.

~livescience.com, 16 March 2021

https://www.livescience.com

CHEMWATCH
Bulletin Board
Curiosities
MAR. 26, 2021

A deadly fungus behind hospital outbreaks was found in nature for the first time

2021-03-16

A deadly fungus that seemed to spring up out of nowhere in hospitals has been found in nature for the first time.

Researchers isolated the yeast Candida auris from two sites on the Andaman Islands in the Indian Ocean. The discovery suggests that C. auris was an environmental fungus before it was identified as a human pathogen, researchers report online March 16 in mBio.

It was a real puzzle as to where C. auris came from when it began appearing in patients and clinics, says Christina Cuomo, who studies fungal pathogen evolution at the Broad Institute of MIT and Harvard and was not involved in the study. "It's the first clue as to where else it might be."

C. auris emerged as a human pathogen on three continents in the early 2010s. The yeast has since been named a public health threat for its ability to cause dangerous, sometimes fatal infections that are resistant to many antifungal drugs (SN: 11/13/19). C. auris spreads between patients — usually those already seriously ill — in hospitals and other health care facilities, causing infections of the bloodstream, gut or other organs. There have been more than 1,600 cases reported in the United States as of January 19, according to the U.S. Centers for Disease Control and Prevention.

"It's the first clue as to where else it might be."

The fact that C. auris can thrive inside the human body is unusual. Most fungi aren't able to grow in that toasty, 37° Celsius milieu. That has spurred a hypothesis that C. auris gained the ability to infect people after becoming accustomed to warmer temperatures in the environment as a result of climate change (SN: 7/26/19). A possible location for the fungus: wetlands, which are very sensitive to the effects of warming.

The remote Andaman Islands, with coastal wetlands, swamps and beaches, fit the bill. Anuradha Chowdhary, a medical mycologist at the University of Delhi, and colleagues studied soil and seawater specimens from eight places on the islands. They struck gold at two sites, isolating C. auris from a coastal wetland and a beach. The isolates from the beach were resistant to antifungals and genetically similar to each other, a sign they are related. It's unclear at this point whether the beach isolates came from people, Chowdhary says.

But the two isolates from the coastal wetland — where there is no known human activity — were genetically different from each other and from the beach specimens. One of the two wetland isolates was still sensitive to antifungals, the researchers report, suggesting C. auris developed drug resistance after it adapted to people. And while all of the isolates grew at 37° C, the drug-susceptible one grew more slowly than the rest.

The new study should motivate wider sampling of C. auris to understand how extensive it is in nature, says Cuomo. Learning more about where C. auris comes from can provide insight into its tolerance for higher temperatures and its resistance to antifungal drugs. There's now a foot in the door, Cuomo says, "to really look more deeply."

sciencenews.org, 16 March 2021

https://www.sciencenews.org

Giraffe genome holds keys to its peculiar body and clues to hypertension treatments

2021-03-17

To biologists, the giraffe's long neck is a prime example of evolution's handiwork, cited by both Charles Darwin and Jean-Baptiste Lamarck as support for their evolutionary theories. But it is also an engineering problem. In order to get oxygen up its 2-meter neck to its brain, a giraffe's heart constantly pumps blood at a pressure roughly 2.5 times higher than is normal in humans. Now, a new giraffe genome is revealing genetic alterations that allow these animals to live happily with hypertension—along with other genes linked to giraffes' unusual physique.

The findings illuminate "the fascinating evolution of the giraffe form," says wildlife biologist Monica Bond at the Wild Nature Institute. The researchers also expressed a giraffe gene in mice and showed it protected them from hypertension, perhaps laying the groundwork for new therapies for humans. "It is a beautiful validation of the notion that you can try to assess differences in species by making gene substitutions in mice models," says molecular biologist Douglas Cavener of Pennsylvania State University, University Park, who published the first giraffe genome 5 years ago.

For the new study, researchers from China, Norway, and Denmark compared the genes of a male Rothschild's giraffe (Giraffa Camelopardalis rothschildi) with those of 50 other mammals, including the giraffe's closest relative, the short-necked, zebra-size okapi; the animals diverged about 11.5 million years ago. The new study provides detailed data on about

In order to get oxygen up its 2-meter neck to its brain, a giraffe's heart constantly pumps blood at a pressure roughly 2.5 times higher than is normal in humans.

CHEMWATCH
Bulletin Board
Curiosities
MAR. 26, 2021

97% of the giraffe's DNA, compared with two-thirds of the genome in the earlier sequence. Published in Science Advances this week, the study identifies 490 genes with unique adaptations in the giraffe.

Most of the mutations are in genes linked to cardiovascular features, bone growth, and the sensory system. The team zeroed in on the gene FGFRL1, in which Cavener and his colleagues had found seven unique mutations. In humans and mice, mutations in this gene are linked to cardiovascular and skeletal defects. To find out more, the team used the powerful DNA editor called CRISPR to insert the giraffe mutations into the FGFRL1 gene of mice.

The mutant mice did not grow long necks or show any obvious change in their cardiovascular system. So the team decided to see how the animals would respond to high blood pressure, the normal condition of the giraffe. They gave five of 10 modified mice a drug to induce high blood pressure, and also injected the drug into five normal mice. The normal mice developed hypertension and associated kidney and heart damage. But all the mutant rodents, including those given the drug, stayed healthy, and their blood pressure rose only slightly.

"The FGFRL1 giraffe gene does something to the cardiovascular system that counteracts the effects of hypertension," says co-author Rasmus Heller, an evolutionary geneticist at the University of Copenhagen. "But we don't know what yet."

Further studies on FGFRL1 might point to treatments for hypertension, Heller says. But many genes cause hypertension, and there's no evidence so far that FGFRL1 plays an important role in the disease in humans, cautions hypertension and precision medicine specialist Bina Joe at the University of Toledo. "If indeed this is a major gene protecting humans from hypertension, it should have come up as a candidate in genomewide association studies," which scan thousands of people for gene variants linked to a disease. "Talking about therapeutic approaches at this point would be premature," agrees University of Tennessee Health Science Center nephrologist L. Darryl Quarles, who notes that researchers don't yet understand how the mutations affect blood pressure.

The study highlights other unique mutations, including those in genes related to eye development and vision. Previous studies have shown that giraffes have the best vision of all hoofed mammals, which together with their stature allows them to scan the horizon effectively. On the other hand, the giraffe has lost at least 53 olfactory genes compared with the okapi. Heller says this could indicate that giraffes have a lousy sense of

smell—a sense that is less important when your nose is 6 meters above the ground. "The giraffe … has traded off the sense of smell for improved eyesight," he notes. "When you upgrade one feature, you often downgrade another."

The team also found mutations in genes that regulate sleep patterns, which could explain why giraffes in the wild only sleep 40 minutes per day and about 3 to 5 minutes at a time.

Bond notes that giraffes are endangered and in the past 30 years, their population has declined 40%, to 68,000 in the wild. She says knowing more about the animal's genome can help shape effective conservation strategies based on genes related to fitness, health, and immunity. "Genetics is one more piece of the puzzle in understanding an organism," she says. "The more we can understand them, the better we can help protect them."

sciencemag.org, 17 March 2021

https://www.sciencemag.org

Two bonobos adopted infants outside their group, marking a first for great apes

2021-03-18

Attentive parenting appears across the animal world, but adoption is rarer, especially when youngsters taken in aren't kin. Now researchers have witnessed bonobos adopting infants from outside of their own communities.

Two females, each from a different bonobo group, in the Luo Scientific Reserve in Congo took charge of orphans — grooming them, carrying them and providing food for at least a year. Two instances of adopted outsiders are known in other nonhuman primates, but this is the first time it's been observed in great apes, researchers report March 18 in Scientific Reports.

During a week when the researchers couldn't observe the bonobos, two groups each gained an infant. One mum named Marie was already caring for two infants when she adopted Flora, identified from her facial features and color patterns as formerly part of another group. Marie carried and breastfed Flora and her youngest biological daughter and groomed all three. "She seemed to be very tired but was a great mother," says Nahoko Tokuyama, a primatologist at Kyoto University in Japan. Sometimes Marie favored her offspring, Tokuyama says, grooming them more frequently than she did Flora.

But chimps, who along with bonobos are humans' closest surviving evolutionary relatives, can be hostile toward outsider infants and even kill them.

Tokuyama and her colleagues also noticed that a female bonobo named Chio, estimated to be in her mid-50s, had adopted an orphan the team dubbed Ruby. Though Chio wasn't producing milk, she suckled Ruby. A genetic analysis showed that neither infant was maternally related to any female in their new group.

Seeing caretaking beyond the group "blew me away," says Cat Hobaiter, an ethologist at the University of St. Andrews in Scotland who wasn't part of the study. Chimpanzees, for example, may adopt siblings and unrelated orphans from within their clique. But chimps, who along with bonobos are humans' closest surviving evolutionary relatives, can be hostile toward outsider infants and even kill them.

In many ways, the adoptions make sense, Hobaiter says. Unlike chimps, bonobos are notoriously tolerant and seek opportunities to interact with members of other groups. Groups come together for days to "share food and sex and everything else with the neighbors in a really free way," she says.

Researchers sometimes attribute adoptions to females practicing maternal care or helping their kin and advancing their genes. But with unrelated adoptees and females who have already raised young, those explanations don't fit the new observations. The adoptions may stem from the nature of bonobos, Tokuyama says, including their empathy, tolerance and tendency toward behavior that benefits others (SN: 5/24/18).

Such behavior may pay off down the line, says Klaree Boose, a primatologist at the University of Oregon in Eugene who wasn't part of the work. "It's like sidestepping the whole gestation process" to gain another partner, she says. In bonobo society, in which females typically hold the highest ranks, youngsters could remain allies even after joining another group, helping their adoptive mothers when the groups cross paths. But the researchers will have to wait to see where the adoptees' allegiances lie.

sciencenews.org, 18 March 2021

https://www.sciencenews.org

CHEMWATCH

Bulletin Board

Technical Notes

MAR. 26, 2021

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

CHEMICAL EFFECTS

Combined toxicity of endocrine-disrupting chemicals: A review

Experimental Approaches for Characterizing the Endocrine-Disrupting Effects of Environmental Chemicals in Fish

Gut microbiota-mediated pesticide toxicity in humans: Methodological issues and challenges in the risk assessment of pesticides

Toxicity, residue and risk assessment of tetraniliprole in soil-earthworm microcosms

ENVIRONMENTAL RESEARCH

Interdisciplinary Data Science to Advance Environmental Health Research and Improve Birth Outcomes

Seaweeds fast EDC bioremediation: Supporting evidence of EE2 and BPA degradation by the red seaweed Gracilaria sp., and a proposed model for the remedy of marine-borne phenol pollutants

OCCUPATIONAL

Distinct metabolic features in the plasma of patients with silicosis and dust-exposed workers in China: a case-control study

Reconstruction of the Korean Asbestos Job Exposure Matrix

Chronic exposure to metal fume PM 2.5 on inflammation and stress hormone cortisol in shipyard workers: A repeat measurement study

PHARAMACEUTICAL/TOXICOLOGY

HPLC method development/validation and skin diffusion study of caffeine, methyl paraben and butyl paraben as skin-diffusing model drugs

Copyright Chemwatch 2021 ©