CHEMWATCH

Bulletin Board

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ASIA PACIFIC

Malaysia Allows Active Ingredients Claimed on the Label of Health Supplements to Be "Quantified by Input"

2022-11-16

On November 9, 2022, the National Pharmaceutical Regulatory Agency (NPRA) of the Ministry of Health Malaysia issued a "Guidance on the Acceptance Criteria of Quantification by Input (QBI) of Active Ingredients Claimed on Label of Traditional Medicine and Health Supplement (TMHS) Products1 (hereinafter the Guidance) to expound the situations in which the active ingredients in TMHS products could be quantified by input.

Read More

Chemlinked, 16-11-22

https://food.chemlinked.com/news/food-news/malaysia-allows-active-ingredients-claimed-on-the-label-of-health-supplements-to-be-quantified-by-input

Australia Unveils the Import Requirements of Retorted Food

2022-11-16

On November 3rd, 2022, Department of Agriculture, Fisheries and Forestry (DAFF) of Australia published the import conditions and requirements of retorted food (including packaged and canned). The import requirements can be illustrated in the following two cases:

1. For retorted food containing less than 5% meat

- It is not required to obtain the import permit issued by DAFF.
- The product should contain less than 5% meat.
- The product should contain less than 10% dairy and less than 10% egg.
- It must be commercially manufactured and packaged.
- It must be retorted, and the product package/container is unopened after retorting.
- It must be commercially sterile and shelf-stable.
- It should provide the manufacturer's declaration that the product conforms to the points mentioned above.

It is not required to obtain import permits while exporting retorted food containing less than 5% meat to Australia.

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- It should be attached with commercial invoice, freight list, product description, etc.

2. For retorted food containing no less than 5% meat

- It is required to obtain the import permit issued by DAFF.
- Manufacturers should provide the product ingredient list (including the percentage of each ingredient), the flow chart of processing techniques, original thermocouple data, label sample, and the picture of the final product.
- It should conform to the import requirements of the sourced animal.
- Products' core temperature should reach over 100°C after being sealed; F0 value should be no less than 2.8.
- It must be commercially sterile and shelf stable.
- It must be attached with health certificate.
- It should be attached with commercial invoice, freight list, product description, etc.

Read More

Chemlinked, 16-11-22

https://food.chemlinked.com/news/food-news/australia-unveils-the-import-requirements-of-retorted-food

Revised Veterinary Labelling Code published

2022-11-24

The Australian Pesticides and Veterinary Medicines Authority (APVMA) has published the revised Veterinary Labelling Code (VLC), following a review of the labelling requirements and guidance notes for veterinary chemical products. The VLC was last reviewed in 2015.

The revised VLC enshrines the current legislative requirements and best practice guidance, to ensure labels continue to provide appropriate advice for the safe and effective use of veterinary chemical products in Australia.

The objective of the review was to update the VLC to provide clarity for registrants and remove duplication. These revisions will ensure that the VLC provides industry and regulators with clear guidance for relevant labelling requirements.

Following extensive consultation with key stakeholder groups, the VLC has also been redesigned and restructured to improve overall user experience. No legislative changes were made during the review.

What the revised VLC means for product holders

As per the Agricultural and Veterinary Chemicals Code Regulations 1995 (18E), a label must comply with the requirements of the Labelling Standard or, if there is no Labelling Standard, the Agricultural or Veterinary Labelling Codes made by the APVMA, as in force from time to time.

Existing/registered product labels that were compliant with the VLC published in 2015 do not require amendment to reflect the changes to wording or format in the revised VLC. Any such changes should instead be addressed when the existing label requires a material re-assessment or update, or as determined by the registrant. Any product labels not transferred to the E-label template may require a full review to ensure alignment with the revised VLC.

Read More

APVMA, 24-11-22

https://apvma.gov.au/labelling-codes-veterinary-products

AMERICA

Exclusive lab tests show toxic 'forever' chemicals in America's tap water

2022-11-22

Toxic "forever" chemicals are seeping into the water Americans drink every day. The more we learn about the potential health impacts of these chemicals, the more serious the problem becomes. As the EPA takes bold steps to try to limit PFAS contamination, Spotlight on America conducted a series of exclusive lab tests and discovered just how widespread the contamination of America's water system is.

The PFAS Problem

You can't see or taste them, but there are more than 12,000 chemicals that could be lurking in your drinking water, causing everything from birth defects to cancer. Broadly known as PFAS, short for Per- and Polyfluoroalkyl Substances, these are dangerous man-made toxins that never break down, build up in our blood and organs, and could damage the health of millions.

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PFAS originated in the 1940s, when the DuPont company introduced nonstick cookware coated with Teflon using the chemicals. 3M would later become a lead manufacturer of products containing PFAS, touted for being non-stick, stain repellent and waterproof. They would also contribute to a public health crisis we are still seeing develop today. Because PFAS chemicals are so durable, they don't break down. They're often referred to as "forever chemicals" because they're nearly impossible to eliminate from the environment. They also accumulate in our body from a variety of sources.

Read More

ABC News, 22-11-22

https://wjla.com/sponsored/spotlight/exclusive-lab-tests-show-toxic-forever-chemicals-in-americas-tap-water

Why America's food-security crisis is a water-security crisis, too

2022-11-20

Deepak Palakshappa became a pediatrician to give poor kids access to good medical care. Still, back in his residency days, the now-associate professor at Wake Forest University School of Medicine in Winston-Salem was shocked to discover that a patient caring for two young grandchildren was food insecure. "Our clinic had set up one of those food drive boxes, and near the end of a visit, she asked if she could have any of the cans because she didn't have food for the holidays," he recalls.

Thirteen years later, Palakshappa's clinic team now asks two simple questions of every patient to ascertain whether they'll run out of food in a given month. But there are some critical questions they don't ask: Do you drink your tap water? Is it potable and ample? Can you cook food with it, and use it to mix infant formula and cereal? Such questions could uncover some of the millions of Americans who are water insecure—a circumstance directly connected to food insecurity.

There's no healthcare screener for water insecurity. The issue is not even on most public health professionals' radar, although recent water disasters in Flint, Michigan, and Jackson, Mississippi, are starting to change that. Clinicians who are aware of water insecurity "are thinking, 'If I screen for this, what am I going to do about

Read More

Food & Environment Reporting Network, 20-11-22

https://thefern.org/2022/11/why-americas-food-security-crisis-is-a-water-security-crisis-too/

EPA Announces the Release of Its Endangered Species Act Workplan Update

2022-11-23

On November 16, 2022, the U.S. Environmental Protection Agency (EPA) announced it released an Endangered Species Act (ESA) Workplan Update (Workplan Update) that outlines major steps to increase protections for wildlife and regulatory certainty for pesticide users. The Workplan Update details how EPA will pursue protections for nontarget species, including federally listed endangered and threatened (i.e., listed) species, earlier in the process for pesticide registration review and other Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) actions. According to EPA, these early protections will help EPA comply with the ESA, thus reducing its legal vulnerability, providing farmers with more predictable access to pesticides, and simplifying the ESA-FIFRA process that, left unchanged, creates both significant litigation risk and a workload far exceeding what EPA has the resources to handle.

EPA states this update is a follow-up to EPA's April 2022 ESA Workplan that addresses the complexity of meeting its ESA obligations for thousands of FIFRA actions annually. The ESA Workplan prioritizes certain FIFRA actions for ESA compliance, outlines how EPA will pursue early mitigation for listed species under FIFRA, and describes directions for expediting and simplifying the current pesticide consultation process.

As part of registering new pesticides or reevaluating pesticides during registration review, EPA has a responsibility under the ESA to ensure certain pesticide registrations do not jeopardize the continued existence of listed species or adversely modify their designated critical habitats. EPA states that it has seen in the past few decades an increase in litigation due to EPA's failure to meet its ESA obligations when taking FIFRA actions. Over the next six years, existing court-enforceable deadlines will require EPA to complete ESA reviews for 18 pesticides -- the most EPA estimates it can handle during this period based on its current capacity and processes. Ongoing litigation and settlement discussions for other lawsuits cover dozens of additional pesticides and will likely fill the EPA's ESA workload

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well beyond 2030. According to EPA, if its ESA efforts continue at this pace, a future court may decide to curtail drastically pesticide use until EPA meets its obligations. EPA believes this situation would be unsustainable and legally tenuous and provide inadequate protection for listed species and create regulatory uncertainty for farmers and other pesticide users.

Read More

FIFRA Blog, 23-11-22

https://pesticideblog.lawbc.com/entry/epa-announces-the-release-of-its-endangered-species-act-workplan-update

State PFAS Notification Rules Present Complex Compliance Issues for Companies

2022-11-21

Manufacturers of products that contain even small quantities of per- and polyfluoroalkyl substances (PFAS) will soon be required to submit "notifications" to the Maine Department of Environmental Protection (DEP or the Department) providing intricate, and potentially commercially-sensitive, details concerning the chemical makeup of their consumer and commercial-use products. Complying with the impending January 1, 2023 deadline, when the proposed implementing regulations and an electronic reporting portal have not yet been revealed to the regulated community, will be a steep challenge. However, what also should be considered carefully by the countless companies preparing reports is whether they will be revealing information that could implicate compliance issues under existing federal regulatory requirements, such as the federal Toxic Substances Control Act (TSCA).

Background

Maine and a number of other states will soon be the recipients of reports to be submitted by the many US manufacturers and distributors of consumer and commercial-use products that contain "intentionally added" PFAS. The pertinent statute in Maine is the Act to Stop Perfluoroalkyl and Polyfluoroalkyl Substances Pollution, 38 M.R.S. § 1614, enacted in 2021. Understandably, the state's program is of considerable interest to those who will be affected. The Department held a recent stakeholder meeting that was attended online by nearly 500 persons. It was the second public meeting addressing Maine's steps that are preceding an eventual rulemaking process. To date, the Department has issued two pre-rulemaking "concept drafts" (in June and then late October of this year),

each soliciting enormous attention and feedback in the form of written comments. What has become apparent from the discussions during the public meetings is that the Department does not intend to extend the statutory deadlines for the product sales prohibitions (i.e., PFAS-containing floor coverings, consumer-use fabric treatment) which take effect on January 1, 2023.

Read More

Arnold & Porter, 21-11-22

https://www.arnoldporter.com/en/perspectives/advisories/2022/11/state-pfas-notification-rules-present-complex

PFAS Rule to Cost Many Millions More, EPA Analysis Finds

2022-11-24

Companies would pay hundreds of millions of dollars more to report their production of PFAS and importation of goods made with the chemicals than the EPA originally estimated, according to a revised economic analysis the agency will publish Friday.

Small businesses would be expected to pay $863.5 million rather than $1.8 million to report years of production and importation data that the Environmental Protection Agency would require under a rule (RIN 2070-AK67) it proposed in 2021.

The rule would impose $875 million instead of the $10.8 million the EPA previously estimated for social costs that consumers ultimately would pay, the updated analysis found. Public comment on the revised analyses is due Dec. 27.

The EPA recalculated the rule's economic impacts generally and its impacts on small businesses in particular, because many organizations said its proposal lacked sufficient data to support its cost estimates, the EPA's notice said.

Small businesses and groups representing them also criticized the EPA for failing to convene a type of small business advisory panel designed to help the agency understand—prior to proposing a rule—what the impacts of various regulatory options could be. The agency responded by convening a panel to obtain more insights into the proposal's impacts.

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Importers of thousands of manufactured goods, such as construction materials, medical devices, clothing, and cookware, that can be made with per- and polyfluoroalkyl substances (PFAS) also provided more data, the notice said.

The updated analysis also describes more potential benefits from the information the proposed rule would generate, but it will not numerically calculate those, the EPA said.

Read More

Bloomberg Law, 24-11-22

https://news.bloomberglaw.com/environment-and-energy/pfas-rule-to-cost-hundreds-of-millions-more-epa-analysis-finds

EUROPE

Safety of Triclocarban and Triclosan as substances with potential endocrine disrupting properties in cosmetic products

2022-11-04

Conclusion of the opinion:

In light of the information submitted via the call for data, the currently available scientific literature, relevant in silico tools and SCCS' expert judgement and taking under consideration in particular the concerns related to potential endocrine disrupting properties, the SCCS is requested:

3. *to identify and justify specific concerns regarding the safe use of Triclocarban and Triclosan in cosmetic products*

Based on the safety assessment carried out in consideration of all available information, including the potential endocrine effects, the SCCS is of the opinion that:

For Triclocarban

- The use of triclocarban as a preservative in dermally applied cosmetic product is safe up to a maximum concentration of 0.2% for both children (0.5-18 years) and adults, when used individually or in combination.

- In addition to the preservative function, the use of triclocarban is also safe up to a maximum concentration of 1.5% in rinse-off product when used individually or in combination for both children (0.5-18 years) and adults.
- However, the use of triclocarban to a maximum concentration of 0.2% in mouthwash is not safe for adults and children and in toothpaste is not safe for children below 6 years old.
- This assessment does not include exposure of babies through wipes. For Triclosan
- The use of Triclosan as a preservative at the concentrations reported in entry 25 of Annex V in dermally applied cosmetic product is safe except for body lotions, when used individually or in combination, for both adults and children (0.5-18 years).
- The use of Triclosan as a preservative in toothpaste is safe at the concentration of 0.3% when used individually for both adults and children (0.5-18 years) but it is not safe when used in combinations for children below 3 years old.
- For adults, the use of Triclosan as a preservative in mouthwash is safe at the concentration of 0.2% when used individually but not when used in combination. For children and adolescents, it is not safe at 0.2%, even when used individually.

4. *to highlight if there is a potential risk for human health from the use of Triclocarban and Triclosan in cosmetic products*

The SCCS is not aware of the use of triclocarban and triclosan together in a single product, and, therefore, this has not been assessed.

Read More

European Commission, 04-11-22

https://health.ec.europa.eu/publications/safety-triclocarban-and-triclosan-substances-potential-endocrine-disrupting-properties-cosmetic_en

Is the Euro 7 proposal good or bad after all? — Yes.

2022-11-23

If you are reading this blog, you've likely heard about the European Commission's Euro 7 proposal to regulate the pollutant emissions of road vehicles and are wondering: Why is everybody unhappy with it?

Your confusion is understandable. While public health advocates call the proposal a disappointing step towards protecting the health of

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Europeans, industry representatives label it unrealistic and extreme. We at the ICCT did not give the warmest welcome to the Euro 7 proposal. Still, some things are good news. I will walk you through the strong and weak elements of what the Commission just proposed.

The Strengths

The Euro 7 proposal is innovative in many aspects. We highlight three of those here.

If you can drive it, you can test it—well, almost: Since Dieselgate broke, thanks to an ICCT investigation, the real-world emissions of cars have finally started to decrease due to the introduction of the real-driving emissions (RDE) test procedure. However, the RDE regulation placed strict limits on how cars could be tested on the road. As a result, it is actually hard to perform a valid RDE test under Euro 6, so such tests cannot be considered truly representative. Euro 7 would drop most of these restrictive requirements, simplifying the testing and enhancing its real-world representativeness.

New requirements for non-exhaust emissions: While commonplace in Brazil, China, and the United States, Euro 7 plays catch-up by proposing limits for the vapor emissions of petrol that occur during refueling. Euro 7 also proposes new limits for the particle emissions from brakes—a world's first—that would apply not only to combustion-powered vehicles but also to zero-emission technologies. These two elements would drive new emission control systems in areas neglected under previous regulations.

Durability requirements for EV batteries: In another world's first, Euro 7 proposes durability requirements specific to the traction battery of electric vehicles, forcing manufacturers to continuously monitor the state-of-health and performance of the battery. While the specific requirements are aligned with current technology and would not put manufacturers in a pickle, these provisions are essential for increasing trust in the second-hand market for EVs.

The Weaknesses

As mentioned above, there are some aspects of the Euro 7 proposal that could use some work. Two major issues are outlined below.

Pollutant limits could go even further: Pollutant emission standards, such as Euro 7, have two essential functions: Forcing the adoption of emission control technologies for which there is no market incentive, and ensuring

these technologies are functioning correctly over the vehicle's lifetime. Worryingly, it is here that Euro 7 shows its shortcomings.

In the case of cars and vans, the Euro 7 emission limits are not much different from those of the Euro 6 regulation. For NOx emissions in particular—the most important air pollutant—the Euro 7 limits are just a harmonization with the limits set for petrol vehicles under Euro 6. And, despite the proposal of a voluntary certification level—with the euphonious name Euro 7+—the optional limits are a meager 20% lower than what's mandated by the unadorned Euro 7. ICCT's research shows that the emissions performance of current Euro 6 cars is already better than that. One does wonder if those cars deserve the clean credentials that such a buzz-worthy certification would suggest.

The situation is different for trucks and buses. Our research indicates that, compared to Euro VI vehicles, the proposed Euro 7 limits will drive substantial improvements in the emissions of NOx and particles, bringing to market technologies ripe for commercialization.

Read More

ICCT, 23-11-22

https://theicct.org/euro-7-proposal-good-or-bad-nov22/

School supplies: the great vagueness of chemical substances

2022-09-15

September is traditionally a back-to-school month, which translates into a denser-than-usual stationery and other supplies department in stores. However, in recent years, the start of the new school year has been accompanied by several studies conducted by the Danish Environmental Protection Agency , Ademe , UFC Que Choisir and 60 Millions de Consommateurs which have revealed the presence or emission of chemicals (including phthalates , formaldehyde , allergenic substances, etc.) in school or office supplies.

Signals that prompted ANSES to take action on the subject.

Inhaled, ingested or in contact with the skin, some of these chemical substances can cause health effects: certain phthalates (used as plasticizers) can be toxic for reproduction or endocrine disruptors, etc. ; formaldehyde (used as a biocide, in resins or even as a preservative) is skin sensitizing and carcinogenic…

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These effects could be observed especially in children, who tend to put certain objects in their mouths. Since these products are used on a daily basis, the Agency has therefore decided to identify the substances that are specifically present in them .

No official categorization of school and office supplies exists today, whether in France, in Europe or in the world. Thus, as part of this study, ANSES carried out research into the various categorizations proposed and combined them together in order to propose its own classification. It is recalled that new technologies (eg tablet) are not considered in this study.

Incomplete regulations and data

In France and in Europe, school supplies are not subject to any specific regulations whatsoever for their composition, manufacture or use.

It should however be noted that the European regulations REACh (which secures the manufacture and use of chemical substances in industry in Europe) and CLP (intended for communication on the dangers of chemical substances and mixtures at European level) apply. , as well as the general product safety directive n°2010/95/EC. Some toys (glitter pens, finger paints, etc.) can also be used as school supplies, but they come under a more restrictive regulatory framework in accordance with Directive 2009/48/EC .

ANSES has therefore produced a summary of the available literature concerning the chemical substances present in or emitted by school and office supplies. She observed that this theme is very poorly documented . Studies on school or office supplies mainly focus on the emission of chemical substances, and to a lesser extent on transfer by skin contact (subject for which there are modeling data).

In the scientific literature, few studies specific to the chemical composition of school supplies have thus been identified. Nevertheless, some institutions have focused on some of them, in particular the Danish EPA. In 2007, the Danish agency, for example, identified the presence of phthalates in gums through composition tests.

Read More

ANSES, 15-09-2022

https://www.anses.fr/fr/fournitures-scolaires-substances-chimiques

GB Article 95 List – Biocides suppliers must take action by 31 December 2022

2022-11-24

Biocidal active substance and product suppliers included on the EU Article 95 List at the end of the EU exit transition period on 31 December 2020 were automatically added to the GB Article 95 List.

To remain on the GB Article 95 List, suppliers must submit information to HSE by 31 December 2022.

Find out what you need to do to remain on the GB Article 95 List

Once all of the submissions have been fully processed, suppliers that have failed to take the necessary steps will be removed from the GB Article 95 List.

HSE will give advance warning of the list of suppliers that will be removed and a date on which this will take effect. This will allow time for biocidal product suppliers to take any necessary action to ensure they are using a supplier who will remain on the list.

Look out for the announcement of the date in future ebulletins.

Read More

HSE, 24-11-22

https://www.hse.gov.uk/biocides/gb-article-95-transition/action-for-article-95-suppliers.htm

INTERNATIONAL

Recycling Our Cities, One Building at a Time

2022-11-23

From abandoned Japanese farmhouses to retired New York City water towers, builders are mining existing structures for materials to make new buildings greener.

Takumi Osawa kneels on the narrow balcony of a wooden house outside Tokyo and describes how, 140 years ago, workers would have hoisted baskets of mulberry leaves to the second floor to feed silkworms. When they ate, it sounded like rain.

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Known in Japan as minka, these locally crafted structures with characteristic pitched roofs were built for hundreds of years to accommodate farmers, artisans and merchants. This one was originally constructed in 1879 and housed a family on the first floor who tended silkworms on the second and third. Minka are typically designed like an interlocking puzzle, without nails or screws, which allowed Osawa and a team of craftsmen to take the building apart, move it about 90 kilometers (56 miles) east and reassemble it closer to Tokyo, where a couple now live in it.

Read More

Bloomberg, 23-11-22

https://www.bloomberg.com/news/features/2022-11-23/sustainable-construction-how-to-refurbish-upcycle-and-green-old-buildings?srnd=citylab

37 days left to resubmit data and confirm you are based in the UK

Commission decisions on applications for authorisation

2022-11-09

The European Commission has granted 11 authorisations for uses of

4-(1,1,3,3-Tetramethylbutyl)phenol, ethoxylated (4-tert-OPnEO)

(EC -, CAS -) (the expiry dates for the review period are in brackets):

- four uses applied for by Zoetis Belgium S.A. (4 January 2031 and 4 January 2033);
- two uses applied for by Delpharm Biotech (4 January 2033);
- three uses applied for by Idexx Montpellier SAS (4 January 2033);
- one use applied for by Idexx B.V. (4 January 2033); and
- one use applied for by Instrumentation Laboratory SpA (4 January 2033).

The European Commission has granted two authorisations for uses of

4-Nonylphenol, branched and linear, ethoxylated (4-NPnEO)

(EC -, CAS -) (the expiry dates for the review period are in brackets):

- one use applied for by Idexx Montpellier SAS (4 January 2033); and
- one use applied for by Idexx B.V. (4 January 2033).

Read More

ECHA, 09-11-22

https://echa.europa.eu/view-article/-/journal_content/title/9109026-225

Efficacy guidance now updated

2022-11-09

Our guidance document for the Biocidal Products Regulation (BPR) Volume II - Efficacy Assessment and Evaluation (Parts B+C) has been updated. The update covers the chapter on disinfectants for product-types 1-5.

Sections on co-formulants being potential active substances, virucidal claims, room and laundry disinfection, and disinfection of packaging before aseptic filling have been added or revised.

Appendices 1 (Claim matrices), 2 (Standards and testing methods), 3 (Test organisms) and, particularly, 4 (Overview of standards, test conditions and

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pass criteria) have also been updated based on recently developed and published European standards.

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ECHA, 09-11-22

https://echa.europa.eu/view-article/-/journal_content/title/9109026-225

European nanomaterial market expected to grow

2022-11-07

The latest study by the European Union Observatory for Nanomaterials (EUON) predicts growth in the European nanomaterial market over the period of 2021 - 2025. The study provides a list of nanomaterials currently on the market and identifies key market operators.

Helsinki, 07 November 2022 - EUON has published a study report on the European Union market for nanomaterials, including substances, uses, volumes and key producers, traders and users. The study also covers the European Economic Area (EEA) countries and Switzerland.

According to the study, which was carried out in 2021 as a combination of literature research, surveys and interviews, the European nanomaterial market is expected to grow in the next five years in both volume and value. While Brexit had an impact on this projection, perhaps surprisingly, the SARS-COV-2 pandemic was not perceived by interview participants to lead to a market slow-down. It is worth noting that the study was carried out before the crisis arising from the war in Ukraine, and hence its impact on the study outcomes is not known. While the largest segment is currently the metal oxides market, growth is predicted to be driven mainly by nanoclays, nanocellulose and carbon-based nanomaterials.

The main drivers for growth are foreseen to be the technological advancement and public demand for functional, lightweight, and affordable state-of-the-art products. Aerospace, automotive, energy, food packaging and construction industries most likely will drive the growth of the market. The use of nanomaterials in medicine and personal care are also expected to give the market a boost. The study identified EU and national public funding as a significant enabler for the continued development and commercialisation of new nanomaterials.

The current regulatory landscape, which does not allow products containing nanomaterials to be easily commercialised, was perceived through surveys and interview participants as a significant barrier to

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growth. Potential upcoming changes in regulatory requirements and relatively high scale-up costs were also mentioned as dampening the interest of companies in ramping up production. On the other hand, it was noted that a stricter regulatory regime can also help increase public trust in nanomaterial products. Among other factors hindering growth, respondents included the relatively negative public opinion towards nanomaterials.

According to the study there are approximately 2 200 existing products containing nanomaterials on the EU, EEA and Swiss markets. More than 90 nanomaterial substances that are available on the EU, EEA, and Swiss markets have not been listed by any of the inventories that the EUON reports on. Some of the discrepancy can be due to regulation-specific conditions under which substances in nanoform need to be registered/ notified. Different regulatory schemes may also have different definitions for what they consider a substance, e.g., in relation to alloys and doped nanomaterials.

The EUON compiles information from a number of national and European nanomaterials inventories which have their own particular reporting criteria and requirements. It also features substances registered under the REACH regulation to cover nanoforms. REACH registration is required when a substance, regardless of the forms it exists in, is produced or imported above one tonne/year per registrant.

Read More

EUON, 07-11-22

https://euon.echa.europa.eu/view-article/-/journal_content/title/european-nanomaterial-market-expected-to-grow

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Janet's Corner

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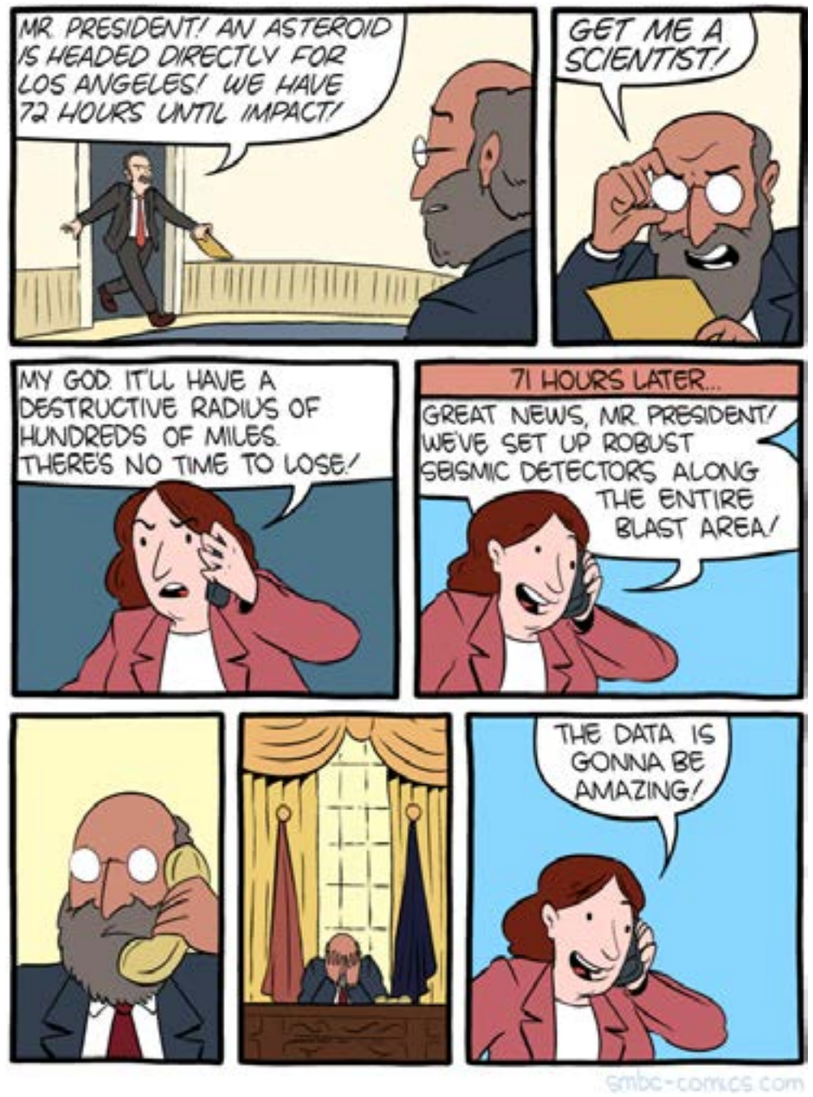
Get Me a Scientist

2022-12-02



https://www.smbc-comics.com/comic/get-me-a-scientist

Boron

2022-12-02

Boron is a chemical element with symbol B and atomic number 5. [1]. It is a non-metallic element and the only non-metal of the group 13 of the periodic table. Boron is electron-deficient, possessing a vacant p-orbital. It has several forms, the most common of which is amorphous boron, a dark powder, unreactive to oxygen, water, acids and alkalis. It reacts with metals to form borides. At standard temperatures boron is a poor electrical conductor but is a good conductor at high temperatures. [2] Boron is found in the environment primarily combined with oxygen in compounds called borates. Common borate compounds include boric acid, sodium tetraborates (also referred to as borax) and boron oxide. [3]

USES [4]

Boron is used in special-purpose alloys, in cementation of iron, as oxygen scavenger for copper and other metals, as fibres and filaments in composites with metals or ceramics, as semiconductor, for nuclear reactors, as a shield for nuclear radiation and in instruments used for detecting neutrons. Boron is used in pyrotechnic flares (distinctive green colour), for rockets (as an igniter), in boron-coated tungsten wires and in high temperature brazing alloys.

Borates are used mostly to produce glass. They are also used in fire retardants, leather tanning industries, cosmetics, photographic materials, soaps and cleaners, adhesives and for high-energy fuel. Some pesticides used for cockroach control and some wood preservatives also contain borates.

Borax is used in soldering metals, as a cleansing flux in welding, in the manufacture of glazes and enamels (e.g. for covering steel of refrigerators and washing machines), in tanning, in cleaning compounds, to artificially age wood, as a preservative against wood fungus (either alone or with other antiseptics), and in fireproofing fabrics. It is also used for curing and preserving skins, in cockroach control and as a water softener in washing powders.

Boric acid is used for weatherproofing and fireproofing fabrics, as a preservative, in the manufacture of cements, crockery, porcelain, enamels, glass, borates, leather, carpets, hats, soaps, and artificial gems, and in nickel-plating baths. It is also used in the manufacture of cosmetics, in ointments and eye washes, as a mild antiseptic, in printing and dyeing, in

Boron is a chemical element with symbol B and atomic number 5. [1]

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photography, for impregnating wicks, for hardening steel, in welding flux, copper brazing, as an insecticide for cockroaches and carpet beetles, and in fungus control for citrus fruits.

Boron oxide is used in metallurgy, in the analysis of silicon dioxide in silicates, in blowpipe analysis, for the production of boron, in heat-resistant glassware, as a fire-resistant additive for paints, in electronics and as an herbicide.

Boron carbide is used as an abrasive, in the manufacture of hard and chemical-resistant ceramics or wear-resistant tools, in the refractory industry, in light weight cermets, in armour tiles, in radiation protection and shielding, in the nuclear industry in control rods in nuclear reactors (high capture cross-section to absorb thermal neutrons), as raw material for producing other boron containing materials (e.g. titanium boride), and in solid fuel (propellant for ducted rockets).

Boron nitride is used as a refractory material, laboratory reagent, and abrasive. Boron trichloride is used in the manufacture and purification of metal alloys, in bonding of iron and steel, in soldering fluxes, and in the manufacture of electrical resistors. It is also used to extinguish magnesium fires in heat resisting furnaces.

Boron trifluoride is widely used to promote various organic reactions. Boron filaments are high-strength, lightweight materials that are used in fibre optics research and for advanced aerospace structures.

SOURCES OF EMISSION & ROUTES OF EXPOSURE

Sources of Emission [4]

- Industry sources: Boron can be released from industries that use boron and boron compounds, e.g. leather tanning, cement works, and glass works.
- Diffuse sources: Boron can be released from household use of consumer products containing borates such as cosmetics, washing powders, or pesticides, and sub-threshold facilities.
- Natural sources: Boron is not an abundant element. The element boron does not occur in nature and boron is mostly found combined with oxygen in compounds called borates. Common borate compounds include boric acid, salts of borates and boron oxide. Natural deposits of borates are borax and kernite. Tourmaline contains about 10 % boron. Boron is released to the environment from natural sources such

as volcanoes and geothermal steam. Traces are present in rocks, soil, water and some food.

- Transport sources: Mobile sources are normally not associated with the emission of boron.
- Consumer products: Heat-resistant household glassware (Pyrex), laboratory glassware, some soap, some pesticides, some cosmetics and laundry products, some leather products and some cement products.

Routes of Exposure [5]

- Inhalation – Minor route of exposure for the general population. Predominant route of exposure for boron workers.
- Oral – Predominant route of exposure for the general population via ingestion of boron in food and drinking water.
- Dermal – Minor route of exposure.

HEALTH EFFECTS [4]

The severity of health effects will depend on how much boron a person has been exposed to, for how long, and current state of health. Once different borates are dissolved in the acid of gastric juices, they cannot be distinguished from each other on chemical or toxicological grounds. Both boric acid and borax may enter the body by absorption from the gastrointestinal tract or through mucous membranes. Although absorption can occur through undamaged skin, it is slow and toxic effects are less likely. However, absorption through damaged skin can be rapid and complete. Ingestion of large borate quantities is unlikely, but may be harmful if it occurs. Ingestion or absorption through the skin can cause nausea, abdominal pain, diarrhoea and persistent vomiting (vomitus and faeces may sometimes contain blood), which may be accompanied by headache and weakness, lethargy, restlessness, tremors, intermittent convulsions, and characteristic erythematous (abnormally red) lesions on the skin. In severe cases, shock with fall in arterial pressure, tachycardia (increase in heart rate) and cyanosis (blue skin colour) may occur. Central nervous system stimulation followed by depression, gastrointestinal disturbance (haemorrhagic gastroenteritis) and erythematous skin eruptions (giving rise to a boiled lobster appearance) may be present. The kidneys (producing oliguria (small volume of urine), albuminuria (presence of albumin in the urine), anuria (absence of or defective excretion of urine)) and, rarely, the liver (jaundice) may also be involved. Excretion occurs mainly through the kidneys with about half excreted in the first 12 hours and the remainder over 5-12 days. Toxic symptoms may be delayed

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for several hours. The mean lethal dose of sodium borate or boric acid probably exceeds 30 grams in adults and death occurs due to vascular collapse in the early stages or to central nervous system depression in later stages. Children are thought to be more susceptible to the effects of borate intoxication. Breathing moderate levels of boron dust or fume can result in irritation of the nose, throat, and eyes.

There is little information on the health effects of long-term exposure to boron. Most of the studies are on short-term exposures. Chronic intoxication with boric acid may give rise to anorexia, loss of strength, confusion and loss of hair (alopecia). Reproductive effects, such as low sperm count, were seen in men exposed to boron over the long-term.

The International Agency for Research on Cancer (IARC), and the United States Environmental Protection Agency (EPA) have not classified boron for human carcinogenicity.

SAFETY [6]

First Aid Measures

- Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.
- Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.
- Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
- Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention.
- Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Exposure Controls & Personal Protection

Engineering Controls

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits.

If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protective Equipment

The following personal protective equipment is recommended when handling boron:

- Safety glasses;
- Lab coat;
- Dust respirator (Be sure to use an approved/certified respirator or equivalent);
- Gloves.

Personal protective equipment recommended for large spills:

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

REGULATION

United States [3]

OSHA: The Occupational Health and Safety Administration has limited workers' exposure to an average of 15 mg/m^3 for boron oxide in air for an 8-hour workday, 40-hour workweek.

EPA: The Environmental Protection Agency has determined that exposure to boron in drinking water at concentrations of 4 mg/L for 1 day or 0.9 mg/L for 10 days is not expected to cause any adverse effects in a child. In addition, the agency has determined that lifetime exposure to 1 mg/L boron is not expected to cause any adverse effects.

Australia [4]

Safe Work Australia: Safe Work Australia defines boron oxide as hazardous and has set its exposure standard to 10 milligram/m^3 (TWA). Boron halides are also classified as hazardous with an exposure standard of 1 ppm (TWA).

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The exposure standard for the non-hazardous borax is 5 milligram/m^3 (TWA).

Australian Drinking Water Guidelines (NHMRC and ARMCANZ, 2004):

Maximum of 4 mg/L (i.e. 0.004 g/L)

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Global timekeepers vote to scrap leap second by 2035

2022-11-18

Scientists and government representatives meeting at a conference in France voted on Friday to scrap leap seconds by 2035, the organization responsible for global timekeeping said.

Similar to leap years, leap seconds have been periodically added to clocks over the last half century to make up for the difference between exact atomic time and the Earth's slower rotation.

While leap seconds pass by unnoticed for most people, they can cause problems for a range of systems that require an exact, uninterrupted flow of time, such as satellite navigation, software, telecommunication, trade and even space travel.

It has caused a headache for the International Bureau of Weights and Measures (BIPM), which is responsible for Coordinated Universal Time (UTC)—the internationally agreed standard by which the world sets its clocks.

A resolution to stop adding leap seconds by 2035 was passed by the BIPM's 59 member states and other parties at the General Conference on Weights and Measures, which is held roughly every four years at the Versailles Palace west of Paris.

The head of BIPM's time department, Patrizia Tavella, told AFP that the "historic decision" would allow "a continuous flow of seconds without the discontinuities currently caused by irregular leap seconds".

"The change will be effective by or before 2035," she said via email.

She said that Russia voted against the resolution, "not on principle", but because Moscow wanted to push the date it comes into force until 2040.

Other countries had called for a quicker timeframe such as 2025 or 2030, so the "best compromise" was 2035, she said.

The United States and France were among the countries leading the way for the change.

Tavella emphasized that "the connection between UTC and the rotation of the Earth is not lost".

"Nothing will change" for the public, she added.

A leap minute?

In search of lost time: The leap second will soon become a thing of the past.

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Seconds were long measured by astronomers analyzing the Earth's rotation, however the advent of atomic clocks—which use the frequency of atoms as their tick-tock mechanism—ushered in a far more precise era of timekeeping.

But Earth's slightly slower rotation means the two times are out of sync.

To bridge the gap, leap seconds were introduced in 1972, and 27 have been added at irregular intervals since—the last in 2016.

Under the proposal, leap seconds will continue to be added as normal for the time being.

But by 2035, the difference between atomic and astronomical time will be allowed to grow to a value larger than one second, Judah Levine, a physicist at the US National Institute of Standards and Technology, told AFP.

"The larger value is yet to be determined," said Levine, who spent years helping draft the resolution alongside Tavella.

Negotiations will be held to find a proposal by 2035 to determine that value and how it will be handled, according to the resolution.

Levine said it was important to protect UTC time because it is run by "a worldwide community effort" in the BIPM.

GPS time, a potential UTC rival governed by atomic clocks, is run by the US military "without worldwide oversight", Levine said.

A possible solution to the problem could be letting the discrepancy between the Earth's rotation and atomic time build up to a minute.

It is difficult to say exactly how long that might take, but Levine estimated anywhere between 50 to 100 years.

Instead of then adding on a leap minute to clocks, Levine proposed a "kind of smear", in which the last minute of the day takes two minutes.

"The advance of a clock slows, but never stops," he said.

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https://phys.org

Artemis 1 is off – and we're a step closer to using Moon dirt for construction in space

2022-11-17

NASA has just launched its first rocket in the Artemis program, which will, among other things, take scientific experiments to produce metal on the Moon.

In recent years, a number of businesses and organisations have ramped up efforts to establish technologies on the Moon. But doing work in space is expensive. Sending just one kilogram of material to the Moon can cost US$1.2 million (A$1.89 million).

What if we could save money by using the resources that are already there? This process is called in-situ resource utilisation, and it's exactly what astrometallurgy researchers are trying to achieve.

Why the Moon?

The Moon has amazing potential for future space exploration. Its gravity is only one-sixth as strong as Earth's, which makes it much easier to fly things from the Moon to Earth's orbit than to fly them direct from Earth! And in an industry where every kilogram costs a fortune, the ability to save money is extremely attractive.

Although people have been looking at making oxygen and rocket fuel in space for decades, the Artemis program marks the first time we have solid plans to make and use metal in space.

A number of companies are looking at extracting metals and oxygen from Moon dirt. At first these will be demonstrations, but eventually Moon metal will be a viable option for construction in space.

As a researcher in this field, I expect that in about 10 to 20 years from now we'll have demonstrated the ability to extract metals from the Moon, and will likely be using these to construct large structures in space. So exactly what will we be able to extract? And how would we do it?

What's out there?

There are two main geological regions on the Moon, both of which you can see on a clear night. The dark areas are called the maria and have a higher concentration of iron and titanium. The light areas are called the highlands (or terrae) and have more aluminium.

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In general, the dirt and rocks on the Moon contain silicon, oxygen, aluminium, iron, calcium, magnesium, titanium, sodium, potassium and manganese. That might sound like a mouthful, but it's not really that much to choose from. There are some other trace elements, but dealing with those is a spiel for another day.

We know metals such as iron, aluminium and titanium are useful for construction. But what about the others?

Well, it turns out when you have limited options (and the alternative is spending a small fortune), scientists can get pretty creative. We can use silicon to make solar panels, which could be a primary source of electricity on the Moon. We could use magnesium, manganese and chromium to make metal alloys with interesting properties, and sodium and potassium as coolants.

There are also studies looking at using the reactive metals (aluminium, iron, magnesium, titanium, silicon, calcium) as a form of battery or "energy carrier". If we really needed to, we could even use them as a form of solid rocket fuel.

So we do have options when it comes to sourcing and using metals on the Moon. But how do we get to them?

How would extraction work?

While the Moon has metals in abundance, they're bound up in the rocks as oxides – metals and oxygen stuck together. This is where astrometallurgy comes in, which is simply the study of extracting metal from space rocks.

Metallurgists use a variety of methods to separate metals and oxygen from within rocks. Some of the more common extraction methods use chemicals such as hydrogen and carbon.

Some such as "electrolytic separation" use pure electricity, while more novel solutions involve completely vaporising the rocks to make metal. If you're interested in a full rundown of lunar astrometallurgy you can read about it in one of my research papers.

Regardless of the method used, extracting and processing metals in space presents many challenges.

Some challenges are obvious. The Moon's relatively weak gravity means traction is basically nonexistent, and digging the ground like we do on Earth isn't an option. Researchers are working on these problems.

There's also a lack of important resources such as water, which is often used for metallurgy on Earth.

Other challenges are more niche. For instance, one Moon day is as long as 28 Earth days. So for two weeks you have ample access to the Sun's power and warmth … but then you have two weeks of night.

Temperatures also fluctuate wildly, from 120 during the day to -180 at night. Some permanently shadowed areas drop below -220 ! Even if resource mining and processing were being done remotely from Earth, a lot of equipment wouldn't withstand these conditions.

That brings us to the human factor: would people themselves be up there helping out with all of this?

Probably not. Although we'll be sending more people to the Moon in the future, the dangers of meteorite impacts, radiation exposure from the Sun, and extreme temperatures mean this work will need to be done remotely. But controlling robots hundreds of thousands of kilometres away is also a challenge.

It's not all bad news, though, as we can actually use some of these factors to our advantage.

The extreme vacuum of space can reduce the energy requirements of some processes, since a vacuum helps substances vaporise at lower temperatures (which you can test by trying to boil water on a tall mountain). A similar thing happens with molten rocks in space.

And while the Moon's lack of atmosphere makes it uninhabitable for humans, it also means more access to sunlight for solar panels and direct solar heating.

While it may take a few more years to get there, we're well on our way to making things in space from Moon metal. Astrometallurgists will be looking on with keen interest as future Artemis missions take off with the tools to make this happen.

The Conversation, 17 November 2022

https://theconversation.com

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Self-assembled nanoscale architectures could feature improved electronic, optical, and mechanical properties

2022-11-18

Scientists at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory have developed a new way to guide the self-assembly of a wide range of novel nanoscale structures using simple polymers as starting materials. Under the electron microscope, these nanometer-scale structures look like tiny Lego building blocks, including parapets for miniature medieval castles and Roman aqueducts. But rather than building fanciful microscopic fiefdoms, the scientists are exploring how these novel shapes might affect a material's functions.

The team from Brookhaven Lab's Center for Functional Nanomaterials (CFN) describes their novel approach to control self-assembly in a paper just published in Nature Communications. A preliminary analysis shows that different shapes have dramatically different electrical conductivity. The work could help guide the design of custom surface coatings with tailored optical, electronic, and mechanical properties for use in sensors, batteries, filters, and more.

"This work opens the door to a wide range of possible applications and opportunities for scientists from academia and industry to partner with experts at CFN," said Kevin Yager, leader of the project and CFN's Electronic Nanomaterials group. "Scientists interested in studying optical coatings, or electrodes for batteries, or solar cell designs could tell us what properties they need, and we can select just the right structure from our library of exotic shaped materials to meet their needs."

Automatic assembly

To make the exotic materials, the team relied on two areas of longstanding expertise at CFN. First is the self-assembly of materials called block copolymers—including how various forms of processing affect the organization and rearrangement of these molecules. Second is a method called infiltration synthesis, which replaces rearranged polymer molecules with metals or other materials to make the shapes functional—and easy to visualize in three dimensions using a scanning electron microscope.

"Self-assembly is a really beautiful way to make structures," Yager said. "You design the molecules, and the molecules spontaneously organize into the desired structure."

"Self-assembly is a really beautiful way to make structures," Yager said. "You design the molecules, and the molecules spontaneously organize into the desired structure."

In its simplest form, the process starts by depositing thin films of long chainlike molecules called block copolymers onto a substrate. The two ends of these block copolymers are chemically distinct and want to separate from each other, like oil and water. When you heat these films through a process called annealing, the copolymer's two ends rearrange to move as far apart as possible while still being connected. This spontaneous reorganization of chains thus creates a new structure with two chemically distinct domains.

Scientists then infuse one of the domains with a metal or other substance to make a replica of its shape, and completely burn away the original material. The result: a shaped piece of metal or oxide with dimensions measuring mere billionths of a meter that could be useful for semiconductors, transistors, or sensors.

"It's a powerful and scalable technique. You can easily cover large areas with these materials," Yager said. "But the disadvantage is that this process tends to form only simple shapes—flat sheetlike layers called lamellae or nanoscale cylinders."

Scientists have tried different strategies to go beyond those simple arrangements. Some have experimented with more complex branching polymers. Others have used microfabrication methods to create a substrate with tiny posts or channels that guide where the polymers can go. But making more complex materials and the tools and templates for guiding nano-assembly can be both labor-intensive and expensive.

"What we're trying to show is that there's an alternative where you can still use simple, cheap starting materials, but get really interesting, exotic structures," Yager said.

Stacking and quenching

The CFN method relies on depositing block copolymer thin films in layers.

"We take two of the materials that naturally want to form very different structures and literally put them on top of one another," Yager said. By varying the order and thickness of the layers, their chemical composition, and a range of other variables including annealing times and temperatures, the scientists generated more than a dozen exotic nanoscale structures that haven't been seen before.

"We discovered that the two materials don't really want to be stratified. As they anneal, they want to mix," Yager said. "The mixing is causing more interesting new structures to form."

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If annealing is allowed to progress to completion, the layers will eventually evolve to form a stable structure. But by stopping the annealing process at various times and cooling the material rapidly, quenching it, "you can pull out transient structures and get some other interesting shapes," Yager said.

Scanning electron microscope images revealed that some structures, like the "parapets" and "aqueducts," have composite features derived from the order and reconfiguration preferences of the stacked copolymers. Others have crisscross patterns or lamellae with a patchwork of holes that are unlike either of the starting materials' preferred configurations—or any other self-assembled materials.

Through detailed studies exploring imaginative combinations of existing materials and investigating their "processing history," the CFN scientists generated a set of design principles that explain and predict what structure is going to form under a certain set of conditions. They used computer-based molecular dynamics simulations to get a deeper understanding of how the molecules behave.

"These simulations let us see where the individual polymer chains are going as they rearrange," Yager said.

Promising applications

And, of course, the scientists are thinking about how these unique materials might be useful. A material with holes might work as a membrane for filtration or catalysis; one with parapet-like pillars on top could potentially be a sensor because of its large surface area and electronic connectivity, Yager suggested.

The first tests, included in the Nature Communications paper, focused on electrical conductivity. After forming an array of newly shaped polymers, the team used infiltration synthesis to replace one of the newly shaped domains with zinc oxide. When they measured the electrical conductivity of differently shaped zinc oxide nanostructures, they found huge differences.

"It's the same starting molecules, and we're converting them all into zinc oxide. The only difference between one and the other is how they're locally connected to each other at the nanoscale," Yager said. "And that turns out to make a huge difference in the final material's electrical properties. In a sensor or an electrode for a battery, that would be very important."

The scientists are now exploring the different shapes' mechanical properties.

"The next frontier is multifunctionality," Yager said. "Now that we have access to these nice structures, how can we choose one that maximizes one property and minimizes another—or maximizes both or minimizes both, if that's what we want."

"With this approach, we have a lot of control," Yager said. "We can control what the structure is (using this newly developed method), and also what material it is made of (using our infiltration synthesis expertise). We look forward to working with CFN users on where this approach can lead."

Phys Org, 18 November 2022

https://phys.org

Vaccine Breakthrough Could Finally Bring COVID to Its Knees

2022-11-19

With new COVID variants and subvariants evolving faster and faster, each chipping away at the effectiveness of the leading vaccines, the hunt is on for a new kind of vaccine—one that works equally well on current and future forms of the novel coronavirus.

Now researchers at the National Institutes of Health in Maryland think they've found a new approach to vaccine design that could lead them to a long-lasting jab. As a bonus, it also might work on other coronaviruses, not just the SARS-CoV-2 virus that causes COVID-19.

The NIH team reported its findings in a peer-reviewed study that appeared in the journal Cell Host & Microbe earlier this month.

The key to the NIH's potential vaccine design is a part of the virus called the "spine helix." It's a coil-shaped structure inside the spike protein, the part of the virus that helps it grab onto and infect our cells.

Lots of current vaccines target the spike protein. But none of them specifically target the spine helix. And yet, there are good reasons to focus on that part of the pathogen. Whereas many regions of the spike protein tend to change a lot as the virus mutates, the spine helix doesn't.

A new discovery in the fight against COVID could lead to a long-lasting vaccine that works on all variants of the ever-mutating virus.

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That gives scientists "hope that an antibody targeting this region will be more durable and broadly effective," Joshua Tan, the lead scientist on the NIH team, told The Daily Beast.

Vaccines that target and "bind," say, the receptor-binding domain region of the spike protein might lose effectiveness if the virus evolves within that region. The great thing about the spine helix, from an immunological standpoint, is that it doesn't mutate. At least, it hasn't mutated yet, three years into the COVID pandemic.

So a vaccine that binds the spine helix in SARS-CoV-2 should hold up for a long time. And it should also work on all the other coronaviruses that also include the spine helix—and there are dozens of them, including several such as SARS-CoV-1 and MERS that have already made the leap from animal populations and caused outbreaks in people.

To test their hypothesis, the NIH researchers extracted antibodies from 19 recovering COVID patients and tested them on samples of five different coronaviruses, including SARS-CoV-2, SARS-CoV-1 and MERS. Of the 55 different antibodies, most zeroed in on parts of the virus that tend to mutate a lot. Just 11 targeted the spine helix.

But those 11 that went after the spine helix worked better, on average, on four of the coronaviruses. (A fifth virus, HCoV-NL63, shrugged off all the antibodies.) The NIH team isolated the best spine-helix antibody, COV89-22, and also tested it on hamsters infected with the latest subvariants of the Omicron variant of COVID. "Hamsters treated with COV89-22 showed a reduced pathology score," the team found.

The results are promising. "These findings identify a class of… antibodies that broadly neutralize [coronaviruses] by targeting the stem helix," the researchers wrote.

Don't break out the champagne quite yet. "Although these data are useful for vaccine design, we have not performed vaccination experiments in this study and thus cannot draw any definitive conclusions with regard to the efficacy of stem helix-based vaccines," the NIH team warned.

It's one thing to test a few antibodies on hamsters. It's another to develop, run trials with and get approval for a whole new class of vaccine. "It is really hard and most things that start out as good ideas fail for one reason or another," James Lawler, an infectious disease expert at the University of Nebraska Medical Center, told The Daily Beast.

And while the spine-helix antibodies appear to be broadly effective, it's unclear how they stack up against antibodies that are more specific. In other words, a spine-helix jab might work against a bunch of different but related viruses, but work less well against any one virus than a jab that's tailored specifically for that virus. "Further experiments need to be done to evaluate if they will be sufficiently protective in humans," Tan said of the spine-helix antibodies.

There's a lot of work to do before a spine-helix vaccine might be available at the corner pharmacy. And there are a lot of things that could derail that work. Additional studies could contradict the NIH team's results. The new vaccine design might not work as well on people as it does on hamsters.

The new jab could also turn out to be unsafe, impractical to produce or too expensive for widespread distribution. Barton Haynes, a Duke University immunologist, told The Daily Beast he looked at spine-helix vaccine designs last year and concluded they'd be too costly to warrant major investment. The main problem, he said, is that the spine-helix antibodies are less potent and "tough to induce" from their parent B-cells.

The harder the pharmaceutical industry has to work to produce a vaccine, and the more vaccine it has to pack into a single dose in order to compensate for lower potency, the less cost-effective a vaccine becomes for mass-production.

Maybe a spine-helix jab is in our future. Or maybe not. Either way, it's encouraging that scientists are making incremental progress toward a more universal coronavirus vaccine. One that could work for many years on a wide array of related viruses.

COVID for one isn't going anywhere. And with each mutation, it risks becoming unrecognizable to the current vaccines. What we need is a vaccine that's mutation-proof.

Daily Beast, 19 November 2022

https://thedailybeast.com

FDA gives green light to first lab-grown chicken product in US

2022-11-20

California company Upside Foods has been given the green light from the U.S. Food and Drug Administration (FDA) for its lab-grown chicken, paving the way for its product to reach market shelves next year, and making the

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US the second country in the world to allow legal sales of lab-grown meat products.

In 2019 the FDA and the U.S. Department of Agriculture Food Safety and Inspection Service (USDA-FSIS) developed a formal regulatory process for future lab-grown meat products. The joint framework established the FDA as regulator of the cell culturing part of lab-grown meat manufacturing, and the USDA-FSIS as overseer of post-harvest cell processing and food labelling.

A recent announcement from the FDA has revealed Upside Foods is the first company to complete the initial pre-market consultation stage on the road to market approval. This means the FDA has completed its part of the regulatory process, giving the safety thumbs up to Upside Foods' lab-grown chicken manufacturing processes.

"The FDA's pre-market consultation with the firm included an evaluation of the firm's production process and the cultured cell material made by the production process, including the establishment of cell lines and cell banks, manufacturing controls, and all components and inputs," the FDA noted in a statement. "The voluntary pre-market consultation is not an approval process. Instead, it means that after our careful evaluation of the data and information shared by the firm, we have no further questions at this time about the firm's safety conclusion."

The next steps before the product reaches American supermarkets is a "grant of inspection" for the manufacturing premises from the USDA-FSIS, and then finally, approval over the lab-grown chicken's final labeling. It is still unclear exactly what labeling will be necessary for these kinds of products.

Nevertheless, the FDA is enthusiastic about "supporting innovation in the food supply." An accompanying statement from Robert Califf, the FDA's Commissioner of Food and Drugs, and Susan Mayne, director of the Center for Food Safety and Applied Nutrition, indicated the regulatory agency is keen to work with food technology companies and get these novel products to market.

"We are already engaged in discussion with multiple firms about various types of products made from cultured animal cells, including those made from seafood cells, which will be overseen solely by the FDA," said Califf and Mayne. "We continue to encourage firms to enter into dialogue with us often and early in their product development phase, well ahead of making any submission to us."

Lab-grown chicken has been deemed safe by the FDA and now needs a green light from the US Department of Agriculture before reaching supermarket shelves.

If Upside Foods' lab-grown chicken product reaches US market shelves over the next year it will be only the second time a regulatory body has authorized commercial sales of what some are calling "cultivated meat." In late 2020 Singapore became the first nation in the world to approve a lab-grown meat product for commercial sale. That approval was also for a chicken product.

Lab-grown chicken will inevitably be just the first of many cultivated meat products to hit the market over the coming years. Upside Foods, one of several companies in the space, already has beef meatball, duck and seafood products in their pipeline.

"This is a watershed moment in the history of food," said Upside Foods CEO Dr. Uma Valeti. "This milestone marks a major step towards a new era in meat production, and I'm thrilled that U.S. consumers will soon have the chance to eat delicious meat that's grown directly from animal cells."

New Atlas, 20 November 2022

https://newatlas.com

Considered Impossible – New Study of 5 Million People Reveals Genetic Links to Height

2022-11-20

The study, which was recently published in the journal Nature, is the largest genome-wide association study ever conducted, using the DNA of nearly 5 million individuals from 281 contributing studies. It fills a significant gap in our knowledge of how genetic differences contribute to height differences. Over one million research participants are of non-European heritage (African, East Asian, Hispanic, or South Asian).

The 12,111 variants that cluster around areas of the genome involved with skeletal growth offer a strong genetic predictor of height. For people of European ancestry, the identified variants account for 40% of the variance in height, and for those of non-European ancestry, 10–20%.

Adult height is mostly determined by the information encoded in our DNA; children of tall parents are likely to be taller, while children of short parents tend to be shorter, although these estimations aren't perfect. The development of a small baby into an adult, as well as the role of genetics in this process, has long been a complicated and poorly understood aspect of human biology. The previous largest genome-wide association

The results of the research may help doctors identify patients who are unable to grow to their genetically projected height, which may subsequently facilitate the identification of undiagnosed diseases or conditions.

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study on height employed a sample size of up to 700,000 people; the current sample is around seven times larger than earlier studies.

The study, which is being conducted at a scale never before seen, offers new levels of biological detail and understanding of why individuals are tall or short, with heredity being connected to various specific genomic regions. The results demonstrate that regions comprising just over 20% of the genome contain the majority of the gene variants linked to height.

The study's findings could help doctors identify people who cannot reach their genetically predicted height, which may aid in the diagnosis of hidden diseases or conditions that may be stunting their growth or impacting their health. The research also provides a valuable blueprint on how it could be possible to use genome-wide studies to identify a disease's biology and subsequently its hereditary components.

Greater genomic diversity needed

While this study has a large number of participants from non-European ancestries compared to previous studies, the researchers emphasize the need for more diversity in genomic research.

Most of the genetic data available are from people of European ancestry, so genome-wide studies don't capture the wide range of ancestral diversity across the globe. Increasing the size of genome-wide studies in non-European ancestry populations is essential to achieve the same saturation level and close the gap in prediction accuracy in different populations.

Dr. Eirini Marouli, a co-first author of the study and Senior Lecturer in Computational Biology at Queen Mary University of London, said: "We have accomplished a feat in studying the DNA of over 5 million people that was broadly considered impossible until recently."

She continues, "Genomic studies are revolutionary and might hold the key to solving many global health challenges – their potential is tremendously exciting. If we can get a clear picture of a trait such as height at a genomic level, we may then have the model to better diagnose and treat gene-influenced conditions like heart disease or schizophrenia, for example. If we can map specific parts of the genome to certain traits, it opens the

door to widespread targeted, personalized treatments further down the line that could benefit people everywhere."

Sci Tech Daily, 20 November 2022

https://scitechdaily.com

New Durable and Inexpensive Catalyst Reduces Carbon Footprint

2022-11-21

The Haber-Bosch process, which is often used to synthesize ammonia (NH3)—the foundation for synthetic nitrogen fertilizers—by combining hydrogen (H2) and nitrogen (N2) over catalysts at high pressures and temperatures, is one of the most significant scientific breakthroughs that has helped enhance crop yields and raise food production worldwide.

However, owing to the process's high temperature and pressure requirements, large fossil fuel energy inputs are required. The hydrogen utilized in this method is derived from natural gas (mainly methane). This hydrogen-production process consumes a lot of energy and emits a lot of CO2. To address these issues, several catalysts have been created to allow the reaction to take place at gentler circumstances utilizing hydrogen produced by water electrolysis using renewable energy. Among them are nitride-based catalysts that contain active metal nanoparticles like nickel and cobalt (Ni, Co) loaded on lanthanum nitride (LaN) supports.

Both the support and the active metal are involved in the formation of NH3 in these catalysts. The active metal splits the H2, whilst the LaN support's crystal structure contains nitrogen vacancies and nitrogen atoms that adsorb and activate nitrogen (N2). While these catalysts are cheap (since they don't need ruthenium, which is expensive), their catalytic performance suffers when exposed to moisture, with the LaN support transforming into lanthanum hydroxide (La(OH)3).

Now, in a new study published in Angewandte Chemie, researchers from China and Japan led by Professor Hideo Hosono from the Tokyo Institute of Technology (Tokyo Tech), Japan, have developed a chemically stable catalyst that is stable in the presence of moisture. Taking inspiration from stable rare-earth compounds containing chemical bonds between a rare-earth metal (in this case, La) and a metal, they incorporated aluminum atoms into the LaN structure and synthesized a chemically stable La3AlN support containing La-Al bonds that prevent lanthanum atoms from reacting with moisture.

A cheap and chemically durable catalyst to synthesize ammonia.

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The La-Al-N support along with the active metals, such as nickel and cobalt (Ni, Co), was able to produce NH3 at rates similar to that with conventional metal nitride catalysts and could maintain a stable production when fed with nitrogen gas-containing moisture. "The Ni- or Co-loaded La-Al-N catalysts showed no distinct degradation following exposure to 3.5% moisture," says Prof. Hosono.

While the Al atoms stabilized the support, the lattice nitrogen and nitrogen defects present in the doped support enabled the synthesis of ammonia in a manner similar to the conventional active metal/rare-earth metal nitride catalysts. "Lattice nitrogen, as well as nitrogen vacancy in La-Al-N, play a key role in N2 adsorption, with the La-Al-N support and the active metal Ni being responsible for N2 and H2 absorption and activation, respectively," explains Prof. Hosono.

The Haber-Bosch process is an energy-intensive chemical reaction, accounting for about 1% of global annual carbon dioxide emissions. While alternative environmentally friendly approaches for NH3 production are being investigated, introducing inexpensive catalysts could provide immediate benefits by allowing the process to operate under milder conditions.

Sci Tech Daily, 21 November 2022

https://scitechdaily.com

NIH study casts doubts on heart benefits of "good" cholesterol

2022-11-23

For half a century cholesterol has been divided into good and bad categories. Low-density lipoprotein (LDL) is considered the "bad" cholesterol as it's responsible for blocking arteries and causing stroke or heart attacks, while high-density lipoprotein (HDL) has been seen as the "good" form of cholesterol as it catches LDL in the bloodstream and takes it back to the liver.

Back in the 1970s a foundational research project, called the Framingham Heart Study, detected a consistent link between increased HDL levels and decreased heart attack risk. The association has informed clinical practice for the decades since it was found, with doctors frequently suggesting higher HDL levels can be protective against heart attack.

Research, in a racially diverse cohort, found high levels of so-called "good" HDL cholesterol did not correlate with decreased risk of heart attacks.

Since the Framingham study, researchers have conducted several follow-up investigations that have delivered pretty inconsistent results. When looking at White European ethnicities, low HDL levels can certainly be linked to increased heart disease risk, but when more racially diverse cohorts were assembled that association tended to disappear.

Nathalie Pamir, from the Oregon Health & Science University and senior author on the new study, said it is important to understand the racial differences that could be at play when analyzing the effect of HDL levels on heart attack risk. Pamir's research looked at data from a long-term stroke study tracking more than 20,000 people for over a decade.

"The goal was to understand this long-established link that labels HDL as the beneficial cholesterol, and if that's true for all ethnicities," said Pamir. "It's been well accepted that low HDL cholesterol levels are detrimental, regardless of race. Our research tested those assumptions."

The data Pamir and colleagues analyzed were from a project called REGARDS (the Reasons for Geographic and Racial Differences in Stroke), a study designed to investigate the different risk factors for stroke between White and Black middle-aged adults in the United States. The initial findings confirmed a general presumption, high levels of "bad" LDL cholesterol do increase a person's risk for cardiovascular disease, regardless of ethnicity. But the rest of the investigation turned up some surprises.

Looking at so-called "good" HDL cholesterol, the research found low levels only correlated with increased heart disease in White adults. And perhaps most striking, high HDL levels were not associated with less heart attacks in either White or Black study participants.

"What I hope this type of research establishes is the need to revisit the risk-predicting algorithm for cardiovascular disease," added Pamir. "It could mean that in the future we don't get a pat on the back by our doctors for having higher HDL cholesterol levels."

It's currently unclear why HDL cholesterol would have a different impact on heart disease risk between ethnicities. Sean Coady, an epidemiologist from the National Heart, Lung, and Blood Institute said these findings call for more study into the properties of HDL cholesterol.

"HDL cholesterol has long been an enigmatic risk factor for cardiovascular disease," said Sean Coady, who didn't work on this new study. "The findings suggest that a deeper dive into the epidemiology of lipid metabolism is

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warranted, especially in terms of how race may modify or mediate these relationships."

The study was published in the Journal of the American College of Cardiology.

New Atlas, 23 November 2022

https://newatlas.com

Decades of air pollution undermine the immune system, lymph nodes study finds

2022-11-22

The diminished power of the immune system in older adults is usually blamed on the aging process. But a new study by Columbia immunologists shows that decades of particulate air pollution also take a toll.

The study found that inhaled particles from environmental pollutants accumulate over decades inside immune cells in lymph nodes associated with the lung, eventually weakening the cells' ability to fight respiratory infections.

The findings—published Nov. 21 in Nature Medicine—offer a new reason why individuals become more susceptible to respiratory diseases with age.

Elderly people are especially vulnerable to respiratory infections, a fact brought into stark relief by the COVID pandemic. The death rate from COVID is 80 times greater in people over age 75 than in younger adults, and the elderly are also more vulnerable to influenza and other infections of the lung.

The Columbia researchers weren't initially looking at air pollution's influence on the immune system. More than ten years ago, they began to collect tissues from deceased organ donors to study immune cells in multiple mucosal and lymphoid tissues. Such cells have been largely inaccessible to researchers studying the immune system where sampling is limited to peripheral blood.

"When we looked at people's lymph nodes, we were struck by how many of the nodes in the lung appeared black in color, while those in the GI tract and other areas of the body were the typical beige color," says Donna Farber, Ph.D., the George H. Humphreys II Professor of Surgical Sciences

"These immune cells are simply choked with particulates and could not perform essential functions that help defend us against pathogens."

(in Surgery) and professor of microbiology & immunology at Columbia University Vagelos College of Physicians and Surgeons, who led the study.

And as the researchers collected more tissue from younger donors, they also noticed an age difference in the appearance of the lung's lymph nodes: Those from children and teenagers were largely beige while those from donors over age 30 looked were tinged with black and got darker with increasing age.

"When we imaged the lung's blackened lymph nodes and found they were clogged with particles from airborne pollutants, we started to think about their impact on the lung's ability to fight infection as people age," Farber says.

In the new study, she and her colleagues examined tissues from 84 deceased human organ donors ranging in age from 11 to 93, all nonsmokers.

They found that the pollutant particles in the lung's lymph nodes were located inside macrophages, immune cells that engulf and destroy bacteria, viruses, cellular debris, and other potentially dangerous substances.

The macrophages containing particulates were significantly impaired: they were much less capable of ingesting other particles and producing cytokines—chemical "help" signals—that activate other parts of the immune system. Macrophages in those same lymph nodes that did not contain particulates were unimpaired.

"These immune cells are simply choked with particulates and could not perform essential functions that help defend us against pathogens," Farber says.

"We do not know yet the full impact pollution has on the immune system in the lung," Farber adds, "but pollution undoubtedly plays a role in creating more dangerous respiratory infections in elderly individuals and is another reason to continue the work in improving air quality."

James P. Kiley, Ph.D., director of the Division of Lung Diseases at the National Heart, Lung, and Blood Institute, part of the National Institutes of Health, agrees. "This is an interesting study that suggests air pollution may contribute to why older people become more susceptible to respiratory infections," says Kiley, who was not a part of the study. "In addition to supporting ongoing efforts to control air pollution, these findings underscore the importance of additional research to better understand

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the lung effects of inhaled particulates and the interactions between air pollution and chronic lung diseases."

The study is titled "Inhaled particulate accumulation with age impairs immune function and architecture in human lung lymph nodes."

Medical Xpress, 22 November 2022

https://medicalxpress.com

Research shows link between climate change and infectious diseases

2022-11-19

As we are getting closer to winter, more people are getting sick with seasonal illnesses like the flu and the respiratory syncytial virus (RSV). However, new research from the journal Nature Climate Change suggests climate change is aggravating 58% of infectious diseases.

Diving into the data

A group of researchers at the University of Hawaii put together a list of 376 diseases after reviewing many academic studies and then looked to see at how droughts, floods, heat waves and other climate hazards affected those diseases.

Warming temperatures have aggravated 160 unique diseases.

Climate hazards affected only 218 diseases. According to researchers, warming temperatures, precipitation events and floods lead the way in amplifying pathogenic diseases like cholera, Lyme disease, West Nile virus and others.

They also found that droughts and floods that displaced people brought people closer to pathogens, while global warming allowed pathogens to spread.

One example that the study gives is heat waves and how it drives people to recreational water activities. Scientists say those activities have been associated with "rising cases of several waterborne diseases such as Vibrio-associated infections, primary amoebic meningoencephalitis48 and gastroenteritis."

Plus, people displaced by storms and floods brought people closer to the pathogen exposure of pneumonia, hepatitis, respiratory disease, skin diseases and others.

Weather and COVID-19

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Let's talk about how the weather is affecting the spread of the COVID-19. It has mixed results.

Regarding COVID-19, "changes in precipitation and temperature were also noted to affect human social gatherings and the transmissibility of viruses such as influenza and COVID-19," according to researchers.

A study from the Centre For Economic Policy Research (CEPR) that is cited in the research discussed how rainfall affected social distancing around COVID-19 in some areas.

They found that heavy rainfall events kept more people inside and saw lower COVID cases after those events.

But in other cases, social isolation from rain events increased cases of COVID-19 too.

On the flip side, extreme heat increased COVID-19 case sometimes because sweltering temperatures forces people indoors, which could increase the risk of virus transmission, especially with poor ventilation.

Diseases slowed down by climate change

While climate change is aggravating more than half of infectious diseases, it is diminishing the spread of other diseases, too.

The University of Hawaii researchers found that climatic hazards had curbed 63 pathogens.

Researchers say warming reduced the spread of some viral diseases including COVID-19, SARS and influenza. They explained warming temperatures could cause unsuitable conditions for a virus to spread.

Plus, floods have disrupted the environment for some water-borne diseases, while droughts diminished the spread of malaria.

Overall, researchers found over 1,000 pathways in how climate change is amplifying infectious diseases and human pathogens. Researchers will study this more to discover the magnitude this could affect public health and what policy we can do to curb this impact.

Spectrum News, 19 November 2022

https://ny1.com

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What Makes This Creature Nearly Invincible? Biologists Have Gained New Insight

2022-11-20

Researchers at the University of Wyoming have learned more about the biological processes that enable tiny creatures known as tardigrades to endure harsh circumstances, such as being completely dried out in suspended animation for years.

Thomas Boothby, an assistant professor of molecular biology, and colleagues found how trehalose, a sugar, interacts with proteins to enable tardigrades to survive in the absence of water. Their findings were recently published in the journal Communications Biology.

Tardigrades, often known as water bears, are less than half a millimeter long and can tolerate being completely dried out, frozen to just above absolute zero (approximately minus 458 degrees Fahrenheit, when all molecular motion ceases), heated to more than 300 degrees Fahrenheit, irradiated several thousand times beyond what a person can withstand, and even survive the vacuum of outer space.

Tardigrades' ability to survive being dried out has perplexed scientists since it seems to vary from that of a number of other species that can enter suspended animation. Previously, scientists believed tardigrades did not produce trehalose to survive drying out, but Boothby and his colleagues discovered that they do, although at lower levels than other organisms.

The researchers also found that, in tardigrades, trehalose works synergistically with another tardigrade-specific protein called CAHS D.

Ultimately, Boothby and other researchers hope that their discoveries can be applied to help solve societal and global health issues — in this case, water scarcity. Their work might lead to better ways of stabilizing pharmaceuticals and generating engineered crops that can cope with harsh environments.

"A long-term goal of this field is to understand better how to confer the adaptation abilities of tardigrades to organisms that do not naturally survive drying," Boothby says. "This study and its findings provide a compelling argument that to do so may require the combination of different, synergistic protectants."

Sci Tech Daily, 20 November 2022

https://scitechdaily.com

Tardigrades, also known as water bears, evolved over 500 million years ago.

Increasing Levels of CO2 Results in Less Nutritious Crops

2022-11-19

For years, one of the only possible bright sides of increasing levels of atmospheric carbon dioxide (CO2) seen by scientists is enhanced photosynthesis. After all, plants use carbon dioxide for photosynthesis, so it was expected that higher levels of the greenhouse gas will lead to more productive plants. However, this effect may be less than expected because elevated levels of CO2 make it difficult for plants to obtain the minerals necessary to grow and provide nutritious food. This is explained by scientists from the Institute for Plant Science of Montpellier in France in a review published on November 3 in the journal Trends in Plant Science.

"There are many reports in the literature showing that the CO2 levels expected at the end of the twenty-first century will lead to a lower concentration of nitrogen in most plants, mainly affecting the protein content in plant products," says first author Alain Gojon. "It is very important to understand why growing plants at elevated CO2 has such a negative effect on the protein content of most staple crops and the future of food." Gojon is the research director of France's National Research Institute for Agriculture, Food and the Environment.

Plants use photosynthesis to incorporate CO2 into sugars that they derive their energy from. However, photosynthesis does not provide plants with the key minerals they need to grow. For most plants, these minerals, such as nitrogen, phosphorus, and iron, are picked up from the soil through their root systems. Nitrogen is particularly important as it is a key building block for the amino acids that plants use to make proteins

Not only does a nitrogen deficiency mean that a plant will have difficulty building its tissues, but also that it will provide less nutrition to humans. "What is clear is that the nutrient composition of the main crops used worldwide, such as rice and wheat, is negatively impacted by the elevation of CO2. This will have a strong impact on food quality and global food security," says corresponding author Antoine Martin, researcher of the French National Centre for Scientific Research.

"Two main nutrients that are essential for human nutrition may be affected by this phenomenon," adds Gojon. "The first one is proteins built from nitrogen. In developing countries this can be a big issue, because many diets in these countries aren't rich in proteins and plants grown at elevated

Elevated levels of CO2 make it difficult for plants to obtain the minerals necessary to grow and provide nutritious food.

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CO2 can have twenty to thirty percent less protein. The second one is iron. Iron deficiency already affects an estimated 2 billion people worldwide."

Beyond global food systems, the lowered mineral status of plants due to increased atmospheric CO2 levels may lead to a negative feedback loop for mitigating climate change. "The terrestrial carbon sink associated with enhanced photosynthesis may be limited if most of the vegetation is deficient in nitrogen and other minerals, which may prevent any additional increase of CO2 capture from the atmosphere," says Gojon.

"We would like to really understand the mechanisms that are responsible for the negative effects of elevated CO2 on the mineral composition of plants," says Martin. "For example, we are currently exploring the natural genetic variation behind these negative effects, that could be used afterward to improve crops nutritional value under future CO2 atmosphere."

Sci Tech Daily, 19 November 2022

https://scitechdaily.com

Not Science Fiction: Paralyzed People Can Navigate Using Mind-Controlled Wheelchairs

2022-11-18

By translating users' thoughts into mechanical commands, a mind-controlled wheelchair can help a paralyzed person gain new mobility. Researchers demonstrate that tetraplegic users can operate mind-controlled wheelchairs in a natural, cluttered environment after training for an extended period in a study published today (November 18) in the journal iScience.

"We show that mutual learning of both the user and the brain-machine interface algorithm are both important for users to successfully operate such wheelchairs," says José del R. Millán, the study's corresponding author at The University of Texas at Austin. "Our research highlights a potential pathway for improved clinical translation of non-invasive brain-machine interface technology."

Millán and his colleagues recruited three tetraplegic people for the longitudinal study. Each of the participants underwent training sessions three times per week for 2 to 5 months. The participants wore a skullcap that detected their brain activities through electroencephalography (EEG), which would be converted to mechanical commands for the wheelchairs

Tetraplegic users can operate mind-controlled wheelchairs in a natural, cluttered environment. The mind-controlled wheelchair helps paralyzed people gain new mobility by translating users' thoughts into mechanical commands.

via a brain-machine interface device. The participants were asked to control the direction of the wheelchair by thinking about moving their body parts. Specifically, they needed to think about moving both hands to turn left and both feet to turn right.

In the first training session, three participants had similar levels of accuracy—when the device's responses aligned with users' thoughts—of around 43% to 55%. Over the course of training, the brain-machine interface device team saw significant improvement in accuracy in participant 1, who reached an accuracy of over 95% by the end of his training. The team also observed an increase in accuracy in participant 3 to 98% halfway through his training before the team updated his device with a new algorithm.

The improvement seen in participants 1 and 3 is correlated with improvement in feature discriminancy, which is the algorithm's ability to discriminate the brain activity pattern encoded for "go left" thoughts from that for "go right." The team found that the better feature discrimnancy is not only a result of machine learning of the device but also learning in the brain of the participants. The EEG of participants 1 and 3 showed clear shifts in brainwave patterns as they improved accuracy in mind-controlling the device.

"We see from the EEG results that the subject has consolidated a skill of modulating different parts of their brains to generate a pattern for 'go left' and a different pattern for 'go right,'" Millán says. "We believe there is a cortical reorganization that happened as a result of the participants' learning process."

Compared with participants 1 and 3, participant 2 had no significant changes in brain activity patterns throughout the training. His accuracy increased only slightly during the first few sessions, which remained stable for the rest of the training period. It suggests machine learning alone is insufficient for successfully maneuvering such a mind-controlled device, Millán says

By the end of the training, all participants were asked to drive their wheelchairs across a cluttered hospital room. They had to go around obstacles such as a room divider and hospital beds, which are set up to simulate the real-world environment. Both participants 1 and 3 finished the task while participant 2 failed to complete it.

"It seems that for someone to acquire good brain-machine interface control that allows them to perform relatively complex daily activity

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like driving the wheelchair in a natural environment, it requires some neuroplastic reorganization in our cortex," Millán says.

The study also emphasized the role of long-term training in users. Although participant 1 performed exceptionally at the end, he struggled in the first few training sessions as well, Millán says. The longitudinal study is one of the first to evaluate the clinical translation of non-invasive brain-machine interface technology in tetraplegic people.

Next, the team wants to figure out why participant 2 didn't experience the learning effect. They hope to conduct a more detailed analysis of all participants' brain signals to understand their differences and possible interventions for people struggling with the learning process in the future.

Sci Tech Daily, 18 November 2022

https://scitechdaily.com

Evidence grows that soggy meteorites gave earth its oceans

2022-11-20

Rock of Ages

Where Earth's water comes from remains a contentious topic amongst scientists, but a meteorite that landed in England last year may contain a key chunk of evidence.

Dubbed the Winchcombe meteorite, the space rock was examined by researchers from the National History Museum in London, who found that it contained water similar to Earth's water. Their accompanying study, published in the journal Science Advances, lends considerable credence to a prevailing theory that Earth got its massive reserve of water from asteroids.

"Meteorites like Winchcombe are a pretty good match [to] the water in the Earth's oceans and suggests asteroids were the main source of water," Ashley King, lead author of the study and a research fellow at the museum, told The Guardian.

The meteorite was measured to have a composition of approximately two percent carbon and 11 percent water by weight.

With the additional discovery of extraterrestrial amino acids trapped inside, it's practically a starter kit for the building blocks of life, which

"Meteorites like Winchcombe are a pretty good match [to] the water in the earth's oceans and suggests asteroids were the main source of water."

similarly bolsters the theory that organic materials — as well as water — were delivered by meteorites, too.

Unsullied Stone

Most meteorites break apart before falling to Earth, and are often never found. The ones that are recovered are usually compromised by the Earth and its atmosphere, meaning scientists can't be sure what they find inside is from space or from our world.

"Most CM chondrites (a type of meteorite) have 'Earth-like' water but these rocks alter and degrade within days (or) weeks of being on Earth, and so they could just be Earth-like because they have absorbed rain water or something," Luke Daly, a planetary scientist at the University of Glasgow and coauthor of the paper, told CNN.

However, thanks to how quickly the Winchcombe meteorite was retrieved — facilitated with the help of public reports and footage from the UK Fireball Alliance — that wasn't a problem.

"The rapid retrieval and curation of Winchcombe make it one of the most pristine meteorites available for analysis, offering scientists a tantalizing glimpse back through time to the original composition of the solar system 4.6-billion-years-ago," King said in a press release.

And believe it or not, Daly thinks they're just getting started with uncovering the secrets embedded within the meteorite.

"There are certainly many more stories and secrets held in this special stone," he said to CNN.

All in all, the findings are not definitive proof that Earth got its water off-world, but it definitely shows that the theory, much like the meteorite, holds water.

Futurism, 20 November 2022

https://futurism.com

More Successful Than Ketamine – A Shocking Depression Treatment

2022-11-20

According to an analysis of six studies that recently published their findings in JAMA Psychiatry, electroconvulsive therapy (ECT) is better than ketamine in quickly relieving major depression.

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According to the World Health Organization, depression is a widespread condition that affects roughly 5% of individuals globally (WHO). Feeling sad, irritable, losing enjoyment in formerly delightful things, and even enduring inexplicable pain or fatigue for weeks at a time are all signs of depression. The most common first-line treatment for depression is the use of an oral antidepressant (in conjunction with psychotherapy). However, if oral antidepressants are ineffective or if the patient is in immediate danger of self-harm, there are other, quicker therapy options, including ECT and, more recently, ketamine or esketamine.

Ketamine is less often used in the US than esketamine, a nasal spray that has been given approval by the Food and Drug Administration to treat depression. However, there are no studies comparing the effectiveness of ECT with esketamine. Ketamine, a sister drug of esketamine, has been studied. Ketamine is typically used as an injectable anesthetic in medicine, but it has lately been investigated as a fast-acting intervention to help those suffering from serious depression.

T. Greg Rhee, a psychiatric epidemiologist at the University of Connecticut School of Medicine, and associates from Harvard University, Kyungnam University in Korea, McLean Hospital and Massachusetts General Hospital in Boston, University of Toronto, VA New England Mental Illness in West Haven, and Yale University examined six global clinical trial studies contrasting ketamine with ECT for major depression. The trials, which were carried out in hospitals in Sweden, Germany, Iran, and India, involved 340 patients in total.

All six of the studies independently found that ECT was more effective than ketamine at relieving severe depression symptoms.

"ECT is consistently more successful than ketamine" at helping patients with serious depression, says Rhee. "We found no differences by age, sex, or geographic location. So we could say anyone who is ECT eligible will benefit."

Although ketamine did generally help patients, ECT had better results overall. Ketamine could be a viable treatment for people who cannot undergo ECT. The side effect profiles of the two treatments differed, with ECT more likely to cause headaches, muscle pain, and memory loss, while ketamine was more likely to cause dissociative symptoms, vertigo, and double vision.

There are two additional studies comparing ECT and ketamine ongoing, and Rhee hopes to add their data to the analysis when they are available.

Electroconvulsive therapy is a psychiatric treatment that involves electrically inducing a generalized seizure to treat mental disorders.

"Every single study directly reports ECT works better than ketamine. But people are still skeptical of ECT, perhaps because of stigma," Rhee says, or negative depictions in films such as "One Flew Over the Cuckoo's Nest" and shows such as "Stranger Things." "We need to improve public awareness of ECT for treatment-resistant depression."

Sci Tech Daily, 20 November 2022

https://scitechdaily.com

AI learns the art of Diplomacy

2022-11-22

Diplomacy, many a statesperson has argued, is an art: one that requires not just strategy, but also intuition, persuasion, and even subterfuge—human skills that have long been off-limits to even the most powerful artificial intelligence (AI) approaches. Now, an AI algorithm from the company Meta has shown it can beat many humans in the board game Diplomacy, which requires both strategic planning and verbal negotiations with other players. The work, researchers say, could point the way toward virtual exercise coaches and dispute mediators. International chatbot diplomacy may not be far behind.

"These are spectacular new results," says Yoram Bachrach, a computer scientist at DeepMind who has worked on the game Diplomacy but was not involved in the new research. "I'm particularly excited about Diplomacy because it's an exceptional environment for studying cooperative AI," in which machines don't just compete, but collaborate.

AI has already bested humans in games of strategy such as chess, Go, poker, and the video game Dota 2. It is also proving powerful at natural-language processing, in which it can generate humanlike text and carry on conversations. The game of Diplomacy requires both. It involves seven players vying for control of Europe. On each turn, players issue orders regarding the movement of army and naval units, following discussion with other players, whom they can attack or support. Success typically requires building trust—and occasionally abusing it. Both former President John F. Kennedy and former Secretary of State Henry Kissinger were fans of the game.

Previous AI research has focused on a version of the game called no-press Diplomacy, in which players do not communicate. That itself is a challenge for computers because the game's combination of cooperation and competition requires pursuing conflicting goals. The new work, published

Meta's algorithm tackles both language and strategy in a classic board game that involves negotiation

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this week in Science, is the first to achieve respectable results in the full game. Noam Brown, a computer scientist at Meta who co-authored the paper, says when he started on the project, in 2019, he thought success would require a decade. "The idea that you can have an AI that's talking strategy with another person and planning things out and negotiating and building trust seemed like science fiction."

Meta's AI agent, CICERO, welds together a strategic reasoning module and a dialogue module. As in other machine learning AIs, the modules were trained on large data sets, in this case 125,261 games that humans had played online—both the game plays and transcripts of player negotiations.

The researchers trained the strategic reasoning module by having the agent play against copies of itself. It learned to choose actions based on the state of the game, any previous dialogue, and the predicted actions of other players, looking several moves ahead. During training, the researchers also rewarded it for humanlike play so that its actions wouldn't confound other players. In any domain, whether dinner-table manners or driving, conventions tend to ease interactions.

The dialogue module also required tuning. It was trained not only to imitate the kinds of things people say in games, but to do so within the context of the state of the game, previous dialogue, and what the strategic planning module intended to do. On its own, the agent learned to balance deception and honesty. In an average game, it sent and received 292 messages that mimicked typical game slang. For example, one message read, "How are you thinking Germany is gonna open? I may have a shot at Belgium, but I'd need your help into Den[mark] next year."

Jonathan Gratch, a computer scientist at the University of Southern California who studies negotiation agents—and provided early guidance for a Defense Advanced Research Projects Agency program that is also trying to master Diplomacy—notes two technical innovations. First, CICERO grounds its communication in multistep planning, and second, it keeps its remarks and game play within the realm of human convention.

To test its skill, the researchers had CICERO play 40 online games against humans (who mostly assumed it was a human). It placed in the top 10% of players who'd played at least two games. "In a game that involves language and negotiation, that agents can reach human parity is very exciting," says Zhou Yu, a computer scientist at Columbia University who studies dialogue systems.

Gratch says the work is "impressive" and "important." But he questions how much CICERO's dialogue, as opposed to its strategic planning, contributed to its success. According to the paper, Diplomacy experts rated about 10% of CICERO's messages as inconsistent with its plan or game state. "That suggests it's saying a lot of crap," Gratch says. Yu agrees, noting that CICERO sometimes utters non sequiturs.

Brown says the work could lead to practical applications in niches that now require a human touch. One concrete example: Virtual personal assistants might help consumers negotiate for better prices on plane tickets. Gratch and Yu both see opportunities for agents that persuade people to make healthy choices or open up during therapy. Gratch says negotiation agents could help resolve disputes between political opponents.

Researchers also see risks. Similar agents could manipulate political views, execute financial scams, or extract sensitive information. "The idea of manipulation is not necessarily bad," Gratch says. "You just have to have guardrails," including letting people know they are interacting with an AI and that it will not lie to them. "Ideally people are consenting, and there's no deception."

Science, 22 November 2022

https://science.org

JWST finds sulphur dioxide for the first time on an exoplanet

2022-11-23

Although you might not have heard of WASP-39 b, it's a minor celebrity when it comes to planets.

The James Webb Space Telescope (JWST) has 'hot Saturn' in its sites, and in August showed the first clear detection of carbon dioxide in the planet. Now, a series of five papers published on arXiv (currently under review at Nature) has found evidence of another surprising gas – sulphur dioxide.

This is the first-time sulphur dioxide has been discovered in an exoplanet's atmosphere. The 300-astronomer strong team also discovered the first detection of carbon monoxide in WASP-39b's atmosphere.

This, and other new information from JWST potentially makes WASP-39b the best explored planet outside the solar system.

"The level of detail provided by JWST is revolutionary. It is incredibly exciting to think that we're only at the dawn of the JWST era."

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"We observed the exoplanet with multiple instruments that, together, provide a broad swath of the infrared spectrum and a panoply of chemical fingerprints inaccessible until JWST," said one of the team, University of California, Santa Cruz astronomer Natalie Batalha.

"Data like these are a game changer."

WASP-39 b, (or the International Astronomical Union official name Bocaprins) is around 698 light-years from Earth and is in the area of the Virgo constellation. The exoplanet is what's known as a 'hot Saturn'. This means exactly what it sounds like – the planet is very hot and is about the same size of Saturn. WASP-39 b is also 'puffy' – it's less than half the mass of Jupiter but has a radius of 1.27 times the size. A real marshmallow of a planet.

It's also incredibly close to its host star – whizzing around the star every four days. This means it would be a bit balmy – temperatures would reach up to 900 °C.

We only know the planet is there because of tiny changes in the light levels of the star it's orbiting – called WASP-39. You can see how this works below with another exoplanet – WASP-96 b.

The JWST has a number of instruments perfect for needling the atmosphere of far-flung exoplanets. It carries the Near InfraRed Spectrograph (NIRSpec), the Near InfraRed Camera (NIRCam) and the Near InfraRed Imager and Slitless Spectrograph (NIRISS), which were all used for the new studies. These sensors are able to detect which wavelengths are missing after the light goes through the exoplanet's atmosphere in incredible detail.

"I was blown away when I first saw the planet's spectrum. I knew we had something remarkable, in terms of the level of structure that was in the spectrum and the precision we achieved," said Imperial College London astrophysicist Dr James Kirk.

"The level of detail provided by JWST is revolutionary. It is incredibly exciting to think that we're only at the dawn of the JWST era."

The new papers found that a photochemical reaction is possibly taking place to create the sulphur dioxide. This occurs when the light from the star hits the atmosphere, and the team think that atmospheric water is split into hydrogen and hydroxide, which then reacts with hydrogen sulphide to produce the sulphur dioxide. This is the first time a photochemical by-product has been detected on an exoplanet.

The papers also shed light onto the amount of cloud cover on WASP-39b. It seems that the clouds are not a uniform blanket over the planet and could instead be broken up. JWST isn't just looking at WASP-39 b. In it's first year of science it's going to be observing around 70 exoplanets. But WASP-39 b is a benchmark for those studies, allowing us to uncover secrets about our nearest exoplanets neighbours.

Cosmos, 23 November 2022

https://cosmosmagazine.com

Vapes, e-cigarettes linked to higher risk of tooth decay and cavities, study finds

2022-11-24

Each fruity plume of vapour from an e-cigarette may have not-so-sweet repercussions for your pearly whites, according to a study.

Researchers reviewed thousands of patient records from a university dental clinic and found people who reported vaping were at higher risk of tooth decay and cavities than people who said they didn't vape.

The study was published in the Journal of the American Dental Association today.

Karina Irusa from Tufts University in the US, who led the study, says it's not possible to say that vaping definitely causes tooth cavities, but there's a likely association between the two.

"We stumbled upon this [potential link] by accident, and then the more we learned about it, the more we thought, 'OK, this could be a bad thing.'"

Vaping's effects emerge from the haze

E-cigarette or vape liquid, which is heated and inhaled, is mostly a thick liquid base, such as glycerol and propylene glycol, mixed with a whole bunch of artificial flavourings and other chemicals.

And vaping has bloomed in popularity in Australia, especially among young adults. The 2019 National Drug Strategy Household Survey found nearly two-thirds of respondents aged 18 to 24 reported vaping at least once (up from just under half in 2016), with 5 per cent saying they currently use an e-cigarette or vaping device.

But vaping can be harmful to our health, particularly for non-smokers and young people, according to an Australian report published in April. We

Vapers were more likely to be in the "high-risk" group for tooth decay (79 per cent) compared to non-vapers (60 per cent).

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know users are at higher risk of developing, for instance, seizures and lung damage.

Today's research is not the first to suggest a link between tooth decay and vaping.

A 2017-18 survey of 4,600 people in the US found those who currently used e-cigarettes were more likely to have untreated cavities than their non-smoking counterparts.

It's something one of Dr Irusa's colleagues noticed in his Chicago dental practice a few years ago.

He saw three patients, ranging in age from 21 to 52 years, each of whom had multiple cavities in unusual places.

For instance, one woman had decayed patches along the smooth biting edge of her top front teeth.

What the trio had in common was regular e-cigarette use — eight to 12 times a day — using vaping liquids containing THC, the main psychoactive compound found in cannabis.

To see if they could find a link between vaping and tooth decay risk in a wider patient cohort, Dr Irusa and her colleagues analysed patient records for around 13,000 people over 16 who visited a Tufts teaching dental clinic from the start of 2019 to the end of 2021.

Of those, 91 people (or less than 1 per cent) said they used e-cigarettes or vapes.

And they were more likely to be in the "high-risk" group for tooth decay (79 per cent) compared to non-vapers (60 per cent).

The Melbourne Dental School's Matt Hopcraft, who was not involved in the study, said while 91 people who reported vaping wasn't a terribly large group — more on why that might be later — the results hint at potential issues down the track for younger vapers.

By their teenage years, around 40 per cent of Australian children already have decay in their adult teeth, Dr Hopcroft said.

"If kids are turning into young adults who are vaping on a regular basis, that's increasing their risk [for cavities] further — and that's a real concern."

How vaping might leave a sour taste in your mouth

The relatively low proportion of dental patients in the study who reported vaping could be down to a few reasons, Dr Irusa said.

"We purely looked at records, so we are assuming record-keeping was accurate, and we're also assuming the [dental] students did everything correctly.

"Was their [cavities] risk assessment accurate? Did they ask everyone about vaping?

"And even if they asked, did everyone tell the truth?"

Patient records lacked detail such as how often each person vaped, or what was in their vape liquid of choice.

There's also the possibility that people who vape are more likely to partake in cavity-encouraging activities, such as eating more sugary food.

But there are a few different ways vaping in general might contribute to a mouth full of fillings.

The vapourised liquid is thick and coats the teeth, getting into nooks and crannies.

Some compounds commonly found in vape liquids become acidic when aerosolised.

And while the hard, enamel shell that covers our teeth is pretty tough, prolonged contact with acidic substances can erode it.

Fruity and creamy-smelling vapes often include, unsurprisingly, a whole bunch of different sugars.

Some of these sugars are food for acid-producing bacteria that live on and around our teeth. Other sugars affect how those microbes behave.

A 2018 study examined how the bacterium Streptococcus mutans, which is naturally present in our mouth and the main player in tooth decay, acts when bathed in flavoured vapour.

It found bacteria become "stickier" and more likely to clump together as a film on our tooth enamel — what we know as dental plaque.

If not brushed away, bacteria in plaque pump out acids, which soften and dissolve the enamel underneath.

Vaping may also affect how much saliva we make, which can, in turn, contribute to cavities, Dr Irusa said.

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"Saliva dilutes whatever's in your mouth, whether it's acid or sugar, and saliva pH also helps to keep everything neutral.

"But if you don't have enough saliva, then you have acid [on your teeth] for longer periods of time. And that's not good."

ABC News 24 November 2022

https://abc.net.au

CRISPR is so popular even viruses may use it

2022-11-23

The celebrated gene-editing tool CRISPR started out as a bacterial defense against invading viruses. But it turns out the intended targets have stolen CRISPR for their own arsenals. A new study reveals that thousands of the bacteria-attacking viruses known as bacteriophages (phages, for short) contain the CRISPR system's genetic sequences, suggesting they may deploy them against rival phages. The finding is a testament to the molecular weapon's power—and may make CRISPR even more valuable as a laboratory gene editor.

Thousands of viruses appear to have stolen the gene-cutting mechanism from bacteria.

The discovery "opens doors for possible new applications of CRISPR systems," says genomicist Mazhar Adli of Northwestern University's Feinberg School of Medicine, who wasn't connected to the research.

Like other viruses, phages cannot reproduce on their own. Instead, they hijack bacteria's molecular machinery, often killing their hosts in the process. The CRISPR system enables bacteria to fight back. It includes repetitive stretches of DNA that match sequences of previously encountered phages. If these same phages attack a bacterium again, it uses this repetitive DNA to encode strands of RNA that can steer a partner enzyme, which acts like a pair of genetic scissors, to cut the phage's genome at specific places. For about the past decade, scientists have been working to turn this immune defense into a gene-editing technique for myriad uses, including improving crop defenses, detecting pathogens, and fighting diseases such as cancer.

Characteristic DNA that encodes components of the CRISPR system had previously turned up in a handful of phages. But scientists regarded these finds as mere "curiosities," says structural biologist Jennifer Doudna of the University of California (UC), Berkeley, who shared the 2020 Nobel Prize in Chemistry for showing how to tailor the CRISPR system to target particular sequences. "But they got us wondering if these systems were more common."

To find out, Doudna, UC Berkeley geomicrobiologist Jillian Banfield, and their colleagues went looking for additional examples of CRISPR in the phage world. They probed DNA plucked from a variety of environments that are rich in bacterial hosts for the viruses, including soil and the human mouth. This trawl uncovered more than 6000 types of phages that contain CRISPR system DNA, the scientists report online today in Cell. They also examined phage genome sequences that had been posted to online databases and found even more instances of the CRISPR-carrying viruses. Although fewer than 1% of phages sport the sequences, the researchers did not expect "such a broad distribution of an anti-phage system in phages," Doudna says.

Why would phages acquire a system that evolved to thwart them? The most likely reason, Doudna says, is to beat the competition. Multiple viruses can attack a bacterium at the same time, leading to "phage wars" inside an infected cell, she says. Bacteria are also vulnerable to rogue DNA strands known as plasmids that coerce the cells into copying them. By destroying these rivals with the CRISPR system, phages "can have the replication machinery all to themselves," Doudna says.

The phages presumably swiped these CRISPR system sequences from their microbial victims, she says. Since then, the viruses have customized the systems for their own ends. For instance, some phages seem to have lost the capacity to generate certain molecules that can kill bacteria, possibly to preserve their hosts to produce more phages.

The phages' gene-editing tricks may inspire new biotechnology. For instance, most CRISPR-based approaches now rely on the enzyme Cas9 to cut DNA. However, Cas9 is so large it cannot fit into some viruses used to genetically modify cells. A number of phages, however, boast a slimmed-down version known as Cas-lambda that is about 50% smaller, Doudna's and Banfield's team found. Adli says this smaller enzyme could allow new gene-editing applications for CRISPR, such as altering plant genomes, though researchers would first need to overcome several bioengineering hurdles.

Microbiologist Joseph Bondy-Denomy of UC San Francisco says Doudna and Banfield displayed a "[John] Lennon-[Paul] McCartney" level of synergy in ferreting out so many CRISPR-bearing phages that had eluded other scientists. Still, he wants to see evidence that phages actually put their CRISPR systems to use when they invade bacteria. Bondy-Denomy

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also suspects many more phages that wield CRISPR are waiting to be discovered. "The next step is more," he says.

Science, 23 November 2022

https://science.org

Women beware! The lipsticks you wear are cocktails of harmful chemicals that can even cause cancer

2022-11-25

Women love wearing lipsticks, and why not? The shiny, moisturising, dazzle of colours not only accentuates the lips but also gives a glamorous look.

However, lipsticks come under fire for being loaded with harmful substances that cause severe health issues like coughing, eye irritation, wheezing, etc. In many extreme cases, according to doctors, people have also been diagnosed with cancer.

Why is lipstick harmful?

Based on many studies, it has come to light that lipsticks contain a noxious mixture of petroleum-based dangerous chemicals, many of which are not even tested for safety. These chemicals are usually absorbed through the lips and every time you lick them, even if unknowingly, the chemicals are ingested.

Lips are the most sensitive part of the body after skin and due to the lack of hair and sweat glands, they are devoid of any natural defences. Hence, they are more prone to cuts, peel-offs, allergies, etc.

What are the ingredients used in lipsticks?

Apart from lead, a known harmful chemical that causes hypertension and heart issues, other ingredients used in most lipsticks are:

Methylparaben

Methylparaben is a commonly used chemical in many foods, pharmaceuticals, and beauty products. It is used as a preservative to protect the product from fungal attacks. It absorbs in the skin very fast but is hardly stored in the body. The chemical, many studies say is carcinogenic.

Chemicals used to preserve lipsticks cause several health issues like coughing, eye irritation, wheezing, and other allergies, including alteration in endocrine glands and cancer in some cases.

In many European countries, methylparaben is a banned substance because of possible cancer and the risk of attacks on the endocrine system. Methylparaben has been classified as a "moderate risk" by the Cosmetics Database.

Polyparaben

Like methylparaben, polyparaben is also added as a preservative to lipsticks to prevent the growth of harmful bacteria and mold. It helps keep the lipstick moist and oily and increases its shelf-life.

Many experts have said it disrupts the functioning of the endocrine glands and also causes grave allergies. However, the cosmetics database lists it as a high-risk product.

The disadvantage of products with no polyparabens is that they are often more solid, to keep them fresher for longer because it is the soft, oily part of the ingredients that turn rancid the quickest.

Retinyl palmitate

It is a synthetic preservative that is added as an antioxidant. Retinyl palmitate is a synthetic vitamin A and is said to be harmful to pregnant women. The cosmetics database lists it as a "moderate hazard" because there is some evidence that links it to some cancers and reproductive problems.

Experts say when retinyl is exposed to the harmful ultraviolet rays of the sun, retinol compounds break down and produce toxic radicals that can damage DNA and cause genetic mutations, which are a precursor to cancer.

Colour dyes

These are mostly used to colour the lipsticks and form the most attractive value of the products.

A lot of lipsticks available in the markets are made with synthetic and fake dyes that are made from aluminum and petroleum products. These dyes are extremely harmful to our bodies as they can cause cancer, skin issues, and even organ failure.

Some would prefer to use more natural and organic lipstick products. These have the advantage of having a minimal environmental impact because they are biodegradable and come from natural sources. If you

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prefer softer, more natural shades, natural dyes can help you achieve that look. Many use ingredients like beetroot or cocoa, for example.

Important tips to follow

- Avoid buying dark shades lipsticks as harmful heavy metals are darker in colour
- Before applying lipstick, apply a base of ghee or petroleum jelly on the lips, as it reduces the side effects
- Local brands may be cheaper, but they can damage your lips
- Buy lipstick from good brands
- Always check the ingredients
- Scrub your lips with sugar and honey to remove the pigmentation caused by lipsticks

Times Now News, 25 November 2022

https://timesnownews.com

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Role of chemical exposure in the incidence of vitiligo: a case-control study in Tunisia

[Characteristics and Health Risk Assessment of BTESX in the Northern Suburbs of Nanjing]

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EI/IOT of PFCs: Environmental impacts/interactions, occurrences, and toxicities of perfluorochemicals

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Bioaccumulation and toxicity of terbuthylazine in earthworms (Eisenia fetida)

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