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ASIA PACIFIC

New organoid culture method can verify human toxicity of nanomaterials

2024-06-24

The Korea Research Institute of Standards and Science (KRISS) has developed the world's first organoid culture method capable of accurately assessing human toxicity of nanomaterials. Overcoming the limitations of the conventional culture method, this new technology is expected to bring forward the commercialization of organoid-based safety assessment of nanomaterials and nanomedicine.

The paper is published in the journal Nano Letters.

An organoid is a miniaturized version of an organ produced by culturing human stem cells in vitro. Since an organoid effectively simulates the human body, organoids are attracting much attention as a means of next-generation toxicity assessment, replacing animal tests; however, they have a drawback: the standardization is difficult due to limitations in the culture method.

In the conventional organoid culture method, cells are embedded in the extracellular matrix and solidified in the shape of a dome to form a three-dimensional structure; then a culture medium is added to culture the cells. In this method, the thickness of the extracellular matrix dome varies at the center and the edge, causing an oxygen supply imbalance.

Read More

Phys.org, 24-06-24

<https://phys.org/news/2024-06-organoid-culture-method-human-toxicity.html>

Changes to requirements for reporting on hazardous substances

2024-07-04

We have made updates to the information required under the Hazardous Substances (Importers and Manufacturers) Notice 2015. The changes include a requirement that importers and manufacturers of certain hazardous substances report annually on the quantities imported and manufactured.

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The reporting requirements are focussed on substances that have a high potential to directly enter the environment, such as pesticides, fumigants and antifouling paints.

These changes help bring us into line with international best practices for the management of hazardous substances.

Providing information on quantities imported and/or produced is nothing new for companies operating internationally, who already provide it to regulators in other parts of the world, such as Australia and the European Union.

All importers and manufacturers are already required to provide us with business contact information within 30 days of the first time importing or manufacturing a hazardous substance.

Find out more information, including the form to register as an importer or manufacturer

Changes to the importers and manufacturers notice

From 1 January 2026:

- Importers and manufacturers of certain hazardous substances will need to report annually on the quantities imported or manufactured.
- All importers and manufacturers will need to provide their NZBN, HSNO approval numbers and/or titles of the group standards for their hazardous substances.
- Manufacturers of explosives will need to provide the same information that is already required from importers of explosives.

From 1 January to 31 May 2026:

- First annual reports are due by 31 May 2026. Importers and manufacturers of certain substances will need to report on chemical quantities they imported and manufactured from 1 January to 31 December 2025.

From 1 January 2025:

- The EPA has the option to issue multi-shipment import certificates for approved explosives. This will reduce the administrative burden for importers.

We will engage with importers and manufacturers regarding implementing the new requirements and developing supporting guidance. This will include ensuring an appropriate submission tool is in

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place to allow importers and manufacturers to provide their information from 1 January 2026.

We have not yet determined the procedure for applying for a multi-shipment explosive import permit, but we will work with stakeholders in the latter part of 2024.

[Read More](#)

EPA NZ, 04-07-24

<https://www.epa.govt.nz/hazardous-substances/before-you-import-or-manufacture/>

The status of veterinary mRNA vaccines in Australia

2024-07-04

The Australian Pesticides and Veterinary Medicines Authority (APVMA) is actively engaging with industry, researchers, state and territory governments, and our global regulatory counterparts regarding Australia's regulatory approach to mRNA vaccines for use in animals.

Veterinary mRNA vaccines are still in the research and development phase worldwide. There are currently no mRNA vaccines approved by the APVMA for use in animals in Australia.

In anticipation of their development, we are developing a regulatory framework that will include information on data requirements to ensure any new veterinary mRNA vaccine is:

- safe and effective for use in animals
- safe for people who consume animal products derived from vaccinated livestock
- safe for the environment
- safe for the people who administer the vaccine to animals.

Should the research and development for mRNA vaccines be successful, and new veterinary mRNA vaccines are developed, it will take time before they are commercially available within Australia.

Authorisation of mRNA vaccines for use in animals in Australia will require approval by the APVMA, and applications to register these vaccines will

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undergo our rigorous, risk-based registration process to ensure they are safe and effective.

[Read More](#)

APVMA, 04-07-24

<https://www.apvma.gov.au/news-and-publications/news>

Glyphosate grounds decision to come

2024-07-04

In February 2024, we formally received an application from the Environmental Law Initiative (ELI) to decide whether there are grounds to reassess glyphosate and glyphosate-containing substances. ELI made their application on the basis there is significant new information about the negative effects of the substance.

There are existing strict rules around using products containing this substance to reduce any potential risks to people and the environment. A decision-making committee is currently reviewing information from the applicant alongside the latest international research on glyphosate.

A decision on whether there are grounds to reassess this substance is expected in July 2024.

[Read More](#)

EPA NZ, 04-07-24

<https://www.epa.govt.nz/news-and-alerts/latest-news/epa-receives-request-to-take-first-step-in-glyphosate-reassessment-process/>

AMERICA

California Court Grants Injunction to Stop Prop 65 Warnings for Titanium Dioxide in Cosmetic and Personal Care Products

2024-06-20

On June 12, 2024, the U.S. District Court for the Eastern District of California (District Court) issued an Order granting a preliminary injunction brought by the Personal Care Products Council (PCPC), which alleged that the California Office of Environmental Health Hazard Assessment's (OEHHA) requirement for warnings under Proposition 65 (Prop 65)

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related to titanium dioxide in cosmetics and personal care products violated the First Amendment. The Personal Care Products Council v. Bonta, No. 2:23-cv-01006-TLN-JDP (E.D. Cal. 2024). In its Order, the District Court enjoined the California Attorney General and any private citizen enforcers from enforcing Prop 65's warning requirement for "cancer as applied to Listed Titanium Dioxide (i.e., titanium dioxide that consists of airborne, unbound particles of respirable size) in cosmetic and personal care products." The District Court also denied a motion to intervene by Environmental Health Advocates, Inc. (EHA), who had argued it was "an interested party because it is the primary enforcer of Prop 65."

This is the third case successfully challenging Prop 65 warnings on First Amendment grounds, with previous cases involving glyphosate and acrylamide, as discussed in our FIFRA blog. See Natl. Assoc. of Wheat Growers v. Bonta, 85 F.4th 1263 (9th Cir. 2023); Cal. Chamber of Comm. v. Bonta, 529 F. Supp. 3d 1099 (E.D. Cal. 2021). These are important cases with implications for companies facing Prop 65 warning requirements for other substances where the underlying scientific basis for listing also may be unclear and controversial.

Read More

B&C, 20-06-24

<https://www.lawbc.com/california-court-grants-injunction-to-stop-prop-65-warnings-for-titanium-dioxide-in-cosmetic-and-personal-care-products/>

Notice of Intent to address risks of youth appeal and access to nicotine replacement therapies

2024-03-21

Notice of intent to explore legislative and regulatory options for additional measures to protect youth from new and emerging risks related to nicotine replacement therapies

Purpose

The purpose of this Notice of Intent is to inform the public that Health Canada is planning to take action to address risks associated with the access and apparent youth appeal of certain nicotine replacement therapies (NRTs), such as nicotine pouches.

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Background

NRTs are classified as a drug under the Food and Drugs Act (FDA) as they are intended for use by adults aged 18 years and older who smoke regularly and wish to quit. Health Canada regulates NRTs under the FDA to ensure regulatory requirements for safety, efficacy and quality are met, and reduce health risks to Canadians. Drug products are subject to pre-market review and approval by Health Canada. Evidence behind health claims is reviewed to make sure that the product does what it claims to do, and the benefits outweigh the risks.

Depending on the amount of nicotine contained or delivered by the product, an NRT would be considered a prescription drug or a natural health product. All NRTs need market authorization from Health Canada and must carry an approved health claim for smoking cessation to be legally sold in Canada. NRTs that are regulated as natural health products are presently available for sale at retail, including in pharmacies, in a range of formats and with certain flavours.

Strong concerns have been raised regarding the access and potential appeal to youth of certain new and emerging NRTs, such as nicotine pouches, and the way they are marketed. Youth smoking rates are at an all-time low in Canada and advertising of NRTs should not be appealing to youth. NRTs should only be promoted for use in smoking cessation.

The representation of NRTs through labelling, packaging, and advertising among other things should reflect the intended audience of adults who smoke and the public health objective of these products. As nicotine is addictive and toxic, nicotine products should be kept out of the reach of children and youth at all times.

Children and teenagers are especially susceptible to the addictive properties of nicotine as brain development continues throughout adolescence and into early adulthood. Youth access and appeal to youth, as well as place of sale, are not typically managed as part of the regulations under the FDA.

The Tobacco and Vaping Products Act (TVPA) regulates the manufacture, labelling, sale and promotion of tobacco and vaping products. Youth access and appeal are restricted through prohibiting sales to people under the age of 18, certain promotional activities (e.g., lifestyle advertising), and limiting certain flavours appealing to youth. However, the TVPA does not apply to NRTs, other than vaping products, as they are classified as drugs

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when authorized for smoking cessation purposes and do not contain tobacco.

[Read More](#)

Government of Canada, 21-03-24

<https://www.canada.ca/en/health-canada/services/drugs-health-products/natural-non-prescription/notice-intent-address-risks-youth-appeal-access-nicotine-replacement-therapies.html>

New labeling standards will make it easier to determine what packaging is compostable

2024-07-04

In March 2024, the Washington State Legislature passed Organics Management Law 2.0 (OML 2.0), including changes to the compostable product labeling standards ("Plastic Product Degradability," chapter 70A.455 RCW). Below is a summary of key updates that go into effect June 6, 2024.

This bill changes the original Organics Management Law (OML 1.0) passed in 2022, and both will help reach our statewide climate and waste reduction goals. OML 1.0 included labeling standards for compostable products in an effort to support facilities that accept these materials and ease consumer confusion. Consumer confusion adds to contamination, which makes composting more difficult and expensive.

Expanding definition and standards for product compostability

- **Exempt:** Products made from wood are considered compostable and do not need to be labeled in accordance with the labeling rules.
- Products made from more than 98% fiber with no plastic or wax additives or coatings are also considered compostable and do not require specific labeling.
- These products do not need to be listed on a producer's declaration of compliance.
- **Film bags, other film products, and food service products:** These still must be tested and certified to ASTM standards D6400 or D6868 by a third-party.
- **Other products (compostable packing peanuts, cellulose tape, PLA insulated mailers, etc.):** These can be certified to a similar scientific

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standard for composting in industrial settings (ex. ASTM D8410, ISO 17088, and EN 13432).

[Read More](#)

Department of Ecology, State of Washington, 04-07-24

<https://ecology.wa.gov/blog/june-2024/organics-management-in-washington-changes-to-compostable-product-labeling>

EPA Releases Updated Climate Indicators Report Showing How Climate Change is Impacting People's Health and the Environment

2024-07-02

WASHINGTON — Today, July 2, the United States Environmental Protection Agency released the Fifth Edition of Climate Change Indicators in the United States. The report highlights new data showing the continuing and far-reaching impacts of climate change on the people and environment of the United States. New to the report this year are an indicator on Marine Heat Waves (showing trends related to multi-day high ocean temperatures) and a feature on Heat-Related Workplace Deaths.

"EPA's Climate Change Indicators report is an authoritative resource of how the climate crisis is affecting every American right now and with increasing intensity," said EPA Administrator Michael S. Regan. "Extreme heat, flooding, and wildfires have become more common, harming human health, threatening livelihoods, and causing costly damage. Regular updates to the data in the Climate Indicators website and report help us track these unprecedented changes so we are better informed in our shared work to confront the crisis."

The Fifth Edition presents highlights from a subset of EPA's total of 57 indicators, which include historical data and observed trends related to either the causes or effects of climate change. The report explores the interconnected nature of observed changes in climate with chapters thematically organized around Greenhouse Gases, Heat on the Rise, Extreme Events, Water Resources at Risk, Changing Seasons, Ocean Impacts, Rising Seas, and Alaska's Warming Climate. Since publishing the first edition in 2010, EPA has maintained an up-to-date online resource of climate change indicators and regularly released updated publications that present the latest data.

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EPA partners with more than 50 data contributors from various U.S. and international government agencies, academic institutions, and other organizations to compile these key indicators of climate change. EPA's indicators show multiple lines of compelling evidence that climate change is increasingly affecting people's health, society, and ecosystems in numerous ways. For example:

- **Global and U.S. Temperature** – Worldwide, 2023 was the warmest year on record, 2016 was the second warmest, and 2014–2023 was the warmest decade on record since thermometer-based observations began. In the U.S., unusually hot summer days have become more common over the last few decades, and unusually hot summer nights have increased at an even faster rate, indicating less “cooling off” at night.
- **Heat Waves in U.S. Cities** – Heat waves are occurring more often in major cities across the United States. Their frequency has steadily increased, from an average of two heat waves per year during the 1960s to six per year during the 2010s and 2020s. The average length of the heat wave season across the U.S. cities is 46 days longer now than it was in the 1960s and, in recent years, the average heat wave in major U.S. urban areas has lasted about four days.
- **A Closer Look** – Heat-Related Workplace Deaths - From 1992 to 2022, a total of 986 workers across all industry sectors in the United States died from exposure to heat of which the construction sector accounted for about 34 percent of all occupational heat-related deaths. During this time frame, 334 construction workers died due to heat exposure on the job.
- **Sea Surface Temperature** – Over the past century, sea surface temperature has increased and continues to rise. Sea surface temperature has been consistently higher during the past three decades than at any other time since reliable observations began in 1880.

[Read More](#)

US EPA, 02-07-24

<https://www.epa.gov/newsreleases/epa-releases-updated-climate-indicators-report-showing-how-climate-change-impacting>

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EUROPE

Key air pollutant emissions decline across the EU, reducing ammonia biggest challenge

2024-07-05

In 2022, 16 Member States met their respective 2020-2029 national emission reduction commitments under the EU's National Emission reduction Commitments Directive (NECD) for each of the five main pollutants (nitrogen oxides, non-methane volatile organic compounds, ammonia, sulphur dioxide and fine particulate matter), according to the EEA assessment. Eleven Member States failed to do so for at least one of five main air pollutants.

The EEA briefing is based on the latest available data reported by Member States in 2024 for their 2022 emissions. It describes the progress made towards reducing emissions of the five main air pollutants regulated under the directive. It presents an assessment of Member State performance against the emission reduction commitments for 2020-2029 as well as their progress towards achieving the more ambitious reduction commitments that will apply from 2030 onward.

Future progress

Reducing ammonia emissions remains the biggest challenge: nine Member States need to cut their 2022 emission levels to fulfil their 2020-2029 reduction commitments. The agriculture sector is the principal

source, responsible for 93% of total ammonia emissions according to the EEA assessment. Ammonia emissions have decreased only slightly in many Member States since 2005 and in some cases have increased.

Achieving further reductions for 2030 and beyond will be a significant challenge for nearly all EU countries and for almost all air pollutants. The reduction over time for some pollutant emissions is now levelling off. One exception is sulphur dioxide where 22 Member States are already compliant with their 2030 reduction commitment.

The EEA assessment is based solely on data provided by Member States and does not constitute a compliance check which is undertaken by the European Commission.

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The numbers presented here may also be subject to change in relation to the result of ongoing quality checks being undertaken.

Read More

EEA, 05-07-24

<https://www.eea.europa.eu/en/newsroom/news/key-air-pollutant-emissions-decline-across-the-eu>

Climate adaptation case studies can help boost know-how across Europe

2024-06-24

The Climate-ADAPT platform, which is maintained by the EEA, targets governmental decision-makers as well as the organisations supporting them in the development, implementation, and evaluation of climate change adaptation strategies, plans and actions at all governance levels in Europe. The platform currently includes 134 case studies for learning and to inspire action.

According to the new EEA briefing 'Preparing society for climate risks in Europe — lessons and inspiration from Climate-ADAPT case studies', the recently published European Climate Risk Assessment (EUCRA) stressed the need to scale up adaptation measures and actions across all policy sectors and governance levels to address escalating climate risks like extreme heat, drought, wildfires and flooding.

While Climate-ADAPT case studies cover many risks, gaps remain in practical examples that showcase adaptation in some specific risks under the food, and economy and finance risk areas. New perspectives for developing case studies for other key vulnerable sectors (such as forestry), for governance levels (such as transnational case studies to address cross-border impacts) and for some European regions and the outermost regions of Europe are also under consideration.

Case studies play a key role for learning

The EEA is encouraging EEA Member States which often have national case studies to help fill these gaps by sharing more examples of adaptation actions and initiatives that can serve to build knowledge and experiences and serve as inspiration. Showcasing these case studies on Climate-ADAPT helps users to explore the co-benefits and potential trade-offs of adaptation measures. They also highlight the need for enhanced

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monitoring, evaluation and learning to assess the effectiveness of these actions and prevent adaptation failures.

The EEA briefing notes that the future development of Climate-ADAPT case studies will focus on addressing specific risks identified by the EUCRA. Cooperation between EEA Member States will be crucial to upgrade the Climate-ADAPT case studies and to share practical learning experiences, including best practices, across Europe.

Read More

EEA, 26-06-24

<https://www.eea.europa.eu/en/newsroom/news/climate-adaptation-case-studies-can-help>

German Chemicals Office Submits Proposal to EU Linking TFA to Reproductive Toxicity

2024-07-01

The German Federal Office for Chemicals (Bundesstelle für Chemikalien or BfC) has submitted to the European Chemical Agency (ECHA), in separate dossiers, its proposal linking reproductive toxicity to trifluoroacetic acid (TFA) and its inorganic salts; TFA is an atmospheric by-product of HFO-1234yf and other f-gases.

BfC is a division of Germany's Federal Institute for Occupational Safety and Health (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin or BAuA). ECHA is responsible for the safe use of chemicals in the EU.

This is one of the first efforts by a country to associate exposure to small quantities of TFA (concentrations of at least 0.1% to 0.3%) with harmful human health effects. One of the main sources of TFA in the environment is the oxidation of HFO-1234yf and other f-gases in the atmosphere, with TFA absorbed in rainfall. TFA is also formed from the breakdown of pesticides and other anthropogenic sources.

While it is an ultrashort-chain, two-carbon substance, TFA falls under the scientifically accepted "one fully fluorinated carbon" definition of PFAS (per- and polyfluorinated substances) established by the OECD (Organisation for Economic Co-operation and Development). As such, it acts as a "forever chemical" that persists for a very long time in the environment. Longer chain PFAS with a similar chemical architecture (known as perfluoroalkyl carboxylic acids), such as eight-carbon PFOA,

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have been tied to harmful health impacts, including reproductive toxicity, ulcerative colitis and cancer.

[Read More](#)

Natural Refrigerants, 01-07-24

<https://naturalrefrigerants.com/german-chemicals-office-submits-proposal-to-eu-linking-tfa-to-reproductive-toxicity/>

INTERNATIONAL

A new light to guide action on chemicals, pollution and waste

2024-06-21

I'm going to try to be very expedited, but also try to see if I can help make some suggestions for how you may be able to move forward.

First, however, let me give a big thanks to the government of Switzerland for hosting us here in this beautiful place, and for being a generous friend of UNEP, as well as for having been part of the very early sponsorship of this resolution and continued friend of the process.

Also, my deep thanks to all delegates here present for all that you have done. I held a number of separate meetings this morning to listen to distinguished delegates that are here. I have also highlighted we see this work as an important stepping stone for UNEP and the UN to deal with that environmental wave that is not yet on our shores, but will be hitting our shores in the future. And that obviously includes dealing with elements pertaining to pollution, waste and chemicals.

Now, this is where your work comes in. In 1988 the world decided to establish the IPCC. In 2010 the world decided to establish IPBES. And in 2022, this panel. So, there is much to do and learn from in terms of precedence. You are not working from scratch and I have a feeling that you feel that you are, but there's a lot of precedence already established and you do not need to establish everything at this point.

[Read More](#)

UNEP, 21-06-24

<https://www.unep.org/news-and-stories/speech/new-light-guide-action-chemicals-pollution-and-waste>

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From Bolsonaro to Lula: Brazil's Pesticide Policy Shifts and the EU's Export Double Standards

2024-07-04

During Jair Bolsonaro's presidency (2019-22), the agribusiness caucus prioritized a bill amidst a favorable political climate, supported by the far-right president's endorsement of pro-agribusiness legislation. However, the bill did not advance to a vote before Lula took office.

Since President Luiz Inácio Lula da Silva took office in January 2023, Brazil's agribusiness caucus has leveraged a conservative majority in Congress to push legislation that undermines environmental regulations. This move starkly contrasts Lula's green promises.

One significant legislation, the "Poison Bill," took effect in late 2023. The legislation shifts the responsibility for pesticide regulation exclusively to Brazil's Ministry of Agriculture, Livestock, and Food Supply, reducing the role of health and environmental agencies. This new law relaxes the criteria for agrochemical approval. It shortens registration deadlines despite long-standing concerns about their environmental and health impacts, including several substances banned in the European Union (EU).

Supporters and Critics

Proponents like Pedro Lupion, deputy coordinator of the agriculture caucus, argue that the bill reduces bureaucracy and modernizes pesticide policy. However, experts and environmentalists view it as catastrophic. Over the past decade, Brazil has witnessed a 78% increase in pesticide consumption, particularly in the advancing agricultural frontier of the Amazonian regions. Experts warn that the Poison Bill poses catastrophic risks, threatening Indigenous peoples, riverine communities, and small farmers while also jeopardizing the biodiversity of the Amazon Rainforest.

Environmental and Health Impacts

Researchers highlight the severe consequences of this legislation. Ricardo Theophilo Folhes from the Federal University of Pará warns that pesticides are particularly harmful at the edge of the Amazon Rainforest, leading to long-lasting soil and water contamination. Larissa Mies Bombardi, a lecturer at the University of São Paulo, underscores the dramatic increase in pesticide use in the Amazon, including substances banned in Europe. Notably, the use of the fungicide mancozeb increased by 5,600% and atrazine by 575%, both linked to serious health issues.

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REACH Update

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Occupational exposure limits: Calls for evidence

2024-06-07

We are looking for information on:

- Anthraquinone (EC 201-549-0, CAS 84-65-1)
- Oximes: Butanone oxime (EC 202-496-6, CAS 96-29-7) and Acetone oxime (EC 204-820-1, CAS 127-06-0)

The aim is to gather new scientific information on uses, exposure, health effects, toxicology, epidemiology and modes of action of these substances. Any other relevant information is also welcome.

The information will help the Agency in drafting the scientific reports related to exposure limits at the workplace.

Have your say until 16 September 2024.

Read More

ECHA, 17-06-24

<https://echa.europa.eu/oels-cce-current-consultation>

NAM-BASED HAZARD ASSESSMENT OF NANOCELLULOSE: INTESTINAL UPTAKE, COLONIC FATE AND LOCAL EFFECTS OF INGESTED NANOCELLULOSE

2024-07-02

Scientific principles in hypothesis-driven nano-risk assessment

According to the framework on risk assessment of nanoparticles in applications related to food and feed falling within the remit of the European Food Safety Authority (EFSA) - i.e. nutrients and nutrient sources, novel foods, food contact materials, food additives, food flavourings, feed additives, and pesticides - nanoscale specificities are integrated in the risk assessment process as nanoscale-based hypotheses. These hypotheses encompass potential human exposure to particles ('Is toxicokinetics driven by particle uptake and distribution?') and particle-related hazards ('Has the material particles within a biologically relevant nanoscale size? Does this size influence cellular uptake? Is there bioaccumulation of nanoparticles or other biological interactions related to the nanoscale?') [Schoonjans et al., 2023]. The Guidance on Nano - Risk Assessment of the EFSA Scientific Committee points out New Approach Methodologies (NAMs) as the first choice to generate information for addressing these hypotheses

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and improve mechanistic understanding of processes at the nanoscale [EFSA Scientific Committee, 2021]. Integrated Approaches to Testing and Assessment (IATAs) are suggested to be used for the integration of human, animal and NAMs-derived evidence.

Nanocellulose: a material on the rise

Recently, the production and use of cellulose at the nanoscale has attracted increasing interest. Nanocellulose (NC) is an emerging material in the food sector with several application areas, including prospective use as a novel food or as food additive. Three main classes of NC exist, i.e. NC fibres produced by bacterial species (bacterial NC, BNC) and other NCs obtained by technological modification of cellulose from plants or other origins, leading to cellulose nanofibres (nanofibrillated cellulose, NFC) or nanocrystals (cellulose nanocrystals, CNC). The biological sources and processing conditions affect the size, morphology, and several other physicochemical parameters of NC. Although all NC materials typically have a high aspect ratio, CNC usually consists in rod-shaped crystals, whereas NFC consists in fibrils composed of fibres with a length up to 2-3 µm; nanofibers are even longer in BNC and organized in networks. For all the NC types, the diameter can be very small (as low as 5-10 nm).

Read More

EUON, 02-07-24

<https://euon.echa.europa.eu/nanopinion/-/blogs/nam-based-hazard-assessment-of-nanocellulose-intestinal-uptake-colonic-fate-and-local-effects-of-ingested-nanocellulose>

European Commission updates REACH Restrictions Roadmap

2024-07-01

The updated Rolling List of (groups of) substances for restriction was updated on 1 July. The roadmap outlines ongoing efforts and future plans

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REACH Update

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for restrictions under REACH. It prioritises group restrictions for the most harmful substances to human health and the environment, in line with the EU's Chemicals Strategy for Sustainability.

This is the first update to the roadmap since its initial launch in April 2022.

Read More

ECHA, 01-07-24

https://ec.europa.eu/docsroom/documents/60674#msdyntrid=iMNHcmlYMGEsFbU0_wcBg5cWYBzZFnt2cfngP2rXIQ

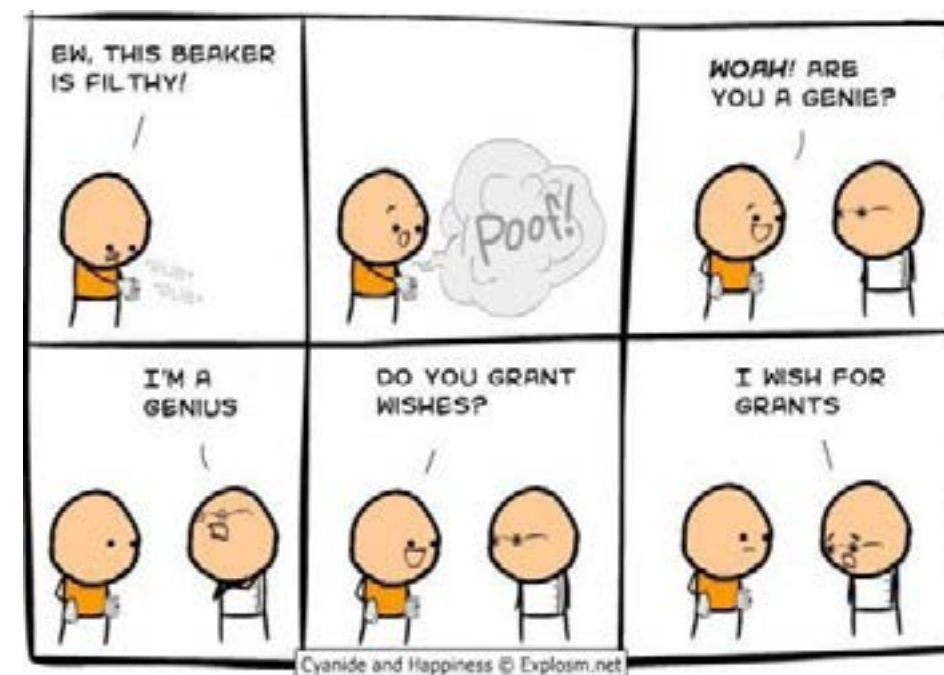
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1,3-Dichloropropene

2024-07-12

USES [2,3]

1,3-Dichloropropene is used mainly in farming as a pesticide, specifically as a preplant fumigant and nematicide. It is widely used in the United States and other countries, but is in the process of being phased out in the European Union. It is also used in making other chemicals.

EXPOSURE SOURCES & ROUTES OF EXPOSURE [3]

Exposure Sources

The primary source of exposure to 1,3-dichloropropene is by breathing air containing it. This can occur either via contaminated workplace air or air around hazardous waste sites that contain it. Exposure may also occur through drinking contaminated water or touching contaminated soil where it is produced or used, or near hazardous waste sites that contain it.

Routes of Exposure

The main routes of exposure to 1,3-dichloropropene are:

- inhalation,
- skin absorption,
- ingestion,
- skin and/or eye contact

HEALTH EFFECTS [4]

Acute Health Effects

Acute inhalation exposure of humans after a tank truck spill resulted in mucous membrane irritation, cough, chest pain, and breathing difficulties. Effects on the lung, including emphysema and oedema, have been observed in rats acutely exposed to 1,3-dichloropropene by inhalation. Lung congestion and haemorrhage, ulcerations of the glandular stomach, haemorrhage of the small intestine, dark and patchy liver, and haemorrhage of the liver have been observed in rats acutely exposed to 1,3-dichloropropene in their diet or via gavage (experimentally placing the chemical in the stomach). Neurotoxic effects, including hunched posture, lethargy, ptosis, ataxia, and decreased respiratory rate, have also

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been observed in orally exposed rats. Acute animal tests in rats, mice, and rabbits have demonstrated 1,3-dichloropropene to have moderate acute toxicity from inhalation, moderate to high acute toxicity from oral exposure, and high acute toxicity from dermal exposure.

Carcinogenicity

Information on the carcinogenic effects of 1,3-dichloropropene in humans is limited. Two cases of histiocytic lymphomas and one case of leukaemia have been reported in emergency response personnel exposed to concentrated 1,3-dichloropropene vapours during clean-up of a tank truck spill. An increased incidence of bronchioalveolar adenomas has been reported in male mice exposed by inhalation but not in rats or female mice. Forestomach and liver tumours in rats and forestomach, urinary bladder, and lung tumours in mice have been observed in rodents exposed to 1,3-dichloropropene via gavage. Liver tumours were noted in rats exposed to 1,3-dichloropropene in the diet. EPA has classified 1,3-dichloropropene as a Group B2, probable human carcinogen.

SAFETY

First Aid Measures [5]

- **Eye Contact:** Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention immediately.
- **Skin Contact:** Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.
- **Inhalation:** Remove the person from exposure. Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped. Transfer promptly to a medical facility.

Workplace Controls & Practices [4]

Control measures include:

- enclosing chemical processes for severely irritating and corrosive chemicals,
- using local exhaust ventilation for chemicals that may be harmful with a single exposure, and
- using general ventilation to control exposures to skin and eye irritants.

The following work practices are also recommended:

- Label process containers.

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- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

Personal Protective Equipment [5]

The following personal protective equipment is recommended when handling 1,3-Dichloropropene:

- **Gloves and Clothing:** Wear personal protective equipment made from material that cannot be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation. All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
- **Eye Protection:** Wear indirect-vent, impact and splash resistant goggles when working with liquids. Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances. Do not wear contact lenses when working with this substance.
- **Respiratory Protection:** Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams. Where the potential exists for exposure over 1 ppm, use an approved supplied-air respirator with a full face-piece operated in a pressure demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

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REGULATION

United States

ACGIH: American Conference of Governmental Industrial Hygienists has set a Threshold Limit Value (TLV) of 1 ppm, 4.5 mg/m³ TWA (Skin); Appendix A4 (Not Classifiable as a Human Carcinogen)

NIOSH: National Institute for Occupational Safety and Health has set a Recommended Exposure Limit (REL) of 1 ppm TWA; Potential carcinogen

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CRISPR-Cas9 Editing in Plants: What's the Latest Research?

2024-06-13

The emergence of CRISPR-Cas9 genome-editing tools created new opportunities for enhancing plant and crop traits in agricultural biotechnology research. Now, multiplex genome-editing (MGE) technologies, which allow for simultaneous modification of several genetic sites in a single genome in the same experiment, are promising to further transform the field.

Here, we discuss the latest research advancements in research applying multiplexed CRISPR-Cas9 editing in plants, including novel approaches to enhance the efficiency of large-scale genome-editing projects.

Altering gene expression in crops without introducing foreign DNA

Since the emergence of CRISPR-Cas technology as a gene-editing tool, numerous research labs have utilized it to decrease the expression of specific genes in crops.

In a new study from the Innovative Genomics Institute at the University of California Berkeley (UCB), scientists applied CRISPR-Cas9 in rice crops to reach a different end goal: increased gene expression.

Patel-Tupper is a former postdoctoral student in the lab of Professor Kris Niyogi at UCB, which focuses on photoprotection, methods to improve photosynthesis and carbon dioxide removal. Photoprotection refers to biochemical processes that help organisms defend against and manage damage from the sun.

The genes that encode these biochemical processes naturally occur in all plants. In a 2018 study, Niyogi and colleagues found that overexpression of Photosystem II Subunit S (PsbS), using transgenic methods, enhanced a model crop's water-use efficiency. Inspired by this work, the new study aimed to alter the expression of a plant's native genes without having to insert foreign DNA. The research team hypothesized that this could be achieved by applying CRISPR-Cas9 gene editing to regulatory DNA mechanisms upstream of PsbS in rice, an important crop for global food supplies.

By "flipping" the regulatory DNA, PsbS expression was successfully increased to an extent that surprised even the research team.

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Increased levels of the PsbS protein enhanced a photoprotective mechanism called non-photochemical quenching and water-use efficiency.

Using RNA sequencing, the research team explored whether their strategy had affected the activity of other genes that carry important functions in the rice genome, identifying a "very small" number of differentially expressed genes.

As only one percent of the plants generated by the team possessed the desired phenotype, there's a long road ahead for this method to be optimized, the researchers emphasized. Eventually, it could help overcome regulatory barriers associated with genetically modified and genetically edited organisms, Patel-Tupper said: "We showed a proof-of-concept here, that we can use CRISPR-Cas9 to generate variants in key crop genes and get the same leaps as we would in traditional plant breeding approaches, but on a very focused trait that we want to engineer and at a much faster timescale."

"It's definitely more difficult than using a transgenic plant approach, but by changing something that is already there, we may be able to preempt regulatory issues that can slow how quickly we get tools like this into the hands of farmers," he concluded.

Boosting sugarcane yield to enhance biofuel production

Sugarcane is an economically important crop that provides ~70% of the world's sugar and is grown across 121 different countries. Due to its high sucrose content, sugarcane is becoming increasingly important to the biofuel industry as feedstock for ethanol production.

The crop's complex genome – it is a hybrid of *Saccharum officinarum* and *Saccharum spontaneum* – has hindered efforts to improve sugarcane via conventional breeding methods. Thankfully, sophisticated genome-editing tools, such as CRISPR-Cas technology, can lend a hand.

Researchers from the University of Florida's Center for Advanced Bioenergy and Bioproducts Innovation (CABBI) recently utilized CRISPR-Cas9 technology to edit the genome of sugarcane which, on the phenotype level, resulted in an adjusted leaf angle. As a result, the sugarcane leaves captured a greater amount of sunlight, ultimately increasing the biomass produced by the crop.

Sugarcane's complex genome stems from the fact that it has many copies of each gene, which means that each individual plant's phenotype is

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dependent on the collective expression of a specific gene. Altepeter and colleagues' project was possible because CRISPR-Cas9 technology can be designed to edit as little or as many copies of a gene as a researcher desires.

In previous work by the same team, a gene known as LG1 was identified as important for the formation of joints between the leaf blade and sheath, causing leaves to stand upright. Sugarcane's genome possesses 40 copies of LG1, enabling Altepeter and colleagues to mutate a varying number of copies across different plants and study the effects on biomass in field trials. "In doing so, we were able to tailor the leaf architecture until we found the optimal angle that resulted in increased biomass yield," Altepeter said.

One line of the mutated crop – L35 – possessed edits in ~12% of the LG1 copies. In field trials, L35 demonstrated a 56% decrease in leaf inclination angle and a subsequent 18% increase in yield.

Enhancing the efficiency of large-scale genome editing in plants

The discussed research studies demonstrate how MGE using CRISPR-Cas technology is increasing in popularity among agricultural researchers.

Dr. Thomas Jacob's lab at the VIB-UGent Center for Plant Systems Biology is exploring new approaches to develop easy-to-use genome editing systems for a variety of plant species, with a specific focus on developing methods that reduce the complexity and costs associated with large-scale genome-editing projects.

In the lab's latest study, published in *The Plant Journal*, it has developed novel screens that systematically mutate thousands to hundreds of thousands of genes at one time in the model plant *Arabidopsis thaliana* (*Arabidopsis*).

"Here, we systematically tested different nuclear localization sites (NLS) and promoter configurations for the production of inheritable, multiplex mutants in *Arabidopsis*," the authors explained.

In CRISPR-Cas9 editing, promoters are DNA sequences that regulate Cas9 expression, while NLS' are short amino acid sequences that ensure Cas9 reaches its target site within the nucleus.

Jacobs and colleagues tested up to seven promoters and six NLSs in simplex and multiplex editing experiments. They found that a combination of using Ribosomal protein S5 A (RPS5A) promoter to express

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Cas9, and flanking Cas9 with bipartite NLS, resulted in the most multiplex-edited plants – 99% of plants contained at least 1 knockout mutation, while over 70% had 4–7 mutations.

The study marks the highest multiplex editing efficiency achieved in *Arabidopsis* to date, and the researchers are confident that the optimizations made will likely apply to other CRISPR systems.

Transforming plant biology and enhancing crop development

Knowledge obtained through MGE experiments is facilitating advancements in both basic and applied agricultural research.

As laboratories continue to refine approaches to MGE – boosting its efficiency and ability to fine-tune genetic editing of crops – these technologies carry significant potential for increasing new plant biology discoveries and enhancing our ability to generate resilient crops in the face of global crises.

Technology Networks, 13 June 2024

<https://technologynetworks.com>

Natural olive compound aids weight loss and regulates blood sugar

2024-07-11

A compound that occurs naturally in olives has been found to lower blood sugar levels and ramp up weight loss in rapid time, mimicking the effects of drugs such as diabetes medications liraglutide and metformin. This opens the door for developing safe, natural and affordable treatments for obesity and type 2 diabetes.

"Lifestyle modifications and public health measures have had limited impact on the rising prevalence of obesity, one of the top risk factors for type 2 diabetes," said research lead Dongmin Liu, a professor at Virginia Tech. "Available obesity drugs are ineffective in weight loss maintenance, expensive and/or carry potential long-term safety risks. Our goal was to develop safer, cheaper and more convenient multi-targeting agents that can prevent the occurrence of metabolic disorders and type 2 diabetes."

The team from Virginia Tech set out to target metabolic hormone secretion in the gut, which would have a knock-on effect of regulating metabolic function. Their aim was to find a natural compound that impacted L-cells,

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which secrete glucagon-like peptide-1 (GLP-1) and peptide YY (PYY), two key hormones in hunger satiety, metabolism and blood sugar regulation.

What they found was that elenolic acid triggered the secretion of GLP-1 and PYY in the gut, resulting in a significant reduction in food intake, and it also decreased the expression of agouti-related peptide (agRP) in the brain's hypothalamus. There's a direct link between agRP expression and overeating and weight gain.

"Overall, the study showed that elenolic acid from olives has promising effects on hormone release and metabolic health, particularly in obese and diabetic conditions," said Liu. "The compound seems to mimic the physiological conditions of eating to directly promote gut metabolic hormone secretion, which helps regulate energy balance and metabolic health."

The researchers found that just a week of oral elenolic acid treatment resulted in weight loss and better glucose regulation in obese, diabetic mice, compared to mice that did not receive the compound. After 4-5 weeks, the mice had a mean 10.7% reduction in weight, and their blood sugar levels and insulin sensitivity resembled that of healthy, leaner mice.

Yes, it is a mouse study, but researchers are confident they'll see similar benefits in a human trial.

Elenolic acid is a derivative of the polyphenol oleuropein, which has traditionally been used as an antioxidant supplement to support the immune system and tame free radicals. And while the acid naturally occurs in olive oil and mature olive fruit, the researchers note that its concentration in those sources is most likely too low to deliver these metabolic benefits. The team extracted the acid from existing oleuropein products.

The researchers will now look at just how this compound is absorbed and metabolized in the digestive system, which should pave the way for a human trial.

The findings were presented at NUTRITION 2024, the annual meeting of the American Society for Nutrition, and is based on research published in *Frontiers in Nutrition*.

New Atlas, 11 July 2024

<https://newatlas.com>

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Researchers Discover an Immune Defect in Lupus and a Possible Way To Reverse It

2024-07-11

The autoimmune disease systemic lupus erythematosus — known as lupus — affects more than 1.5 million people in the U.S. It can result in life-threatening damage to multiple organs including the kidneys, brain and heart. The causes of this disease have long been unclear. Existing treatments often fail to control the disease, the study authors said, and have unintended side effects of reducing the immune system's ability to fight infections.

But now, Northwestern Medicine and Brigham and Women's Hospital scientists have discovered a molecular defect that promotes the pathologic immune response in lupus and show that reversing this defect may potentially reverse the disease.

"Up until this point, all therapy for lupus is a blunt instrument. It's broad immunosuppression," said co-corresponding author Dr. Jaehyuk Choi, associate professor of dermatology at Northwestern University Feinberg School of Medicine and a Northwestern Medicine dermatologist. "By identifying a cause for this disease, we have found a potential cure that will not have the side effects of current therapies."

"We've identified a fundamental imbalance in the immune responses that patients with lupus make, and we've defined specific mediators that can correct this imbalance to dampen the pathologic autoimmune response," said co-corresponding author Dr. Deepak Rao, an assistant professor of medicine at Harvard Medical School and a rheumatologist at Brigham and Women's Hospital and co-director of its Center for Cellular Profiling.

In a study published in *Nature* on July 10, the scientists report a new pathway that drives disease in lupus. There are disease-associated changes in multiple molecules in the blood of patients with lupus. Ultimately, these changes lead to insufficient activation of a pathway controlled by the aryl hydrocarbon receptor (AHR), which regulates cells' response to environmental pollutants, bacteria or metabolites, a substance created when the body breaks down food, drugs, chemicals or its own tissue. Insufficient activation of AHR results in too many immune cells that promote the production of disease-causing autoantibodies.

To show this discovery can be leveraged for treatments, the investigators returned the AHR-activating molecules to blood samples from lupus patients. This seemed to reprogram these lupus-causing cells into a type

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of cell that may promote wound healing from the damage caused by this autoimmune disease.

“We found that if we either activate the AHR pathway with small molecule activators or limit the pathologically excessive interferon in the blood, we can reduce the number of these disease-causing cells,” said Choi, also the Jack W. Graffin Professor at Feinberg. “If these effects are durable, this may be a potential cure.”

Choi, Rao and colleagues next want to expand their efforts into developing novel treatments for lupus patients. They are now working to find ways to deliver these molecules safely and effectively to people.

Technology Networks, 11 July 2024

<https://technologynetworks.com>

Can't Sleep? A New Study Found This Solution Was More Powerful Than Melatonin

2024-04-12

February 2022 data from the Journal of the American Medical Association suggested that over the past 20 years, the use of melatonin supplements to support healthy sleep has increased by 478%. If you've turned to this sleep hormone in pill form, you know that when a melatonin supplement does its job, it really helps. But if you've discovered that's not always the case, a brand-new study may have found a more reliable—and even more natural—solution. Earlier this month, Swedish researchers shared their finding that another increasingly popular sleep aid was remarkably effective at triggering the release of melatonin in the body.

In the October 2022 study—which was published in the Journal of Sleep Research—26 men and women were asked to sleep one night with a weighted blanket, then one night without. After measuring the participants' saliva for levels of three hormones (melatonin, oxytocin and cortisol), the study concluded that melatonin levels increased by an impressive 32% when participants slept with a weighted blanket.

Why a melatonin supplement isn't always the best solution

Melatonin is a hormone the brain releases when it's exposed to darkness, assisting in the regulation of your circadian rhythm to help you sleep. But there are factors that affect melatonin production. As examples, one 2012 German study published in Scientific World Journal pointed out that melatonin secretion decreases with age, as well as for many individuals

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who experience illnesses such as dementia, type 2 diabetes, and some cancers.

The blog for Johns Hopkins Medicine also points out that lifestyle patterns can affect the body's melatonin output. Habits like using personal tech products and eating too close to bedtime can also make it more difficult for the body to produce melatonin and fall asleep.

Further, the science behind the efficacy of melatonin is still up for debate. Melatonin supplements are made synthetically. Plus, according to the guidelines from the American Academy of Sleep Medicine and the American College of Physicians—there isn't enough evidence to prove that taking melatonin can benefit chronic insomnia. Some doctors say that your melatonin receptors can desensitize with consistent melatonin use, and research even shows it can even induce depression.

Plus, according to the Sleep Foundation, some melatonin supplements contain less melatonin, or even more (up to 500%), than what the label states. Taking too much melatonin can result in unwanted side effects, such as headaches, changes in blood pressure, drowsiness, or vomiting, or other concerning effects.

How to increase your melatonin naturally

Weighted blankets are known for providing deep pressure simulation, according to the Sleep Foundation. This means the controlled pressure from the weight can help to calm your nervous system, reduce anxiety, and increase sleep quality. That's not to mention, as this study asserts: weighted blankets can even help you fall asleep faster when you're feeling restless at night.

The Sleep Foundation offers additional explanation for why a weighted blanket can support sleep so beautifully: “Weighted blankets are said to work in the same way a tight swaddle helps newborns feel snug and cozy.” One interesting note worth mentioning: the researchers who led the Swedish study suggest that to be effective, the blanket should be around 12% of the individual's body weight. To find the best weighted blanket for you, check out the 6 Best Weighted Blankets According to Amazon Reviews.

The Healthy, 12 April 2024

<https://thehealthy.com>

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Chemists develop robust molecule that gives organic electronic devices a boost

2024-07-11

RIKEN chemists have developed a molecule that enhances the performance of organic electronic devices and is also more stable than previous alternatives, raising the chances that it could be used in industrial manufacturing processes. The study is published in *Advanced Materials*.

Conventional electronic devices are made from hard semiconductors such as silicon, but increasingly organic semiconductor molecules are appearing in devices such as televisions and cell-phone displays that use organic light-emitting diodes (OLEDs).

“Organic electronic devices are strong candidates for thin, light and flexible devices, which are not easily realized using inorganic materials,” explains Kazuo Takimiya of the RIKEN Center for Emergent Matter Science, who led the research.

But organic semiconductors need a helping hand from other molecules, known as dopants, to boost the flow of charge through them. For example, some dopants contain electrons in high-energy levels, which can be readily released into a semiconductor. But existing electron-donating organic dopants tend to be unstable, making them difficult to design, synthesize and handle, says Takimiya.

His team had previously studied derivatives of a molecule called tetraphenyl dipyranylidene, which could readily donate electrons to organic semiconductor materials. Now, by making further tweaks to this molecule, they have improved its stability at high temperatures.

The most promising alteration added nitrogen-based amine groups that push electrons into the molecule’s central region. Theoretical calculations suggested that the resulting molecule, dubbed DP7, has electrons at a sufficiently high energy level. Experiments showed that it is also very stable and can be added to devices by vacuum deposition—one of the most widely used processes in semiconductor manufacturing.

The team incorporated DP7 into several organic electronic devices, including an organic field-effect transistor (OFET) that consisted of a thin film of buckminsterfullerene, or “buckyballs,” on top of a silicon-based substrate. They added ultrathin patches of DP7 to connect the buckminsterfullerene layer to gold electrodes.

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The researchers found that the interface between buckminsterfullerene and DP7 had a much lower electrical resistance than previous variants of the dopant—indeed, it had one of the lowest resistances of any electron-doped OFET reported to date. This will enhance the flow of electrons into the buckminsterfullerene.

Furthermore, the device was stable, showing no degradation after being stored under an inert atmosphere for two weeks.

DP7 is easily made from commercially available chemicals using just two chemical reactions, and Takimiya is optimistic that it could find uses in industry. “For commercial devices, it could be used to improve the conductivity of the electron-transport layer in OLEDs, which are fabricated by vacuum processes.”

The researchers are now searching for other stable dopants that have even greater electron-donating abilities.

Phys Org, 11 July 2024

<https://phys.org>

Moving from the visible to the infrared: Developing high quality nanocrystals

2024-07-09

Awarded the 2023 Nobel Prize in Chemistry, quantum dots have a wide variety of applications ranging from displays and LED lights to chemical reaction catalysis and bioimaging. These semiconductor nanocrystals are so small -- on the order of nanometers -- that their properties, such as color, are size dependent, and they start to exhibit quantum properties. This technology has been really well developed, but only in the visible spectrum, leaving untapped opportunities for technologies in both the ultraviolet and infrared regions of the electromagnetic spectrum.

In new research published in *Nature Synthesis*, University of Illinois at Urbana-Champaign bioengineering professor Andrew Smith and postdoctoral researcher Wonseok Lee have developed mercury selenide (HgSe) and mercury cadmium selenide (HgCdSe) nanocrystals that absorb and emit in the infrared, made from already well-developed, visible spectrum cadmium selenide (CdSe) precursors. The new nanocrystal products retained the desired properties of the parent CdSe nanocrystals, including size, shape and uniformity.

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"This is the first example of infrared quantum dots that are at the same level of quality as the ones that are in the visible spectrum," Smith says.

Although nanocrystal technology has existed for more than 50 years, only nanocrystals that operate in the visible portion of the spectrum have been significantly advanced. Smith explains, "They're a big part of display devices. And a big part of any technology that is light absorbing or light emitting. There's just been an intrinsic push to develop a technology that has the biggest market at the end of the day."

Beyond just the market demand for visible spectrum nanocrystals, chemistry is harder for materials in the infrared, which is longer wavelength and lower energy than light in the visible spectrum. To achieve light absorption and emission in the infrared, heavier elements that are lower on the periodic table need to be used. Chemistry with those elements is more difficult, yielding more unwanted side reactions and less predictable reactions. They are also prone to degradation and are susceptible to ambient changes in the environment, like water.

Quantum dot nanocrystals can be made from elemental semiconductors, like silicon, or they can be binary or ternary. Mixing two elements can yield many different properties, mixing three elements together can yield exponentially more properties. "We have been focusing on this one type of material, a ternary alloy -- mercury cadmium selenide -- because we think it could be the 'perfect' material to make," Smith says. "You could basically get any property you want by changing the ratio of cadmium and mercury atoms. It can span this huge range of the electromagnetic spectrum -- across the entire infrared into the entire visible spectrum -- and get so many properties."

Smith had been trying to make this material since he was in graduate school with no luck, and even in the broader research community, there have been no reports of success, until now. "The way we did it was taking the already perfected, visible ones -- cadmium selenide, which is considered to be the most developed quantum dot -- and used it as a 'sacrificial mold,'" he says.

Replacing the cadmium atoms with mercury atoms instantly shifts everything into the infrared spectrum, with all the desired quality retained: strong light absorption, strong light emission and homogeneity.

To do this, Smith and Lee had to ditch the traditional method of synthesis for nanocrystals, which is to mix the precursor elements together and under the right conditions, they decompose into the desired nanocrystal

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form. As it turns out, there are no conditions that anybody has found to work for mercury, cadmium and selenide.

"Lee developed a new process called interdiffusion enhanced cation exchange," Smith says. "In this process, we add a fourth element, silver, which introduces defects in the material that causes everything to mix together homogeneously. And that solved the whole problem."

While quantum dots have many applications, one application for infrared quantum dots with potential to have the most impact is for use as molecular probes for imaging, where they can be put into biological systems and detected in tissues. Since most quantum dots emit in the visible spectrum, only emission near the surface of the skin can be detected. Biology, however, is fairly transparent in the infrared and therefore deeper tissues can be probed.

Mice are the standard models for most diseases and Smith explains that with quantum dots that emit in the infrared, researchers could see almost entirely through a living rodent to see its physiology and the locations of specific molecules throughout the body. This will allow for better understanding of biological processes and for developing therapeutics without having to sacrifice the mice, potentially changing preclinical drug development.

Andrew Smith is also an affiliate of the Holonyak Micro & Nano Technology laboratory, the Carl R. Woese Institute for Genomic Biology, the department of materials science & engineering, the Cancer Center at Illinois and the Carle Illinois College of Medicine at Illinois.

Wonseok Lee is also an affiliate of the Holonyak Micro & Nano Technology laboratory at Illinois.

Science Daily, 9 July 2024

<https://sciencedaily.com>

New Study: This Hot Beverage May Delay Onset of Alzheimer's Disease

2024-08-03

The Cleveland Clinic and Harvard have praised this drink's healthy perks. Now Italian research indicates that steaming cup you love could help ward off Alzheimer's disease.

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There may be one more reason the Italians are known for staying healthy and active into old age. A new study suggests that one particular daily drink could serve as more than just a caffeine boost—it might also help in fending off Alzheimer's disease.

Alzheimer's disease is a neurodegenerative disorder that World Health Organization data suggests affects 55 million people worldwide, a figure that's prompting intensive scientific investigation into preventative measures including everything from a new Alzheimer's blood test to the diet and lifestyle habits that play a role.

Espresso compounds and tau protein aggregation

The study was published in July 2023 in the *Journal of Agriculture and Chemistry*—a publication of the American Chemical Society—and highlights the role of certain compounds in espresso relating to the aggregation of tau proteins. These proteins, essential for stabilizing structures in the brain, become tangled clusters in Alzheimer's patients. This phenomenon is believed to contribute notably to the disease's progression.

This innovative study, led by biochemist Mariapina D'Onofrio, PhD at the University of Verona in Italy, analyzed the chemical composition of espresso shots, specifically focusing on caffeine and trigonelline (both alkaloids), the flavonoid genistein, and theobromine, a compound also present in chocolate. The research team observed how each of these molecules interacted with a shortened form of tau protein.

The study revealed that as the concentrations of espresso extract, caffeine, or genistein rose, the tau protein fibrils—which are typically associated with the onset of Alzheimer's—became smaller and refrained from developing into larger, potentially harmful structures. The entire espresso extract was found to have the most pronounced effects, suggesting that espresso compounds might interfere with the destructive cycle of the disease.

Brain benefits from coffee

Renowned health institutions, including the Cleveland Clinic, Harvard Health, and the Mayo Clinic, have acknowledged the health benefits linked with moderate coffee consumption. This equates to around three to five standard cups of coffee per day, or 400 milligrams of caffeine. However, these organizations also advise moderation, as excessive intake can trigger anxiety, insomnia, and a rapid heart rate.

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The benefits of regular coffee intake are manifold, and it is becoming increasingly evident that coffee—and espresso in particular—might offer substantial advantages when it comes to the prevention of Alzheimer's disease.

Devon Peart, RD, MHS, BSc, a registered dietitian at the Cleveland Clinic, emphasizes that coffee is more than just a delightful beverage: It's a robust source of beneficial compounds. Among these are B vitamins, potassium, and riboflavin, along with phenolic compounds that assist the body in battling stress and inflammation.

In addition to the compounds that espresso may deliver to fend off tau proteins, another specific benefit of a shot may be the fact that it's often served solo, without indulgent condiments. Even if you're not a fan of a straight shot, Harvard Health's blog advises paying close attention to how you enjoy your coffee. If it's topped with whipped cream and drizzled with flavored syrup, those extra calories, sugar, and saturated fat could offset the potential health benefits of a simple cup of coffee with a little milk...or an espresso shot.

What these findings imply for future research

While these initial findings were in vitro and require further testing in live subjects, they nonetheless provide a hopeful trajectory in the ongoing battle against Alzheimer's. The observed interactions between caffeine, espresso extract, and pre-formed tau fibrils offer an exciting field of research.

This work may eventually lead to discovering or designing other bioactive compounds capable of combating neurodegenerative diseases. The implications of this research suggest that your morning espresso might pack a more potent punch than just the wake-up call you crave.

The Healthy, 3 August 2024

<https://thehealthy.com>

Nanoplastics and 'forever chemicals' shown to disrupt molecular structures and functionality

2024-07-11

Researchers at The University of Texas at El Paso have made significant inroads in understanding how nanoplastics and per- and polyfluoroalkyl substances (PFAS)—commonly known as forever chemicals—disrupt biomolecular structure and function. The work shows that the compounds

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can alter proteins found in human breast milk and infant formulas—potentially causing developmental issues downstream.

Nanoplastics and forever chemicals are manmade compounds present throughout the environment; a series of recent studies have linked them to numerous negative health outcomes. While nanoplastics originate primarily as a result of the degradation of larger plastic materials, like water bottles and food packaging, forever chemicals are found in various products like cookware and clothing.

The UTEP research team focused on the compounds' impact on three proteins critical to human development and function: beta-lactoglobulin, alpha-lactalbumin and myoglobin. Their findings, which provide an atomic-level insight into the detrimental effects of nanoplastics and PFAS on human health, are described in two recent articles in the *Journal of the American Chemical Society* and *ACS Applied Materials and Interfaces*.

"By understanding the molecular mechanisms of how nanoplastics and forever chemicals disrupt cellular functions, scientists can develop safer alternatives to these materials," said Mahesh Narayan, Ph.D., a professor, fellow of the Royal Society of Chemistry and chief of the Division of Biochemistry in UTEP's Department of Chemistry and Biochemistry, who oversaw the two studies. "The insights gained from this research have far-reaching implications."

Narayan said that, most importantly, their research revealed that nanoplastics and PFAS completely "dissolved" a region of proteins known as the alpha helix, converting them into structures called beta sheets.

"We weren't expecting them all to have this similar impact on the alpha helix," Narayan said. "It was a complete coincidence." The team observed that this alteration also occurs in amyloid proteins, which can cause neurodegeneration and neurotoxic outcomes if the synthetic chemicals reach the brain.

Milk protein: Beta-Lactoglobulin (BLG)

BLG is a protein found in the milk of sheep and cows and is commonly used as an ingredient in infant formula. The protein binds to retinol (vitamin A) and fatty acids and is crucial for vision and brain development in infants.

The research team discovered that the binding efficiency of BLG to retinol and fatty acids decreases upon exposure to nanoplastics and PFAS. This decrease, modeled by Lela Vukovic, Ph.D., associate professor in

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the Department of Chemistry and Biochemistry, can lead to significant developmental issues in neonatal infants, the team said.

Additionally, for the first time ever, the team observed that PFAS binds to the milk protein, turning it into a carrier for these compounds.

Human breast milk: Alpha-Lactalbumin

Alpha-lactalbumin is found in human breast milk, participates in lactose synthesis and is ingested by infants to help meet nutritional needs. UTEP researchers found that nanoplastics and PFAS corrupt the structure of alpha-lactalbumin protein, thereby potentially compromising lactose formation. The team said the disruption can lead to downstream developmental defects in neonatal infants, such as compromised immunity and reduced mineral absorption.

Oxygen storage: Myoglobin

Myoglobin, found in the blood and muscle tissue of most mammals, is crucial for storing oxygen. The UTEP research team found that nanoplastics and PFAS compromise the functionality of the myoglobin protein, disrupting its ability to store oxygen. This disruption could lead to health issues such as breathlessness and anemia.

Additional experiments by the team demonstrated that exposure to nanoplastics impairs locomotion in worms, with effects comparable to paraquat—an herbicide that has been tied to causing Parkinson's disease.

"This work has the potential to significantly impact public health and environmental policies, highlighting the vital role of scientific research in addressing global challenges," said Robert Kirken, Ph.D., dean of the College of Science.

"I am proud of the groundbreaking research conducted by Dr. Narayan, Dr. Vukovic and their teams. Their innovative approach to understanding how these manmade materials disrupt biomolecular functions is a prime example of the transformative work UTEP researchers do on a regular basis."

Narayan and his research team plan to continue their studies and investigate the effects of other plastics and PFAS compounds.

Phys Org, 11 July 2024

<https://phys.org>

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Zinc–air batteries created from paper industry waste

2024-07-11

A team of researchers has shown that paper industry waste can be transformed into a zinc–air battery.¹ The battery, created from cellulose and lignin, exhibited a high power density and a wide operating temperature, while avoiding the longstanding issue of dendrite growth.

Zinc–air batteries are popular due to their low cost and high energy density. They are environmentally friendly and have a good safety profile, carrying none of the thermal runaway risks associated with lithium-ion batteries. These benefits facilitate their use in wearable electronics, such as hearing aids.

The wood-based battery created by Lei Zhang of Qilu University of Technology in China and colleagues uses an iron cluster single atom catalyst as the air cathode and lignin from pulping black liquor as the carbon source. The study states that the single atom catalyst displays exceptional oxygen reduction reaction performance and the specific surface area exceeds that of most reported iron-based single atom catalysts. In contrast, traditional transition metal-based single atom catalysts often suffer from slow electron transfer during the oxygen reduction and oxygen evolution reactions.

The battery also contains a polyvinyl alcohol organohydrogel solid state electrolyte reinforced with cationic nanocellulose from pulped wood. Compared to conventional aqueous or alkaline hydrogel electrolytes, this cellulose-reinforced electrolyte showed improved flexibility and mechanical strength in addition to increased water retention capacity and ionic conductivity, which ensures continued stability and function. Moreover, conventional aqueous or alkaline hydrogel electrolytes exhibit poor electrolyte interface stability and dendrite growth, hindering long-term battery function. Functionalised solid-state electrolytes, such as this, can prevent zinc dendrite growth and improve the operational temperature range of the battery.

The study reports that the battery demonstrates ‘high power density and remarkable cycling stability’ over a wide temperature range (–60°C to 50°C). And that it surpasses most reported Zn–air batteries, highlighting their potential for clean energy storage and conversion applications.

‘What [they did] here is solve problems [...] related to lithium–air rechargeable batteries,’ says Thomas Gregory, a battery expert and consultant at Borealis Technology Solutions, US. ‘One being the need

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for a low cost, high functioning electric catalyst for the air electrode. The other one being an electrolyte which resists dendrite penetration and suppresses dendrite growth at the zinc electrode. Those have been longstanding issues... and what [they have done] is address that using relatively low cost, abundant components.’

Beyond wearable electronics, there is a growing interest in using zinc–air batteries for larger scale energy storage, especially in more challenging environments. However, this is a small-scale study using a single source of wood, specifically eucalyptus. ‘How does this technology behave in a larger format?’ asks Gregory. ‘If they used a different wood species from a different source, would they behave the same electrochemically?’ These questions must be answered to enable larger scale applications and increase the pool of sustainable materials in the future.

Chemistry World, 11 July 2024

<https://chemistryworld.com>**Revealing Hidden Catalysts: Scientists Uncover Atomic-Scale Insights Into Zeolites**

2024-07-10

Researchers at the Dalian Institute of Chemical Physics have advanced the analysis of zeolites using innovative ¹⁷O solid-state NMR techniques, revealing the intricate structures of hydroxyl groups and improving our understanding of their catalytic properties. This breakthrough could have wider applications in analyzing other complex materials.

Zeolites are extensively employed across various industries, yet the complete comprehension of their intrinsic catalytic properties remains elusive, largely due to the complexity of hydroxyl-aluminum moieties.

Atomic-scale analysis of local environments for the hydroxyl species is essential for revealing the intrinsic catalytic activity of zeolites and guiding the design of high-performance catalysts. However, many unfavorable factors prohibit the elucidation of their fine structures such as low quantity, meta-stable property, structural similarity, hydrogen-bonding environment, and long-range disordered nature.

Recently, a research team led by Prof. Hou Guangjin and Prof. Chen Kuizhi from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences (CAS) unraveled the precise structure of complex hydroxyl groups in zeolites with a comprehensive set of self-developed

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coupling-edited 1H-17O solid-state nuclear magnetic resonance (NMR) methods. The study was published in the Journal of the American Chemical Society.

Advancements in 17O Solid-State NMR

The 17O solid-state NMR would be a candidate to improve the analytical precision of zeolites if it could overcome the technical difficulties related to the extremely low natural abundance, low gyromagnetic ratio, and quadrupolar nature of the 17O isotope. Therefore, researchers employed a novel 17O-enrichment method and developed a series of 17O-NMR-based spectral editing pulse sequences, allowing them to improve the spectral resolution and address the subtle protonic structures within zeolites.

The precise and high-resolution species identification was attributed to comprehensively addressing an often-neglected and undesired NMR interaction, namely, the 2nd-order quadrupolar-dipolar cross-term interaction (2nd-QD interaction), which was indeed helpful in gaining invaluable information on zeolite structures.

Besides, researchers quantitatively probed Al...H, O...H proximities within both one-bond and multi-bond ranges, and semi-quantitatively realized the dissociation rates of hydroxyl protons such as Brønsted acid site. They revealed the atomic-scale local environment of the catalytically important Al-OH and Si-OH moieties.

The NMR techniques developed in this study might be further applied in providing high-resolution analysis of subtle protonic structures in other circumstances such as metal-oxide surfaces, metal-organic frameworks, and biomaterials. "Our study may provide a generic strategy for high-resolution analysis of the subtle protonic structures in zeolites with 17O solid-state NMR," said Prof. Hou.

Sci Tech Daily, 10 July 2024

<https://scitechdaily.com>

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Why Do Some Clothes Get Smellier Than Others?

2024-06-26

Ever noticed that a polyester T-shirt is smellier than a cotton one after you work out? New University of Alberta research now shows why.

Analysis of various fibres soaked in a solution of simulated sweat showed that cotton and viscose, which are cellulosic, or plant-derived fibres, absorbed — and consequently released — smaller amounts of odour-causing compounds than polyester, nylon and wool.

The key finding from the study explains why some commonly worn fibres are smellier than others when people sweat, says Rachel McQueen, a clothing and textiles scientist in the Faculty of Agricultural, Life & Environmental Sciences who conducted the research with colleagues from the University of Otago in New Zealand.

"Although we know that polyester is smellier after being worn next to sweaty armpits compared to cotton T-shirts, we don't really know why. Now we have a better understanding of how odorants transfer and are selectively absorbed by various fibre types in sweat."

The study's method of using simulated liquid sweat also offers an important fresh approach to exploring the issue, she notes.

"Body odours commonly transfer to clothing through liquid sweat, but investigation of odour retention in textiles often neglects this route of exposure in test procedures," McQueen says, noting that standard scientific methods include examining only how the odour passes through the air to the textile. "If you had a sweaty armpit that never actually touched the shirt you're wearing, then the fabric wouldn't get very smelly.

"By studying the transfer of odorants to fabrics using a liquid sweat solution, we were able to give a more realistic insight into how these smell compounds really get into our clothes."

In the study, the researchers soaked the fibres in the sweat solution for different periods of time, then examined the release of various odour-causing compounds from those fibres using analytical equipment that can detect odorants in the air in real time — more like the human nose does.

Overall, the study showed that the cellulosic fibres took in lesser amounts of the compounds when transferred through the sweat solution than textiles made of wool, nylon and polyester fibres, which conversely, initially released higher amounts of the smelly compounds.

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Sweat, which is mostly made up of water, also has oily compounds that bacteria transform to form odours, McQueen explains. "These oily compounds and odorants in the watery sweat can interact differently with textiles, depending on the fibre chemistry."

"While water-loving cellulosic fibres such as cotton and viscose absorb more of the water from sweat than polyester does, polyester doesn't want to absorb the water," McQueen notes. "It's more oil-loving, and it absorbs more of the odorants, which don't dissolve in water, and more of the oily compounds, which could also later break down and become smelly."

The results of the study help explain why clothing made of cellulosic fibres tends to be less smelly than synthetic clothing after being worn.

The research also showed that although nylon and wool initially took in a lot of the odorants from the sweat, they dissipated them more quickly than polyester. After 24 hours, wool and nylon had much lower intensities of the odorants and were more similar to the cellulosic fibres.

"That tells us that while polyester still needs to be washed, for nylon and wool garments, people might be able to freshen them by just airing them out rather than laundering every time."

Knowing more about why sweat makes some fibres stinkier can help consumers make more informed choices when shopping for their clothing, she says.

"This matters for not just exercise clothing, but for our day-to-day wear," she adds, noting that most of it is fast fashion containing polyester.

"Basically, if you're concerned about smelly clothes, then keep away from polyester. Even with some of the anti-odour claims on some clothing labels, you might want to be cautious. If the anti-odour property is due to an antimicrobial, it may not be as effective as you think, because there's another mechanism in play, which is all about the fibre chemistry and the interaction with odorants."

The study's findings could potentially also be useful for textile scientists and manufacturers, perhaps in developing polyester to be more water-loving and less attracted to oily compounds, she adds.

Technology Networks, 9 July 2024

<https://technologynetworks.com>

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Recall of 7 Major Shampoo Brands in 43 States Warns of Toxin Risk

2024-07-09

What did we do before dry shampoo, especially in the heat of summer? A few spritzes save time when your wash is still relatively fresh, and act as a lifesaver when you simply don't have time to re-style.

However, research has identified dangers from dry shampoo—and a new alert hint at how important it is to consider what's inside that aerosol can.

On July 1, the United States Food and Drug Administration (FDA) published an update to a major hair care manufacturer's recall of 19 dry shampoo aerosol products. The recall by Unilever was originally initiated in October 2022 to include products from the brands Dove, Nexxus, Suave, TIGI (Bed Head and Rockaholic) and TRESemmé, which had been produced as early as in October 2021. According to a press release from the U.S. Food and Drug Administration (FDA), the shampoos were recalled "because testing of the product showed low levels of Benzene." At that time, the FDA referred to the reason for the recall announcement as "product safety/unapproved ingredient."

Benzene has been classified as a human carcinogen, as the National Cancer Institute has noted the chemical can lead to cancers such as leukemia and "other blood disorders." Benzene also happens to be an ingredient in gasoline, according to the CDC.

As part of the original recall, Unilever said an internal investigation had identified the propellant as the source of the benzene. (Propellants in cosmetics and food products such as cooking sprays are often notorious nuisances concerning chemical exposure.)

The FDA's update suggests the total recalled products were 1,559,190 cases of Dove, Nexxus, TRESemmé and Suave, plus 559,844 units of the two TIGI brands.

The recalled products are as follows:

- Dove Dry Shampoo Volume and Fullness: 1.15 oz, 5 oz and 7.3 oz cans
- Dove Dry Shampoo Fresh Coconut: 1.15 oz, 5 oz and 7.3 oz cans
- Dove Dry Shampoo Fresh and Floral: 5 oz cans
- Dove Dry Shampoo Ultra Clean: 5 oz cans
- Dove Dry Shampoo Invisible: 5 oz cans
- Dove Dry Shampoo Detox and Purify: 5 oz cans

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- Dove Dry Shampoo Clarifying Charcoal: 5 oz cans
- Dove Dry Shampoo Go Active: 5 oz cans
- Nexxus Dry Shampoo Refreshing Mist: 5 oz cans
- Nexxus Inergy Foam Shampoo: 6.7 oz cans
- Suave Dry Shampoo Hair Refresher: 5 oz cans
- Suave Professionals Dry Shampoo Refresh and Revive: 4.3 oz cans
- TRESemmé Dry Shampoo Volumizing: 1.15 oz, 5 oz and 7.3 oz cans
- TRESemmé Dry Shampoo Fresh and Clean: 5 oz and 7.3 oz cans
- TRESemmé Pro Pure Dry Shampoo: 5 oz cans
- Bed Head Oh Bee Hive Dry Shampoo: 5 oz cans
- Bed Head Oh Bee Hive Volumizing Dry Shampoo: 5 oz cans
- Bed Head Dirty Secret Dry Shampoo: 2.1 oz cans
- Bed Head Rockaholic Dirty Secret Dry Shampoo: 2.5 oz cans

If you own any of these dry shampoos, you can check their UPC and lot code against the list of recalled products to see whether they were included.

The products were distributed to 43 states: Alaska, Alabama, Arkansas, Arizona, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Iowa, Idaho, Illinois, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Massachusetts, Maryland, Maine, Michigan, Minnesota, Missouri, Montana, North Carolina, Nebraska, New Hampshire, New Jersey, Nevada, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, Vermont, Washington and Wisconsin. It appears the recall also affected products distributed into Anguilla.

In June 2024, the FDA categorized this recall as Class II.

Though the FDA reports an independent health hazard evaluation found that daily exposure to the level of benzene in the affected products would likely not cause health complications, Unilever recalled them out of an “abundance of caution.” According to the FDA, Unilever had received “no reports of adverse events” at the time of the original recall.

If you have any of the recalled products, you can visit [UnileverRecall.com](https://www.unileverrecall.com) for instructions on how to get a refund. You can also contact Unilever by calling (877) 270-7412 on Monday through Friday, between 8:30 a.m. and 9 p.m. EST.

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It's an important reminder to shop clean beauty. And if you're passionate about narrowing down your purchase of cruelty-free products, consider shopping apps like Cruelty Cutter.

The Healthy, 9 July 2024

<https://thehealthy.com>

Faster charge transfer mechanism could lead to better energy conversion devices

2024-07-09

Solar has emerged in recent years as the fastest growing renewable energy source in the United States, spurred in part by great improvements in technology that help turn light from the sun into electricity more efficiently.

But there is also a push to use light to do chemistry.

Like electricity, chemicals are vital to everyday life, and it takes a huge amount of energy, generally from non-renewable sources, to convert chemicals into the consumer and industrial products we need, like gases, plastics, paints, pharmaceuticals and so much more.

The chemicals and petrochemicals industries account for about 40% of all industrial energy use and emissions in the U.S., according to the 2022 U.S. Department of Energy Industrial Decarbonization Roadmap.

“A huge amount of energy is spent doing high temperature and high-pressure chemical reactions so that we can get things that we use in our everyday life. So, one of the big picture pursuits of all chemistry right now is trying to figure out a way to do chemistry using light, especially something like sunlight, because that's free,” said Christy Landes, professor of chemistry at the University of Illinois Urbana-Champaign.

Landes is part of an Illinois research team that has been working in collaboration with researchers at other institutions on this “big picture pursuit.” And their efforts have now revealed a different mechanism of charge transfer that is not only much faster than the traditional mechanism but also doubles the total charge transfer efficiency.

In their recently published paper in *Science Advances*, the Illinois researchers and their collaborators detail the study of this mechanism, which takes advantage of special properties of plasmonic gold particles—

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1/1000th the width of a human hair—to transfer charge to a connecting semiconductor of titanium oxide shells.

The researchers identified how the gold nanoparticles transfer charge to a connecting semiconductor and quantified how much charge is transferred using different colors of light.

The work is important, because plasmonic nanoparticles integrated with a semiconductor could improve the efficiency of light-harvesting technology to generate currents or drive chemical reactions.

“Our results reveal how to design better devices that can use these special properties of the metal particles to convert light energy into electrical or chemical energy,” said chemistry postdoctoral research associate and co-first author Stephen A. Lee.

Gold nanoparticles absorb a lot of light compared to other particles of the same size and gold is a material that creates collective electronic oscillations when light couples with their surface plasmons. So, the researchers theorized that by exciting the plasmon with light, they would get a boost in charge transfer to the semiconductor material. And their study confirmed their theory.

The researchers report “an overall electron transfer efficiency of $44 \pm 3\%$ from gold nanorods to titanium oxide shells when excited on resonance” and half of that “originates from direct interfacial charge transfer mediated specifically by exciting the plasmon.”

Stephan Link, professor of chemistry at Illinois and co-lead author on the paper, said that’s really what this work is all about, trying to understand the role of the plasmon in charge transfer.

“Is it just a great absorber or does it also help make the charge separated state? And we find out that it does have an additional impact, or boost. That really is what’s significant in our work,” Link said. “This confirmed our hypothesis that when we excite the plasmon, we’re going to get this boost.”

At nanoparticle size, gold has a variety of other properties, like tunable color and the ability to drive reactions. The researchers found that the gold particles have much higher charge transfer when they were absorbing a color of light that matched the color of the particles.

“At the plasmon, it absorbs light more strongly, and what we found is that when we do this as a function of color, we see that that the plasmon gives

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us an extra boost,” Link said. “At the plasmon, we’re kicking in this extra channel.”

Lee compared the channel to a short-cut path to the charge separated state. But gold, like any metal, begins to heat when it absorbs light, and heat can outcompete the short cut.

“So, we’re trying to cut out that heating channel that we don’t want. Heat can be good for other things, but for what we want to do, we don’t want the heat and the plasmon helps us get around the heating,” Link said.

“The question is, can we intercept before it gets to heating, and the pathways that we described in this paper give one avenue of how to intercept before and get to the charge separated state.”

This direct plasmon-induced charge transfer, the researchers explain in their study, is like a long-neglected process known as chemical interface damping of plasmons, a theory put forth in the 1990s.

Landes said this is one part of the study that was so exciting that this old theory was actually very good. Link said more scientists are realizing that this chemical interface damping described in the 90s “as an effect is important in the field of plasmonics and plasmonic photocatalysis.

“This work now for the first time puts complementary techniques together to really understand what chemical interface damping is,” said Link, who emphasized that a novel aspect of their study is the variety of different techniques—specifically three different imaging and spectroscopy strategies—that they used to confirm their results.

“This is only possible because we really approached this from many different angles as a team with several different techniques within the center led by Christy,” Link said.

Phys Org, 9 July 2024

<https://phys.org>

Daily Multivitamins Do Not Lower Risk of Death in Healthy Adults, Study Finds

2024-06-29

A recent study, led by the National Institute of Health’s (NIH) National Cancer Institute, has investigated the association between taking multivitamins daily and mortality risk, finding there was not a lower risk

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of death among healthy adults. The research, published in JAMA Network Open, analyzed over two decades of data.

Multivitamin use is very common

In the United States, nearly one in three adults take multivitamins, with the hope of maintaining and improving health as well as preventing disease. Although multivitamin use is common, one study found only 23% of all supplements consumed were recommended by a healthcare provider.

Research into the benefits and potential risks of multivitamin supplements has produced mixed results. Observational studies are often limited by heterogeneity and confounding factors, such as the healthy user effect, where individuals who take vitamins are more likely to engage in overall healthy lifestyle behaviors. A study in 2022 analyzed data on multivitamin use and all-cause mortality from randomized clinical trials, which found insufficient evidence for determining benefits or harms. However, this may be due to limited follow-up time and lack of external validity.

Using large cohorts and longitudinal studies is therefore crucial for understanding the long-term effects of multivitamin use.

Insights from two decades of data

To this end, the new NIH study analyzed dietary data from three large and geographically diverse studies, with a sample size of over 390,000 US adults who were followed for over 20 years. Participants were deemed healthy with no history of cancer or other chronic diseases. The researchers examined the link between multivitamin use and the primary causes of chronic disease-related deaths, such as cardiovascular disease and cancer. They used repeated assessments of multivitamin use and extended follow-up periods to track mortality causes.

The analysis revealed daily multivitamin use was not associated with a decreased risk of mortality from any cause. Factors such as race, ethnicity, education and diet quality were also considered, but did not impact the results.

Multivitamin use and other health conditions

Although the researchers did not find evidence to suggest multivitamin use reduces mortality risk, they also stated in their paper that they “cannot preclude the possibility that daily multivitamin use may be associated with other health outcomes related to aging.”

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Further studies may be needed to investigate multivitamin use and the risk of death in other populations, which may be impacted by nutritional deficiencies, and their effect on other health conditions.

Technology Networks, 29 June 2024

<https://technologynetworks.com>

New hemp reference material will help ensure accurate cannabis measurements

2024-07-09

The National Institute of Standards and Technology (NIST) is now selling a hemp reference material that will help laboratories accurately measure key components in cannabis plant products. This will help law enforcement agencies accurately distinguish between hemp and marijuana and will help manufacturers and regulatory agencies ensure that cannabis products are safe and accurately labeled.

Hemp and marijuana both come from the Cannabis plant. Before 2018, all cannabis plant material or products were controlled substances under federal law. The 2018 Farm Bill legalized hemp, which it defined as any cannabis material with 0.3% total THC or less. Cannabis with more than that amount of total THC is considered marijuana and is still a controlled substance under federal law.

This means that, to determine whether a material is a controlled substance, labs now have to measure the amount of total THC in it. However, recent studies, including one by NIST researchers, have found that THC measurements as shown on product labels are not consistently reliable, causing potentially serious safety and regulatory challenges.

The new hemp material from NIST will help address this issue by serving as a reference material—that is, a material that labs use to ensure the accuracy of their measurements.

The NIST Hemp Plant Reference Material (RM 8210) comes with an information sheet listing the precise amounts of total THC, CBD (a nonintoxicating compound with purported health benefits) and several toxic elements sometimes found in agricultural products, along with uncertainty estimates for each.

To ensure that their measurement methods are working properly, labs can analyze a bit of this material. If their numbers match those from NIST to

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within an accepted margin of error, all is well. If not, they'll know they need to recalibrate their instruments or otherwise troubleshoot their methods.

"A farmer's crop or a company's product can be seized or potentially destroyed if it turns out to be a 'hot' material, so it's important to make the correct determination," said Walter Brent Wilson, one of the NIST chemists who developed the new reference material. Hemp, grown as an agricultural crop, is often used to manufacture textiles, paper and food products.

Although this reference material is composed of hemp, labs can use it to validate their measurements of both hemp and marijuana, and it will help companies in the fast-growing cannabis industry and state regulators ensure that cannabis products are safe and accurately labeled.

"If you buy a product that claims to have 25 milligrams of CBD per dose, you should be able to trust that number," said NIST biologist Colleen Bryan, who was also on the team that developed the reference material.

The NIST material also includes measurements for arsenic, lead, mercury, cadmium and other toxic elements that many agricultural products get tested for.

"People who use cannabis for medical reasons may be particularly concerned about safety," Bryan said. "This reference material will help ensure that the cannabis they buy does not contain unsafe levels of toxic elements."

The NIST hemp reference material will also include measurements for moisture content. This is important because it will help labs accurately report the amounts of THC and other substances on a dry-weight basis, which is how most regulatory limits are defined.

Finally, the new material from NIST will help researchers who study the health and other effects of cannabis to accurately measure the dosages used in their studies. This will allow researchers to compare results across studies more easily.

Laboratories use reference materials all the time. NIST produces more than a thousand of them.

Reference materials such as peanut butter, spinach and infant formula are used to ensure food safety and accurate nutrition labels. You can trust the results of your blood test because of NIST reference materials

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such as cholesterol, glucose and vitamin D. Environmental contaminants, atmospheric gases, construction materials—the list goes on and on.

NIST's hemp reference material was made from commercially purchased dried hemp. To make it, NIST researchers ground the hemp, sieved it to achieve a consistent particle size, blended a bit of lower-THC material into it to achieve a total THC concentration just below the legal threshold, and measured the amounts of the various components to a very high degree of accuracy and precision. Finally, NIST statisticians analyzed the measurement results to estimate the uncertainty values for each measurement.

Each unit of the material contains three packets with 1.5 grams each of ground hemp—some of the most carefully quantified cannabis ever sold.

Provided by National Institute of Standards and Technology

Phys Org, 9 July 2024

<https://phys.org>

Zinc-air batteries created from paper industry waste

2024-07-11

A team of researchers has shown that paper industry waste can be transformed into a zinc-air battery.¹ The battery, created from cellulose and lignin, exhibited a high power density and a wide operating temperature, while avoiding the longstanding issue of dendrite growth.

Zinc-air batteries are popular due to their low cost and high energy density. They are environmentally friendly and have a good safety profile, carrying none of the thermal runaway risks associated with lithium-ion batteries. These benefits facilitate their use in wearable electronics, such as hearing aids.

The wood-based battery created by Lei Zhang of Qilu University of Technology in China and colleagues uses an iron cluster single atom catalyst as the air cathode and lignin from pulping black liquor as the carbon source. The study states that the single atom catalyst displays exceptional oxygen reduction reaction performance and the specific surface area exceeds that of most reported iron-based single atom catalysts. In contrast, traditional transition metal-based single atom catalysts often suffer from slow electron transfer during the oxygen reduction and oxygen evolution reactions.

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The battery also contains a polyvinyl alcohol organohydrogel solid state electrolyte reinforced with cationic nanocellulose from pulped wood. Compared to conventional aqueous or alkaline hydrogel electrolytes, this cellulose-reinforced electrolyte showed improved flexibility and mechanical strength in addition to increased water retention capacity and ionic conductivity, which ensures continued stability and function. Moreover, conventional aqueous or alkaline hydrogel electrolytes exhibit poor electrolyte interface stability and dendrite growth, hindering long-term battery function. Functionalised solid-state electrolytes, such as this, can prevent zinc dendrite growth and improve the operational temperature range of the battery.

The study reports that the battery demonstrates 'high power density and remarkable cycling stability' over a wide temperature range (-60°C to 50°C). And that it surpasses most reported Zn-air batteries, highlighting their potential for clean energy storage and conversion applications.

'What [they did] here is solve problems [...] related to lithium-air rechargeable batteries,' says Thomas Gregory, a battery expert and consultant at Borealis Technology Solutions, US. 'One being the need for a low cost, high functioning electric catalyst for the air electrode. The other one being an electrolyte which resists dendrite penetration and suppresses dendrite growth at the zinc electrode. Those have been longstanding issues... and what [they have done] is address that using relatively low cost, abundant components.'

Beyond wearable electronics, there is a growing interest in using zinc-air batteries for larger scale energy storage, especially in more challenging environments. However, this is a small-scale study using a single source of wood, specifically eucalyptus. 'How does this technology behave in a larger format?' asks Gregory. 'If they used a different wood species from a different source, would they behave the same electrochemically?' These questions must be answered to enable larger scale applications and increase the pool of sustainable materials in the future.

Chemistry World, 11 July 2024

<https://chemistryworld.com>

Landfills belch toxic 'forever chemicals' into the air

2024-07-11

What's dumped into a landfill is supposed to stay there, but a new study finds that toxic "forever chemicals" are wafting from the waste into the air.

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Per- and polyfluoroalkyl substances, or PFAS, have been detected in the gas exuded by some Florida landfills in quantities comparable to or even greater than in the liquids that seep from the waste, researchers report June 26 in *Environmental Science & Technology Letters*. These chemicals have been linked to cancer, weakened immune systems, developmental problems in children and a tide of other harmful health effects.

The discrepancy between landfill liquid and gas is significant because compared with the systems that collect runoff, or leachate, the systems that collect gas "are nowhere near as efficient," says environmental engineer Ashley Lin of the University of Florida in Gainesville. Moreover, the portion of gas that is captured onsite is not typically treated in ways intended to destroy PFAS, she says. "The real concern is with how we manage this really concentrated gas that we're pulling off."

PFAS molecules contain resilient links of carbon and fluorine atoms, which contribute to their resistance to heat, grease and water resistance as well as to their widespread use in consumer products such as raincoats, cosmetics and nonstick cookware. But those bonds also cause PFAS to linger in the environment, with some forms taking more than 1,000 years to degrade.

Unsurprisingly, researchers have found that these forever chemicals gather within most if not all U.S. landfills and their leachates. For instance, a 2023 EPA report indicated that leachates from more than 95 percent of 200 landfills across the country contained PFAS, identifying 63 different types of PFAS across the sites. But few studies have investigated what types and quantities of PFAS are escaping into landfill gas.

For the new study, Lin and her colleagues sampled and analyzed gas from three municipal solid waste sites. Of the 27 types of PFAS they checked for, 13 were detected, with combined concentrations of up to 210 to 940 parts per trillion. A single class of PFAS that typically exists in the gas state, called fluorotelomer alcohols, dominated the PFAS in the samples, reaching concentrations that were somewhat comparable to those in fumes from soil near a PFAS manufacturing facility, the researchers note.

The team also sampled leachate from each landfill. But since those samples harbored different types of PFAS than the gas, the researchers compared how much of a common PFAS building block — fluorine — the leachate and gas samples contained. They found that comparable amounts of fluorine from PFAS were being released from the waste into leachate and gas, and at one site roughly three times as much was escaping into the gas.

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A landfill's location, the time of year and different detection methods can all affect how much PFAS is found in gas and leachate samples, says environmental chemist Florentino De la Cruz, who was not involved with the study. More data will be necessary to complete the picture nationwide, and a national sampling campaign funded by the U.S. Environmental Protection Agency is currently underway, says De la Cruz, of the University of North Florida in Jacksonville.

But it's clear that landfill gas carries forever chemicals, he adds. "That is no longer debatable."

Lin says that questions also remain regarding the fate of the emitted PFAS. Captured landfill gas is often burned off in the flames of beaconlike gas flares, but it remains unknown whether that process destroys PFAS.

As for PFAS-laden gas that escapes a landfill, "you've got an air release that gets diluted really, really fast," says civil and environmental engineer Morton Barlaz. "I think the levels are so low that it's not likely to be causing a [health] impact." Still, he says, it's too early to say for sure.

Research shows that household products can also release PFAS that concentrate within indoor dust, says Barlaz, of North Carolina State University in Raleigh. "If I think about a house a half mile, a mile from a landfill, I'm more worried about dust and whether they have old carpet and old couches that were treated with PFAS," he says. "My goodness, that's in their house."

Science News, 11 July 2024

<https://sciencenews.org>

"Forever Chemicals" Can Penetrate Human Skin

2024-06-24

New research, published in *Environment International*, proves for the first time that a wide range of PFAS (perfluoroalkyl substances) – chemicals which do not break down in nature – can permeate the skin barrier and reach the body's bloodstream.

PFAS are used widely in industries and consumer products from waterproof clothing and school uniforms to personal care products because of their water and stain repellent properties. While some substances have been banned by government regulation, others are still widely used and their toxic effects have not yet been fully investigated.

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PFAS are already known to enter the body through other routes, for example being breathed in or ingested via food or drinking water, and they are known to cause adverse health effects such as a lowered immune response to vaccination, impaired liver function and decreased birth weight.

It has commonly been thought that PFAS are unable to breach the skin barrier, although recent studies have shown links between the use of personal care products and PFAS concentrations in human blood and breast milk. The new study is the most comprehensive assessment yet undertaken of the absorption of PFAS into human skin and confirms that most of them can enter the body via this route.

Lead author of the study, Dr Oddný Ragnarsdóttir carried out the research while studying for her PhD at the University of Birmingham. She explained: "The ability of these chemicals to be absorbed through skin has previously been dismissed because the molecules are ionised. The electrical charge that gives them the ability to repel water and stains was thought to also make them incapable of crossing the skin membrane.

"Our research shows that this theory does not always hold true and that, in fact, uptake through the skin could be a significant source of exposure to these harmful chemicals."

The researchers investigated 17 different PFAS. The compounds selected were among those most widely used, and most widely studied for their toxic effects and other ways through which humans might be exposed to them. Most significantly, they correspond to chemicals regulated by the EU's Drinking Water Directive.

In their experiments the team used 3D human skin equivalent models – multilayered laboratory grown tissues that mimic the properties of normal human skin, meaning the study could be carried out without using any animals. They applied samples of each chemical to measure what proportions were absorbed, unabsorbed, or retained within the models.

Of the 17 PFAS tested, the team found 15 substances showed substantial dermal absorption – at least 5% of the exposure dose. At the exposure doses examined, absorption into the bloodstream of the most regulated PFAS (perfluoro octanoic acid (PFOA)) was 13.5% with a further 38% of the applied dose retained within the skin for potential longer-term uptake into the circulation.

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The amount absorbed seemed to correlate with the length of the carbon chain within the molecule. Substances with longer carbon chains showed lower levels of absorption, while compounds with shorter chains that were introduced to replace longer carbon chain PFAS like PFOA, were more easily absorbed. Absorption of perfluoro pentanoic acid for example was four times that of PFOA at 59%.

Study co-author, Dr Mohamed Abdallah, said “our study provides first insight into significance of the dermal route as pathway of exposure to a wide range of forever chemicals. Given the large number of existing PFAS, it is important that future studies aim to assess the risk of broad ranges of these toxic chemicals, rather than focusing on one chemical at a time.”

Study co-author, Professor Stuart Harrad, of the University of Birmingham’s School of Geography, Earth and Environmental Sciences, added: “This study helps us to understand how important exposure to these chemicals via the skin might be and also which chemical structures might be most easily absorbed. This is important because we see a shift in industry towards chemicals with shorter chain lengths because these are believed to be less toxic – however the trade-off might be that we absorb more of them, so we need to know more about the risks involved.”

Technology Networks, 24 June 2024

<https://technologynetworks.com>

Better mixing leads to faster reactions for key chemicals

2024-07-11

Pouring cream into coffee creates a show of eddies that rivals Jupiter’s roiling storms. But one clank of the spoon collapses all that black and tan chaos into a smooth, uniform brown. It turns out there’s a lot to that mixing. For one thing, industries rely on robust mixing processes to make all kinds of material goods—virtually everything one might touch from the seat of an office chair, for example.

But lots of industrial processes that include mixing also include forcing fluids through a bed of packed grains, less like stirring a cup of coffee and more like brewing espresso. Plastics and chemical manufacturing rely on this approach, as do some forms of carbon capture and environmental remediation.

The trouble is, mixing of the kind found in coffee mugs needs a relatively large volume where turbulence can chaotically stretch one fluid apart and allow it to combine with the other.

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The geometry of the grains in a packed bed, like the tamped grounds in an espresso machine, maximizes surface contact to drive important chemical reactions, but the tiny spaces between the grains, called pores, don’t offer enough volume for turbulence, making mixing fluids much more difficult.

Now Princeton Engineering researchers have found a way to mimic turbulent mixing in porous environments by loading one of the liquids with springy polymers that stretch and recoil at microscopic scales. That spring action, tuned right, turns each pore into a mug-like volume where rapid mixing can occur, according to the researchers.

Mixing is a key factor in determining the rates of the chemical reactions that produce many important products. Ultimately, the researchers said, the new technique speeds reaction rates by as much as a factor of 10.

The study, published July 9 in the Proceedings of the National Academy of Sciences, was led by Christopher Browne, a graduate alumnus of Princeton’s Department of Chemical and Biological Engineering, and advised by Sujit Datta, associate professor of chemical and biological engineering.

Browne had started investigating these systems in his first year of graduate study, but creating the conditions to study mixing led him through a long series of related problems to solve—what the polymers do to the liquids as they move from pore to pore and how to tune these complex fluids to behave in a controlled, predictable manner.

That research produced a prolific body of work, with several papers published in major journals. Browne had only just started to turn back to the broader question of mixing when it was time to complete his Ph.D. He said that while it was hard to put the questions aside, he figured others in Datta’s lab would pick up the various threads and sort out how it all fit together.

Then, as chance would have it, several months later, he got an opportunity to return for a six-month postdoc position, during which time he completed this capstone study.

“I was very lucky to have the chance to move back,” Browne said. He said at the time he finished his Ph.D., he and Datta had “no idea” how they were going to get from a series of loose threads and interesting data to proving that this technique could enhance reaction rates.

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“And I think that little bit of time not thinking about it gave us a moment to step away and come back with fresh eyes and figure out how to visualize the chemical reactions.”

The polymers Browne and Datta used in this study are common, chemically related to the absorbent materials used in diapers. And they say that there is a wide range of materials that could be used to similar ends, tuning each polymer and fluid to suit a given need.

Datta said that while scientists and engineers have, for decades, tried to solve this problem by changing the geometry of the grains in packed beds, that approach is expensive to scale and, in many cases such as in groundwater aquifers, simply not possible.

The new technique, relying as it does on common polymers to create chaotic mixing, is not only materially simple and mathematically elegant but robust across a wide range of porous environments.

“[It’s] beautiful from a purely aesthetic perspective,” he said. “But beyond being just a cool phenomenon that makes for nice fluid mechanics studies and teaches a lot about fluid mechanics, I truly believe that we can use this to solve legit engineering problems, such as making the production of important chemicals more efficient.

“It’s a completely different approach that is potentially much more scalable, much more feasible,” Datta said.

Phys Org, 11 July 2024

<https://phys.org>

Toxic arsenic and lead found to be common in tampons

2024-07-04

The first study to measure the concentration of metals in tampons has found that several brands contain concerning amounts of lead, arsenic and cadmium. More research is needed to determine whether the presence of these toxic metals poses a health risk.

It’s estimated that, in the US, between 52% and 82% of people who menstruate use tampons. To avoid health risks, especially given the high potential for vaginal absorption, it’s imperative that any harmful chemicals present in tampons are identified.

However, despite their widespread use and this absorption risk, few studies have investigated whether tampons contain these sorts of health-

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affecting chemicals. A new first-of-its-kind study by researchers from UC Berkeley, Columbia University and Michigan State University tested tampons for the presence of 16 metals, including toxic metals known to pose a risk to health.

“Although toxic metals are ubiquitous and we are exposed to low levels at any given time, our study clearly shows that metals are also present in menstrual products, and that women might be at higher risk for exposure using these products,” said Kathrin Schilling, assistant professor at Columbia University’s Mailman School of Public Health and senior author of the study.

Between September 2022 and March 2023, the researchers purchased tampon products from brick-and-mortar stores in the US, UK and EU and from two major online retailers; 14 different brands in all, in unique combinations of brand, product line, and absorbency. Products listed as top sellers were generally selected, as well as ‘store-brand’ products from several large chain retailers in the US.

Across 30 tampons, the concentrations of 16 metals were tested: arsenic, barium, calcium, cadmium, cobalt, chromium, copper, iron, mercury, manganese, nickel, lead, selenium, strontium, vanadium, and zinc. Concentrations were compared by several tampon characteristics, including region of purchase, organic material composition, and brand type.

The researchers detected measurable concentrations of all 16 metals assessed, including elevated mean concentrations of toxic metals lead, cadmium and arsenic. They didn’t find substantial concentrations of mercury or chromium. Concentrations varied according to the region of purchase, organic versus non-organic, and store- versus name-brand products. Lead concentrations were higher in non-organic tampons, while arsenic was higher in organic ones.

Of most concern to the researchers was the presence of lead in all of the tested tampons. As they point out, there is no safe exposure level when it comes to this heavy metal; any amount of lead that leaches out of a tampon and enters the bloodstream can have a negative effect on health. Lead is stored in the bones, replacing calcium, and can stay there for decades. It’s known to negatively affect the brain, kidneys, heart, blood, immune system, and reproductive organs and impact development.

Arsenic and cadmium are also associated with adverse health outcomes. Inorganic arsenic is known to cause cancer and has been associated with

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cardiovascular disease, dermatitis, lung and brain disease. Cadmium targets the kidneys and can cause kidney damage, as well as being linked to cardiovascular disease.

The researchers say that there are several ways that metals could've been introduced into tampons. One is the contamination of raw materials like cotton, rayon or viscose during production. Another is contamination with metal from water during manufacture. Some metals may be introduced intentionally. Several of the metals detected by the researchers – including calcium, cobalt, chromium, copper, nickel and zinc – may be added as antimicrobial agents, odor control, or lubrication.

“I really hope that manufacturers are required to test their products for metals, especially for toxic metals,” said Jenni Shearston, a postdoctoral scholar at UC Berkeley’s School of Public Health and the study’s lead and corresponding author. “It would be exciting to see the public call for this, or to ask for better labeling on tampons and other menstrual products.”

The study could not ascertain whether the metals detected contributed to negative health effects. Further research is needed to test how much of these metals can leach out of tampons and be absorbed by the body.

The study was published in the journal *Environment International*.

New Atlas, 4 July 2024

<https://newatlas.com>

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Technical Notes

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[Visible intruders: Tracing \(micro-\) plastic in organic fertilizers](#)

ENVIRONMENTAL RESEARCH

[Associations of ambient air pollution exposure and lifestyle factors with incident dementia in the elderly: A prospective study in the UK Biobank](#)

[Prenatal exposure to environmental phenols and phthalates and altered patterns of DNA methylation in childhood](#)

[Exposure to source-specific air pollution in residential areas and its association with dementia incidence: a cohort study in Northern Sweden](#)

PHARMACEUTICAL/TOXICOLOGY

[Polygenic inheritance and its interplay with smoking history in predicting lung cancer diagnosis: a French-Canadian case-control cohort](#)

[PFDA promotes cancer metastasis through macrophage M2 polarization mediated by Wnt/ \$\beta\$ -catenin signaling](#)

OCCUPATIONAL

[Exposure to golimumab during pregnancy: Results from the Company’s global safety database](#)

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