

Contents

CHEMWATCH

(click on page numbers for links)

REGULATORY UPDATE

ASIA PACIFIC

Australia GHS classifications updated.....	4
Tranche 24 assessments	4
Find out more about WHS issues and statistics in priority industries	5
How we'll protect people and the environment in 2018/19	6
173 K-REACH PECs Registration Approved	6

AMERICA

EPA Celebrates New Chemical Safety Milestones on 2nd Anniversary of Lautenberg Chemical Safety Act	7
US EPA finalises mercury reporting rule.....	9
Updating the NORA Public Safety Agenda	10
U.S. Department of Labor Extends Enforcement Date of Certain Provisions of the Beryllium Standard to August 9.....	12

EUROPE

Withdrawal of support for the active substance Dazomet from the BPR Review Program.....	13
EU court condemns Germany for exceeding nitrate limits.....	13
Cosmetic Products Regulation Annex VI amended	14
New guidance on nanotechnologies in food and feed.....	14
Pesticide residues: new advice on foods for infants and young children...	15

REACH UPDATE

ECHA and Eurometaux agree on Framework for Cooperation.....	17
Inspectors to check internet sales of chemicals.....	18
Application for authorisation fees adjusted	19
Biocidal Products Committee concludes on a Union authorisation for disinfectants	21

JANET'S CORNER

Hydrophobe	22
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CONTACT US

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

1227 Glen Huntly Rd
Glen Huntly
Victoria 3163 Australia

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

Contents

CHEMWATCH

HAZARD ALERT

Caesium23

GOSSIP

Set-up may make transferring tert -butyl lithium and other pyrophoric reagents safer	28
Diamond stabilises lithium metal electrodes.....	29
Chili pepper compound made to self-destruct.....	29
New form of matter may lie just beyond the periodic table	30
Is Fiskville the tip of an iceberg? PFAS detected across Victoria.....	32
Physicists Think The Weather Can Trigger Blackouts In An Unexpected Way.....	38
Toxic Secrets: Professor 'bragged about burying bad science' on 3M chemicals.....	39
'Green' coating protects plastics	46
We Just Made a Huge Breakthrough in Creating Opioids That Won't Kill People.....	47
US Army has made a plastic bandage that swells to patch wounds	49
Chemists report biorenewable, biodegradable plastic alternative	50
Chemists teach an enzyme a new trick, with potential for building new molecules	51
Game-changing finding pushes 3-D printing to the molecular limit	53
Groundbreaking discoveries could create superior alloys with many applications	54

CURIOSITIES

HPV vaccine has almost wiped out infections in young women, figures show	57
Copper regulates sleep in zebrafish	58
Heart disease stem cell therapy can shrink deadly scar tissue	59
Engineered cotton grows on alternative fertiliser.....	60
Children exposed to 30% more pollution than adults on walk to school due to proximity to exhaust fumes, study says.....	61
Fracking may alter fat cells: Study	62
Threshold for harmful chemicals in drinking water lower than thought: Study	64

Contents

CHEMWATCH

Herpes Has Been Linked to Alzheimer's, Reigniting a Controversial Hypothesis About The Disease.....	66
Biologists Say This Is The Ideal Number of Coffees a Day For Heart Health, And It's Totally Nuts.....	67
Ghosts And Demons That Visit You at Night Could Be Explained by Science	69
Autoimmune Diseases Could Be Linked to Living With a Stress Disorder, Study Shows.....	71
Which Is Worse For Your Health, Marijuana or Alcohol? Here's The Science	72
Oral antibiotics tied to increased risk of kidney stones.....	76
Gaming addiction classified as mental health disorder by WHO.....	77
I've always wondered: why do we get dark circles under our eyes?.....	78
Can a Bar of Soap Transmit Infection?	80
Night Owls May Have Higher Depression Risk.....	81
Why Do Our Brains Have Folds?	81
Kidney cells engineered to produce insulin when caffeine is present in the body.....	82
Accurate measurements of sodium intake confirm relationship with mortality	83

TECHNICAL NOTES

(Note: Open your Web Browser and click on Heading to link to section)...	85
ENVIRONMENTAL RESEARCH.....	85
MEDICAL RESEARCH.....	85
OCCUPATIONAL RESEARCH	86
PUBLIC HEALTH RESEARCH.....	86

Regulatory Update

CHEMWATCH

ASIA PACIFIC

Australia GHS classifications updated

2018-07-06

On 27 June 2018, Safe Work Australia's Hazardous Chemical Information System (HCIS) was updated. Two substances (already classified) had their classifications updated. Refer to the Safe Work Australia website for further information.

Yorda's Hive, 4 July 2018

<https://www.yordasgroup.com/hive/news>

Tranche 24 assessments

2018-07-06

The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) established the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework to accelerate the assessment of existing chemicals on the Australian Inventory of Chemical Substances (AICS or the Inventory). IMAP is a scientific and risk-based model for assessing chemicals with three tiers of assessment. The assessment effort increases with each tier. A decision is made at the end of each assessment tier if the next tier of assessment is required to determine risk. The risk assessments for human health and environment have been conducted separately and may have different outcomes and be published separately. The assessment outcomes are based on the information available at the time. Chemicals assessed using the IMAP framework have been published in several tranches. Tranche 24 assessments were published on 29 June 2018 and are open for public comment until 24 August 2018. Assessments included:

polymers

excluded use chemicals

Tier I

- Human health: Chemicals not considered to pose an unreasonable risk to the health of workers and public health on the basis of the Tier I assessment (high throughput assessments).
- Environment: Chemicals not considered to pose an unreasonable risk to the environment from their industrial use on the basis of the Tier I assessment (high throughput assessments).

**On 27 June 2018,
Safe Work Australia's
Hazardous Chemical
Information System
(HCIS) was updated.**

Regulatory Update

CHEMWATCH

Tier II

Tier II assessment reports for each chemical can be accessed by clicking on the link on Chemical CAS Registry Number in the table.

- Human health: Chemicals which have been assessed at Tier II (individual chemical evaluation) because the Tier I assessment indicated that it needed further investigation.
- Environment: Chemicals which have been assessed at Tier II (individual chemical evaluation) because the Tier I assessment indicated that it needed further investigation.

Tier III

Tier III assessment reports for each chemical can be accessed by clicking on the link on Chemical CAS Registry Number in the second tab of the Excel spreadsheet.

- Human health: Chemicals which have been assessed at Tier III (in depth chemical assessment) because the Tier II assessment indicated that it needed further investigation.

IMAP Tranche Publication and Public Comment Dates for published Tranches can be found [here](#).

NICNAS, 29 June 2018

<http://www.nicnas.gov.au>

Find out more about WHS issues and statistics in priority industries

2018-07-06

Safe Work Australia has published a set of updated WHS snapshots providing an insight into the key national data and WHS issues of seven industries. The snapshots contribute to the overall awareness and improvement of WHS in Australia by offering insights into the industries identified as national priorities in the *Australian Work Health and Safety Strategy*. Further information is available at: [priority industry snapshots](#)

SafeWork Australia, 29 June 2018

<http://www.safeworkaustralia.gov.au>

Safe Work Australia has published a set of updated WHS snapshots providing an insight into the key national data and WHS issues of seven industries.

Regulatory Update

CHEMWATCH

How we'll protect people and the environment in 2018/19

2018-07-06

New Zealand's Environmental Protection Authority's Statement of Performance Expectations (SPE) 2018/19 sets out what we at the EPA are committed to delivering in the coming financial year, what resources we'll use to do it, and how we will measure our performance. One of our overarching goals is to protect people and the environment in partnership with businesses, Māori, and the community. The EPA want people to have trust and confidence in their work; to deliver the right decisions, cost effectively; and to be a confident and proactive environmental regulator. To achieve this, one of the main programs that will progress this year is the hazardous substances modernisation program, which aims to revolutionise the way chemicals are managed and regulated in New Zealand, to support the ongoing safety and sustainability of our unique environment, our economy, and New Zealanders into the future. This, and the agency's other major areas of focus for the year, are detailed in SPE 2018/19.

[EPA Statement of Performance Expectations 2018/19](#)

NZ EPA, 28 June 2018

<http://www.epa.govt.nz>

173 K-REACH PECs Registration Approved

2018-07-06

On 28 June 2018, South Korea's chemical authority announced the list of the Priority Existing Chemicals (PECs) for which the joint registration dossiers have been submitted under K-REACH. According to the announcement, up to 27 June 2018, the joint registration dossiers of 313 PECs have been submitted to the authority, of which 173 have been approved and issued with registration numbers. Compared to a month ago, the number of approved dossiers has already doubled and is still increasing. It is clear that the authorities are accelerating the process. The remaining applications are still under review. The deadline for registering the 510 PECs will remain as 30 June 2018, although the amended K-REACH

Creating a world-class chemical management system is one of the main programs of work on New Zealand's Environmental Protection Authority's agenda for 2018/19.

Regulatory Update

CHEMWATCH

will introduce a new registration mechanism from 1 January 2019. Companies are encouraged to meet the June registration deadline.

Chemlinked, 29 June 2018

<http://chemlinked.com/en/news>

AMERICA

EPA Celebrates New Chemical Safety Milestones on 2nd Anniversary of Lautenberg Chemical Safety Act

2018-07-05

On the two-year anniversary of the Frank R. Lautenberg Chemical Safety for the 21st Century Act (Lautenberg Chemical Safety Act), the U.S. Environmental Protection Agency (EPA) announced that it has met its statutory responsibilities to release guidance and policy on confidential business information, a strategy to reduce animal testing, and a final mercury reporting rule. "At this two-year milestone, I am proud to say that the Agency is delivering results and meeting the statutory responsibilities and deadlines of the new law," said EPA Administrator Scott Pruitt. "These actions will boost transparency and increase public confidence in chemical safety." Under Administrator Pruitt, EPA has once again met the important deadlines set by the Lautenberg Chemical Safety Act, which amended the nation's primary chemicals management law, the Toxic Substances Control Act (TSCA), by the Act's 22 June 2018 deadline. The legislation received bipartisan support in the U.S. House of Representatives and the Senate and provides significant new responsibilities and authorities to EPA to advance chemical safety. EPA has completed the following milestones at this two-year anniversary:

- **Finalised strategy to reduce animal testing.** The strategy promotes the development and implementation of alternative test methods and strategies to reduce, refine, or replace vertebrate animal testing. It also incorporates input from public meetings and written comments.
- **Final rule on reporting mercury manufacturing and imports.** The information collected through the new reporting requirements will be used to develop future inventories of mercury and mercury-containing product supply, use, and trade in the United States.
- **Guidance for state, tribal, and local governments, and medical personnel and emergency responders on sharing confidential business information (CBI).** These guidance's specify the process that

The United States Environmental Protection Agency will reduce animal testing, track mercury imports and manufacturing, and facilitate sharing of Confidential Business Information with emergency responders

Regulatory Update

CHEMWATCH

will enable other governmental entities and medical and emergency personnel to request CBI information. Further information is available at:

- **Policy and procedures for assigning unique identifiers to better publicly track information on chemicals while protecting CBI.** An identifier will be applied to a substance, whose identity is protected as CBI, as well as to other related information or submissions concerning the same substance. This will allow the public to connect information related to the same substance, even while the specific identity is protected as confidential.
- **Guidance on structurally descriptive generic names.** This guidance will allow EPA to share more information with the public about the structure of substances while protecting the confidential elements of the substance's specific chemical identity. TSCA Submitters claiming the specific chemical identity of a chemical substance as CBI are required to supply a structurally descriptive generic name that can be disclosed to the public.

In addition to these two-year anniversary milestones, EPA has diligently worked to implement the first major update to an environmental statute in 20 years. Here are some highlights:

- On June 22, 2017 – the one-year anniversary of the Lautenberg Chemical Safety Act – EPA met milestones for three framework TSCA rules: the Prioritization Process Rule, the Risk Evaluation Process Rule, and the Inventory Rule. EPA's TSCA team is working hard to implement these important processes.
- EPA announced the first ten chemicals to undergo risk evaluations and then issued corresponding scope documents for these chemicals, which describe the scope of the risk evaluation to be conducted, including the hazards, exposures, conditions of use, and potentially exposed or susceptible subpopulations that the Agency expects to consider. And last month, EPA released problem formulation documents to refine those scope documents. This is an important interim step prior to completing and publishing the final risk evaluations by December 2019.
- EPA also released a systematic review approach for public comment to guide EPA's selection and review of studies and provide transparency in how the Agency plans to evaluate scientific information. EPA proposed a significant new use rule (SNUR) for public comment enabling the Agency to prevent new uses of asbestos – the first such action on asbestos ever proposed as well.

Regulatory Update

CHEMWATCH

- EPA took a number of actions to address the review of new chemical submissions to the Agency: EPA decreased the backlog of new chemicals awaiting EPA review, increased transparency through a public meeting as well as a guidance document for companies and the public to better explain how our analyses are conducted, and added a pre-consultation step to engage early with companies, increase their certainty and improve new chemical submissions.
- Pursuant to the amended law, EPA also proposed a fees rule on certain chemical manufacturers – including importers and processors – to provide a sustainable source of funding to support resources implementing EPA's new responsibilities under the amended law.

U.S EPA, 22 June 2018

<http://www.epa.gov>

US EPA finalises mercury reporting rule

2018-07-05

The United States Environmental Protection Agency (EPA) has issued a final reporting rule to support the development of a national mercury inventory. The move is in keeping with requirements imposed by 2016's amendments to TSCA. The Lautenberg Act instructs the agency to publish such an inventory with data on the substance's supply, use and trade every three years. This will be used to inform policy decisions and to help comply with reporting requirements under the international Minamata Convention on Mercury. The rule covers manufacturers and importers of mercury or mercury-containing products, as well as those who use the substance in a manufacturing process. Consistent with the proposed version of the rule, issued last October, the 2020 inventory will cover activities taking place this year. Electronic data submissions are due by 1 July 2019. Subsequent triennial reports will likewise cover the 12-month period preceding the year in which reporting is required.

Exemptions

The reporting obligations will not apply to those dealing only with mercury-containing waste or with mercury as an impurity. Also exempted are those "engaged in activities involving mercury not with the purpose of obtaining an immediate or eventual commercial advantage"; and those who only import a product that contains a mercury-added component. There are also certain exemptions for those already reporting mercury use under the TSCA section 8 chemical data reporting (CDR) rule, or the Interstate Mercury Education and Reduction Clearinghouse (Imerc)

The United States Environmental Protection Agency (EPA) has issued a final reporting rule to support the development of a national mercury inventory.

Regulatory Update

CHEMWATCH

Mercury-added Products Database. The latter is an online system managed by the Northeast Waste Management Officials' Association (Newmoa), which provides national data on mercury used in products. During the stakeholder consultation process, there was some concern that differences in the Imerc reporting schedule would prevent the US from realising "an accurate national mercury inventory". But in the final rule, the EPA says it has been directed to avoid duplicative reporting, and it finds not requiring overlapping reporting to be a "feasible approach". "To the extent that data elements may not align per differences in reporting years and frequency, the agency does not view such discrepancies to be prohibitive of its ability to carry out statutory obligations," it adds. However, the EPA rejected a suggestion that it should not require reporting for uses of mercury regulated by other federal agencies, such as drugs or animal vaccines. It also declined to adopt a *de minimis* threshold below which reporting is not required. The agency says it plans to publish the first mercury inventory supported by this finalised rule by 1 April 2020, and every three years thereafter. The initial inventory, published in March last year, consisted of readily available, previously published data. Further information is available at: [Final rule \(pre-publication\)](#)

Chemical Watch, 26 June 2018

<http://chemicalwatch.com>

Updating the NORA Public Safety Agenda

2018-07-06

NIOSH published a newly updated National Occupational Research Agenda for Public Safety in the Federal Register on 12 April 2018, asking for public and stakeholder comments on it by 11 June. "The purpose of public comment is to gather input from stakeholders who are not on the Public Safety Sector Council. Since this is a research agenda for the nation, we want as broad input as possible," the agency's leaders on this initiative noted in an email announcing it. A product of the NORA Public Safety Sector Council, this agenda lists eight recommendations:

1. Reduce cardiovascular disease, cancer, and other chronic diseases
2. Reduce infectious disease transmission
3. Reduce musculoskeletal disorders
4. Reduce motor vehicle injuries
5. Reduce workplace violence
6. Promote healthy work design and well-being

Cardiovascular disease, cancer, and chronic diseases are the first recommendation because stress is such a big factor affecting public safety workers' health.

Regulatory Update

CHEMWATCH

7. Increase surveillance
8. Increase resilience and preparedness

The agenda explains why each of these is important. For musculoskeletal disorders, for example, it explains that they are often the most commonly reported work-related injuries among public safety workers. EMTs and paramedics reported the highest incidence of MSDs, at 184 per 10,000 full-time workers, and firefighters reported a rate of 179 per 10,000 full-time workers, according to BLS data cited in the agenda. Cardiovascular disease, cancer, and chronic diseases are the first recommendation because stress is such a big factor affecting public safety workers' health, it says. Sudden cardiac events are responsible for 7 to 22 percent of on-duty deaths among police officers, 17 percent among wildland firefighters, and 11 percent among EMS workers, it says.

Early Comments Supportive

Only a handful of comments were posted to the public docket (CDC-2018-0033) at www.regulations.gov by mid-May. All were supportive of the document. One commenter submitted this: "I sincerely appreciate the opportunity to review the NORA Council Public Safety research agenda. Perhaps it's anecdotal but as a retired State Trooper I've observed a number of former Troopers contracting brain tumours leading to early death. While I don't know about specific rates of brain cancer across all disciplines of Public Safety, it is curious to observe this. Particularly as I make a comparison to the general population (non-public safety people) that I know of with brain tumours. Based on an understanding of some of the technologies used by LE (such as radar for speed detection), as well as exposures to various environmental hazards and hazardous materials, and this unscientific observation of what appears to be a high rate of brain cancers in former State Troopers (in my estimation anyway), it appears to be of some consequence. Hence, I am very pleased to see the research agenda include cancer related research associated with public safety employees in general. Thank you and please continue your efforts to protect those who protect us."

Another wrote, "The NORA Public Safety Agenda is a well-crafted, well researched and comprehensive plan for addressing the most important health hazards faced by this important sector. I applaud the work that NIOSH has done," while a third commenter recommended adding material to the document about "how shift length, lack of sleep, interrupted sleep and fatigue impacts cardiovascular disease, cancer, and other chronic diseases under objective 1." This commenter cited a study titled

Regulatory Update

CHEMWATCH

“Exploratory Study of Heart Rate Variability and Sleep among Emergency Medical Services Shift Workers,” available at <https://www.ncbi.nlm.nih.gov/pubmed/27487176>, saying it “provides some evidence for the impact of interrupted sleep on cardiovascular health.”

Occupational Health & Safety News, 1 July 2018

<http://www.ohsonline.com>

U.S. Department of Labor Extends Enforcement Date of Certain Provisions of the Beryllium Standard to August 9

2018-07-05

The United States Department of Labor’s Occupational Safety and Health Administration (OSHA) has announced a delay in enforcing certain requirements of the final rule on occupational exposure to beryllium in general industry. These requirements will not be enforced until 9 August 2018. The requirements include beryllium work areas, regulated work areas, methods of compliance, personal protective clothing and equipment, hygiene areas and practices, housekeeping, communication of hazards, and recordkeeping. On 1 June 2018, OSHA published a Notice of Proposed Rulemaking to further extend the compliance dates of the remaining requirements until 12 December 2018. On 11 May 2018, OSHA began enforcing the permissible exposure limits for the construction and maritime industries, as well as other requirements of the general industry standard. However, the Agency will not enforce any other provisions for beryllium exposure in those standards unless it provides notice. Certain compliance dates outlined in the rule remain unchanged. Enforcement of the general industry requirements for change rooms and showers will begin 11 March 2019, and requirements for engineering controls will begin 10 March 2020.

U.S OSHA, 3 July 2018

<http://www.osha.gov>

The United States Department of Labor’s Occupational Safety and Health Administration (OSHA) has announced a delay in enforcing certain requirements of the final rule on occupational exposure to beryllium in general industry.

EUROPE

Withdrawal of support for the active substance Dazomet from the BPR Review Program

2018-07-06

The following active substance/product-type combination is no longer considered to be supported in the Biocidal Products Regulation (BPR) Review Program:

- Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione (Dazomet)
- Product type 6 (preservatives for products during storage)
- Product type 12 (slimicides)

Yorda's Hive, 2 July 2018

<https://www.yordasgroup.com/hive/news>

EU court condemns Germany for exceeding nitrate limits

2018-07-06

The Court of Justice of the EU (CJEU) ruled on 21 June, that Germany had breached EU law by allowing an excessive use of manure as a fertiliser, thus violating the limits set out in the EU's nitrates directive which aims to reduce water pollution caused by nitrates from agricultural sources. "Manure doesn't appear out of nowhere – industrial livestock farming is the clear culprit. We're up to our necks in crap and the solution is not to stand on our tippy toes, but to drain the slurry. The manure problem isn't only in Germany, a good start would be for the EU to stop funding the factory farms that pump it out," said Greenpeace EU agriculture policy director Marco Contiero. In 2016, the European Commission brought Germany into court for failing to step up its efforts to combat nitrate pollution. The current European legislation set a limit at 50 milligrams of nitrate per litre of water. In its report on nitrates in 2016, Berlin acknowledged that this limit was exceeded at 28% of the German groundwater monitoring stations. Germany revised its fertiliser ordinance in 2017 and set new limits for nitrogen fertilisation, extended time-frame for fertiliser bans and fertiliser-free areas around water bodies. The European Court of Justice now said it is still insufficient. Nitrate pollution of waterways can cause blooms of algae, which drain the water of oxygen, choking fish and other wildlife, the environmental organisation explained. It said that nitrates can also be converted into toxic nitrite in the human

On 21 June 2018, the Court of Justice of the EU (CJEU) ruled that Germany breached EU law by allowing an excessive use of manure as a fertiliser

Regulatory Update

CHEMWATCH

body, which is particularly dangerous for children and pregnant women. It also pointed out the economic impact of manure-polluted water, arguing that it will become increasingly expensive for communal water works to keep the water clean, which in turn would lead to a sharp rise in water prices. Greenpeace is calling for a new fertiliser ordinance in Germany that would record the nutrients of all farms and also show how much manure is transported to and from where. It also calls for a refocusing of EU agricultural subsidies towards environmentally and water-compatible agricultural practices as well as improved animal welfare in livestock farming. Germany will now have to comply with the Court decision or face a new infringement procedure from the European Commission. This infringement procedure could result in a second Court ruling imposing Germany to pay fines, if it is found to still be in breach of EU law.

Euractiv, 22 June 2018

<http://www.euractiv.com/>

Cosmetic Products Regulation Annex VI amended

2018-07-06

The following substance has been added to Annex VI of the Cosmetic Products Regulation (EC) No. 1223/2009 (CPR) as per Commission Regulation (EU) 2018/885 of 20 June 2018:

- Methylene BisBenzotriazolyl Tetramethylbutylphenol (nano) [EC# 403-800-1]

The Scientific Committee on Consumer Safety (SCCS) has concluded that the use of titanium dioxide nanoparticles at a concentration up to 25% as a UV filter in sunscreens can be considered not to pose a risk of adverse effects in humans after dermal application.

Yorda's Hive, 27 June 2018

<https://www.yordasgroup.com/hive/news>

New guidance on nanotechnologies in food and feed

2018-07-06

The European Food Safety Authority (EFSA) has published its guidance on how to assess the safety of nanoscience and nanotechnology applications. The guidance gives practical suggestions on the types of testing that are needed and the methods that can be applied. Reinhilde Schoonjans, a risk assessment scientist at EFSA, said: "This guidance is very timely because it

**On 20 June 2018, the
Cosmetics Products
Regulation Annex
VI was amended.**

Regulatory Update

CHEMWATCH

gives applicants the tools they need to prepare complete nanotechnology applications and equips risk assessors such as EFSA with the appropriate tools to evaluate their safety". This document, which focuses on the safety assessment for human and animal health, underwent a three-month public consultation and takes into account all comments received. It covers areas such as novel foods, food contact materials, food and feed additives, and pesticides and is intended for all interested parties – in particular risk assessors, risk managers and applicants. The guidance will now enter a pilot phase, with finalisation envisaged by the end 2019. A second guidance will be developed in 2019 focusing on environmental risk assessment of nanoscience and nanotechnology applications in the food and feed chain. Further information is available at: [Guidance on the human and animal risk assessment of the application of nanoscience and nanotechnologies in agri/food/feed](#)

EFSA, 4 July 2018

<http://www.efsa.europa.eu>

Pesticide residues: new advice on foods for infants and young children

2018-07-06

The European Food Safety Authority (EFSA) has made a number of recommendations to further protect young infants from potential risks posed by pesticide residues in food. The proposals are part of a comprehensive evaluation of the safety of pesticide residues in foods intended for infants and young children. To carry out the evaluation, EFSA experts applied [guidance](#) developed by the authority's Scientific Committee in 2017 on assessing substances in food intended for infants below 16 weeks of age, and the results of a literature search for new evidence on developing systems in infants and young children. EFSA recommends that:

- The maximum levels of certain types of pesticide residues that can be present in foods intended for infants and young children be reviewed. This would ensure ample protection for infants under 16 weeks even at the very highest possible exposure levels.
- Specific safe intake levels of pesticide residues for infants below the age of 16 weeks could be established in accordance with the guidance of EFSA's Scientific Committee.
- For infants older than 16 weeks the current approach to establishing health-based guidance values is still considered appropriate.

The European Food Safety Authority (EFSA) has made a number of recommendations to further protect young infants from potential risks posed by pesticide residues in food.

Regulatory Update

CHEMWATCH

Gerrit Wolterink, chair of the working group that drafted the scientific opinion, said: "Advances in our knowledge of child development plus the availability of EFSA's guidance enabled us to arrive at the conclusion about the higher levels of protection for certain pesticides that are desirable for infants below 16 weeks." He added: "The evidence shows that the current protective measures can continue to be applied to infants older than 16 weeks." The new evaluation was requested by the Commission in the light of these advances in knowledge and updates the advice provided in 1997/1998 by the Scientific Committee for Food, which, prior to the establishment of EFSA in 2002, provided the Commission with advice on food safety. Further information is available at: [Scientific opinion on pesticides in foods for infants and young children](#)

EFSA, 28 June 2018

<http://www.efsa.europa.eu>

REACH Update

CHEMWATCH

ECHA and Eurometaux agree on Framework for Cooperation

2018-07-06

The European Chemicals Agency's (ECHA) Executive Director Bjorn Hansen and Eurometaux's Guy Thiran have signed the Metals and Inorganics Sectorial Approach (MISA) agreement providing a cooperation framework for improving the data in the registration dossiers for these substances and advancing technical and scientific issues related to metal compounds and inorganic substances. By the end of 2020, ECHA and Eurometaux, the European non-ferrous metals association, aim to identify the shortcomings in REACH and CLP information for metal compounds and inorganic substances. The MISA agreement aims to generate further information on as many metal compounds and inorganics as possible, as well as to improve supply chain communication and identify new risk management needs. Guy Thiran, Director General of Eurometaux stated: "Europe's metals sector is committed to continually improve its standards of chemicals management. With today's partnership agreement, we welcome the opportunity to work with ECHA to resolve several critical scientific and technical issues. This will help us to better understand the hazard and risks posed by metals and inorganic substances, including their use in a Circular Economy. By addressing issues such as environmental classification and the use of read across, we can work towards updated registration dossiers and additional data generation". Bjorn Hansen, Executive Director of ECHA says: "Eurometaux is the second European industry association committing to improve their implementation of REACH. I am pleased with this proactive approach, from a sector with a long-standing record of constructive involvement in chemicals management. It shows the willingness to cooperate with ECHA to increase efficiencies in implementing REACH for the good of the EU citizen and the single EU market." The MISA framework has been signed by ECHA and Eurometaux and will be followed by bilateral signatures with the participating consortia. By signing up to this framework and related action plan, the participating industry sectors recognise the importance of providing accurate and clear information on hazards, risks and conditions of safe use throughout the supply chain. The MISA agreement is in line with ECHA's Integrated Regulatory Strategy, and the cooperation will contribute to achieving the objectives of the 2020 Strategic Approach to International Chemicals Management (SAICM).

ECHA's Integrated Regulatory Strategy aims to efficiently identify substances of potential concern and ensure appropriate intervention,

By the end of 2020, ECHA and Euro-metaux, the European non-ferrous metals association, aim to identify the shortcomings in REACH and CLP information for metal compounds and inorganic substances.

REACH Update

CHEMWATCH

providing confidence that registrants meet the REACH registration requirements and communicate on safe use in the supply chain. While there is a lot of data available on a number of metals and metal compounds and many have been under substantial regulatory scrutiny, there is also a large group for which data needs improvement. A provisional analysis looking at the data available on about 700 registered metal compounds shows some data gaps and extensive use of adaptations. Furthermore, in line with what is seen for other substances, a large percentage of REACH registration dossiers for metals and inorganic substances have never been updated. ECHA is committed to openness and transparency with its stakeholders. ECHA currently has 114 accredited stakeholder organisations, representing industry, NGOs, trade unions, consumers and academia. These stakeholders are involved in many of the Agency's activities and decision-making processes, and a regular dialogue with them is an important part of our daily work. All organisations at EU and international level affected by the EU's chemicals regulations are considered ECHA's stakeholders and are welcome to participate in our work. Further information is available at:

- [MISA agreement](#)
- [MISA General rolling action plan](#)
- [ECHA's Integrated Regulatory Strategy](#)
- [SAICM 2020 objectives](#)

ECHA, 29 June 2018

<http://echa.europa.eu>

Inspectors to check internet sales of chemicals

2018-07-06

A new enforcement project on online sales will be carried out in 2020. It will likely include restrictions and labelling duties. The report of the REF-5 project checking the safety of the working environment is under preparation. The Forum for Exchange of Information on Enforcement (Forum) held its 30th meeting on 19-20 June 2018 and its BPR Subgroup (BPRS) met on 21 June 2018. The eighth major Forum enforcement project (REF-8) will concentrate on online sales of substances, mixtures and articles. One reason for this focus is the high rate of non-compliance detected in the Forum's pilot project on internet sales. The detailed scope to be checked under REF-8 is yet to be defined. It is expected to include restrictions and labelling duties for hazardous chemicals. The project will be prepared in 2019 and carried out in 2020, with the

A new enforcement project on online sales will be carried out in 2020.

REACH Update

CHEMWATCH

report expected to be published by the end of 2021. The Forum also agreed that inspections for the pilot project on authorisation focusing on chromium VI compounds and other substances will take place in 2020. This will allow inspectors to target more substances and give downstream users sufficient time to notify their authorised uses to ECHA. The inspectors will target companies that are using substances of concern without the required authorisation. Additionally, they will check that authorisation holders and their downstream users comply with the conditions of the authorisation decision. During the meeting, Forum members also discussed the preliminary results of the REF-5 project on exposure scenarios, extended safety data sheets and the implementation of risk management measures and operational conditions. The aim of the project is to check communication in the supply chain and consistency of the extended safety data sheets with the content of the chemical safety reports. The project also looks at whether the risk management measures recommended in the exposure scenarios are actually implemented in the workplace. 29 countries participated in the project. A total of 898 inspections were carried out in collaboration between labour and environmental inspectors. The report is currently being prepared and its adoption and publication are foreseen for the end of 2018. The results of the REF-5 project will be presented at the Forum-31 open session for stakeholders planned for 14 November 2018 in Brussels. Further information is available at:

- Enforcement Forum
- Final report of the Forum pilot project on CLP focusing on control of internet sales

ECHA, 25 June 2018

<http://echa.europa.eu>

Application for authorisation fees adjusted

2018-07-06

The European Commission has revised the fees for applications for authorisation of substances of very high concern under REACH. The revision encourages companies to apply together. The fees for additional uses have increased. The European Chemicals Agency (ECHA) will continue to charge an unchanged base fee covering the application for an authorisation for one substance and one use. The revision of the Fee Regulation increases the fees charged for each additional use covered by the application. The revised fees therefore take better account of the

The European Commission has revised the fees for applications for authorisation of substances of very high concern under REACH.

REACH Update

CHEMWATCH

amount of work involved in assessing the applications. On the other hand, no fees will be charged for additional applicants. Therefore, joint applications are encouraged. If companies are of a different size, the highest applicable fee will be levied.

The revised fees will also apply to authorisation holders who submit a review report.

Table: Four examples of how the new Fee Regulation would affect the fees paid.

Examples	A	B	C	D
Applicants	1	2	1	2
Uses	1	1	2	2
Fees until 11 July 2018	EUR 54 100	EUR 94 675	EUR 64 920	EUR 105 495
New fees as of 12 July 2018	EUR 54 100	EUR 54 100	EUR 102 790	EUR 102 790
Difference %	0 %	-43 %	58 %	-3 %

In the new Fee Regulation, the number of applicants does not increase the fee. Earlier, each additional applicant needed to pay (75 % of the base fee).

1. In the new Fee Regulation, each additional use increases the fee by 90 % from the base fee. Earlier this increase was 20 %.
2. The same logic will also be applied for small, medium and micro sized companies. The new Fee Regulation did not affect them.
3. On average, applications have so far had about 1.7 uses per application (i.e. most have had 1 use, but there are applications with 2 or more uses).

ECHA made a simulation of the impact of the new fees. This was based on applications received by mid-2017. The result was that overall the application fees would remain the same. The Fee Regulation ensures that the structure and amount of the fees provided under REACH must take account of the work required by ECHA and the competent authorities. In addition, the fees have to be fixed at such a level that the revenue derived from them when combined with other sources of Agency revenue is

REACH Update

CHEMWATCH

sufficient to cover the cost of the services delivered. Further information is available at: Revised Fee Regulation

ECHA, 26 June 2018

<http://echa.europa.eu>

Biocidal Products Committee concludes on a Union authorisation for disinfectants

2018-07-06

The Biocidal Products Committee supported the approval of DBNPA for use in disinfectants (product-type 4). However, the evaluating Member State, Denmark, has been requested to assess whether the active substance meets the new criteria for endocrine-disrupting properties before the Committee adopts its opinion on the active substance. The Committee could not conclude on the proposal for chlorfenapyr for use in pest control products, and therefore a revised proposal will need to be submitted to the Committee. The Committee also concluded favourably on an application for Union authorisation for a product family containing iodine/PVP-iodine. Following a request from the European Commission, the Committee also adopted an opinion on a product used for the temporary preservation of corpses. The Committee concluded that a substance in the product acts as an active substance in line with the definition set out in the Biocidal Products Regulation (substance name confidential). The European Commission together with the EU Member States will take the final decision on the approval of the active substances and on the Union authorisation of the biocidal products. The Committee met from 27 June to 28 June 2018. The opinions will be available on ECHA's website in the near future. The next meeting will be held in October 2018.

The Committee supported the approval of DBNPA for use as a disinfectant. It also concluded on one application for Union authorisation.

Further information is available at:

- More information about the opinions
- More information about the BPC

ECHA, 29 June 2018

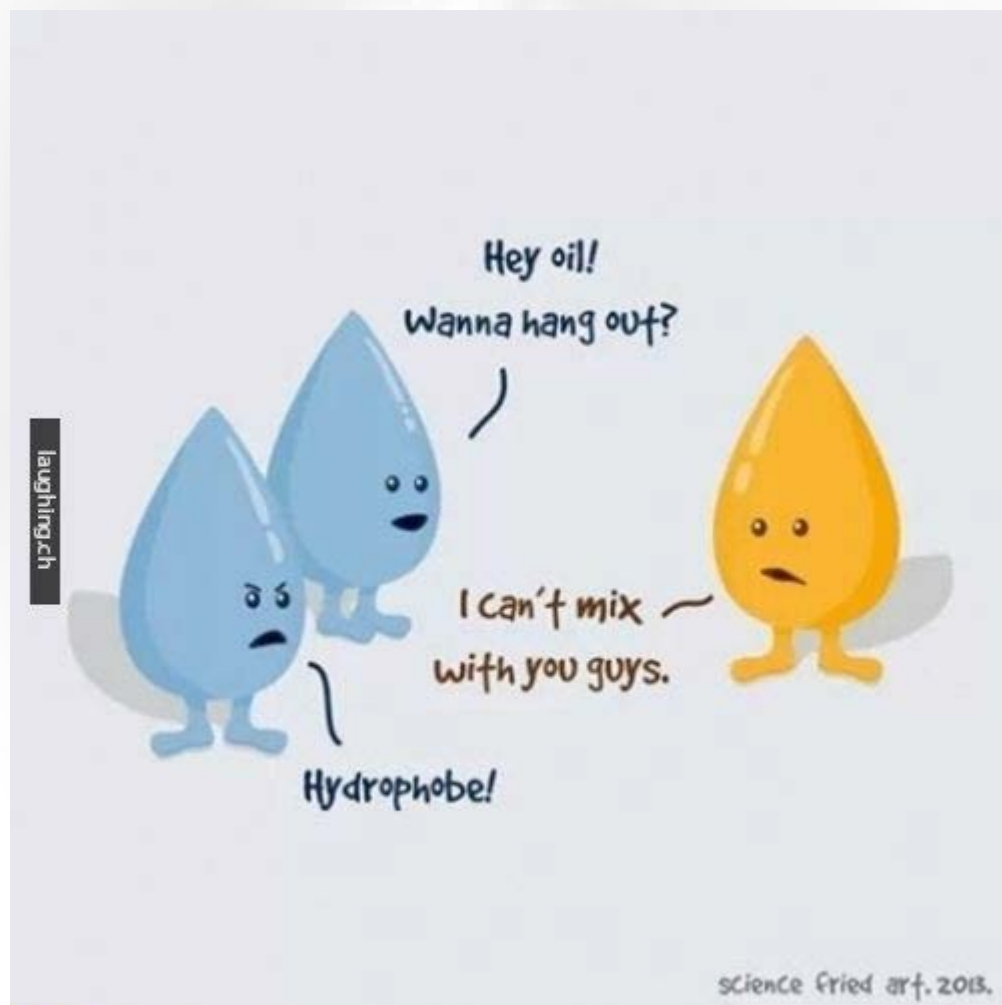
<http://echa.europa.eu>

Janet's Corner

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Hydrophobe

2018-07-06



Laughing.

www.laughing.ch

Hazard Alert

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Caesium

2018-06-23

Caesium is a chemical element with symbol Cs and atomic number 55. [1] It is silvery gold, soft, and ductile. It is the most electropositive and most alkaline element. Caesium, gallium, and mercury are the only three metals that are liquid at or around room temperature. Caesium reacts explosively with cold water and reacts with ice at temperatures above -116°C . Caesium hydroxide is a strong base and attacks glass. Caesium reacts with the halogens to form a fluoride, chloride, bromide, and iodide. Caesium metal oxidises rapidly when exposed to the air and can form the dangerous superoxide on its surface. [2] Caesium is a naturally-occurring element found in rocks, soil, and dust at low concentrations. Natural caesium is present in the environment in only one stable form, as the isotope ^{133}Cs . [3]

USES [2]

Caesium is used in industry as a catalyst promoter, boosting the performance of other metal oxides in the capacity and for the hydrogenation of organic compounds. Caesium nitrate is used to make optical glasses. Caesium is sometimes used to remove traces of oxygen from the vacuum tubes and from light bulbs. Caesium salts are used to strengthen various types of glass. The chloride is used in photoelectric cells, in optical instruments, and in increasing the sensitivity of electron tubes. Caesium is used in atomic clocks and more recently in ion propulsion systems.

Caesium is a chemical element with symbol Cs and atomic number 55.

SOURCES & ROUTES OF EXPOSURE [3,4]

Sources of Exposure

- You can be exposed to low levels of stable or radioactive caesium by breathing air, drinking water, or eating food containing caesium.
- Food and drinking water are the largest sources of exposure to caesium.
- You can be exposed to radioactive caesium if you eat food that was grown in contaminated soil, or if you come near a source of radioactive caesium.
- Working in industries that process or use natural caesium or caesium compounds.
- Living near uncontrolled radioactive waste sites containing caesium.

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Routes of Exposure

Stable and radioactive caesium can enter your body from the food you eat or the water you drink, from the air you breathe, or from contact with your skin. When you eat, drink, breathe, or touch things containing caesium compounds that can easily be dissolved in water, caesium enters your blood and is carried to all parts of your body. Caesium is like potassium; it enters cells and helps to maintain a balance of electrical charges between the inside and the outside of cells so that cells can perform tasks that depend on those electrical charges. Cells like muscle cells and nerve cells require changing electrical charges in order to function properly and allow you to think and move. Once caesium enters your body, your kidneys begin to remove it from the blood; some caesium is quickly released from your body in the urine. A small portion is also released in the faeces. Some of the caesium that your body absorbs can remain in your body for weeks or months but is slowly eliminated from your body through the urine and faeces.

HEALTH EFFECTS [4]

Effects of Caesium

It is highly unlikely that you would be exposed to high enough amounts of stable caesium to cause harmful health effects. Laboratory animals given very large amounts of caesium compounds showed changes in behaviour, such as increased or decreased activity. Exposure to large amounts of radioactive caesium can damage cells in your body from the radiation. You might also experience acute radiation syndrome, which includes nausea, vomiting, diarrhoea, bleeding, coma, and even death in cases of very high exposures.

Carcinogenicity

There are no studies regarding non-radioactive caesium and cancer. There are no human studies that specifically associate exposure to radioactive caesium with increased cancer risk. Because radioactive caesium emits ionising radiation, carcinogenic effects similar to those observed in Japanese survivors of the atomic bombing incidents might be expected among individuals acutely exposed to very high levels of radiation from a radioactive caesium source. Rats exposed to high doses of radiation from ^{137}Cs had increased risk of mammary tumours. Older rats seemed more resistant than younger ones.

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SAFETY [5]

First Aid Measures

- Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
- Skin: Get medical aid immediately. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
- Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.
- Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
- Notes to Physician: Treat symptomatically.

Fires & Explosion Information

- As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
- Caesium can burn in a fire, releasing toxic vapours.
- Caesium will react with water and may release a flammable and/or toxic gas.
- May ignite or explode on contact with steam or moist air.
- Do NOT use water directly on fire.

Exposure Controls & Personal Protection

Engineering Controls

- Use explosion-proof ventilation equipment.
- Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.

Personal Protective Equipment

The following personal protective equipment is recommended when handling caesium:

- Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Hazard Alert

CHEMWATCH

- Skin: Wear appropriate protective gloves and clothing to prevent skin exposure.
- Clothing: Wear appropriate protective clothing to minimize contact with skin.
- Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

REGULATION

United States [3]

There are few guidelines for compounds of stable caesium.

- NIOSH: Based on eye irritation, the National Institute for Occupational Safety & Health has established a recommended exposure limit (REL) for caesium hydroxide of 2 mg/m³ as a time-weighted average (TWA) for up to a 10-hour workday and a 40-hour workweek.
- ACGIH: The American Conference of Governmental Industrial Hygienists has assigned caesium hydroxide a threshold limit value (TLV) of 2 mg/m³ as a TWA for a normal 8-hour workday and a 40-hour workweek, based on respiratory and eye irritation.
- NRC: The Nuclear Regulatory Commission has established guidelines for radioactive caesium that include occupational inhalation exposure Derived Air Concentrations (DACs) of 0.00000004 iCi/mL (4x10⁻⁸ iCi/mL) for 134Cs and 0.00000006 iCi/mL (6x10⁻⁸ iCi/mL) for 137Cs. Annual Limits on Intake (ALIs) for on-the-job exposure are 100 iCi (1x10² iCi) for 134Cs and 200 iCi (2x10² iCi) for 137Cs.

Australia [6]

Safe Work Australia: Safe Work Australia has established an 8-hour time-weighted average concentration for caesium of 2mg/m³.

REFERENCES

1. <http://en.wikipedia.org/wiki/Caesium>
2. <http://www.lenntech.com/periodic/elements/cs>
3. <http://www.atsdr.cdc.gov/phs/phs.asp?id=575&tid=107>
4. <http://www.atsdr.cdc.gov/tfacts157.pdf>
5. <http://www.sciencelab.com/msds.php?msdsId=13280>

Hazard Alert

CHEMWATCH

6. <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/772/Workplace-exposure-standards-airborne-contaminants.pdf>

Set-up may make transferring tert -butyl lithium and other pyrophoric reagents safer

2018-06-26

When chemists want to transfer a small amount of a pyrophoric reagent, such as tert-butyl lithium, they typically use a needle and syringe. But this protocol can be dangerous: One wrong move and the chemical could drip, or worse, squirt out of the needle and ignite. Chemists at Aarhus University have devised a simple setup and protocol that can make such transfers safer. The setup consists of a sealed transfer vial made by fusing the tops of two crimp neck vials, a three-dimensional printed bottle cap that screws onto the bottle of pyrophoric reagent and holds the transfer vial, and a metal clip that secures the system so that it's "hands free." To transfer the reagent once the setup is assembled, a chemist pushes a long needle through both crimp cap seals on the transfer vial (which is filled with inert gas) and then through the reagent bottle's rubber seal. The chemist draws the required amount of reagent into the syringe and then withdraws the needle so that it is contained within the transfer vial. After removing the transfer vial from the 3-D printed bottle cap, the chemist places the transfer vial onto the reaction flask, pushes the needle through the transfer vial and through a septum on the reaction flask, and finally transfers the reagent (Org. Proc. Res. Dev. 2018, DOI: 10.1021/acs.oprd.8b00151). Xiao-Feng Wu at the Leibniz Institute for Catalysis points out that pyrophoric reagents like tert-butyl lithium are used on a daily basis in some research laboratories, even though their high air and moisture sensitivities can lead to serious accidents, particularly when used by chemists who are inexperienced at transferring such materials. "With this system, even high school students can enjoy the advantages of tert-butyl lithium," he says. Debbie M. Decker, safety manager for the chemistry department at the University of California, Davis, thinks that the setup may be useful for transferring small amounts of pyrophoric reagents via syringe. "I think this is an important technique for undergraduates to learn in a teaching environment, rather than in the research environment," she says. "Teaching students the cannula technique may be more useful in a research setting." Lindhardt agrees that a cannula setup is better for transferring large volumes of tert-butyl lithium and similar reagents. He says the goal of this work was to make "something simple that people could construct themselves." Although the chemists enlisted a glassblower to make the transfer vial, they published vial schematics online with the

Simple pieces of equipment decrease the danger of moving small volumes of chemicals prone to igniting

paper, along with specifications for 3-D printing the bottle cap and an instructional video.

Chemical & Engineering News, 18 June 2018

<http://pubs.acs.org/cen/news>

Diamond stabilises lithium metal electrodes

2018-06-26

Coating metallic lithium battery electrodes with two layers of diamond (false coloured to distinguish between them) prevents undesirable reactions and safety hazards. Lithium-ion batteries, which power most of today's portable electronics and many vehicles, rely on electrodes that combine lithium with the oxides of cobalt, nickel, manganese, and other metals. Pure lithium electrodes provide higher charge capacity than mixed metal forms. But lithium metal's reactivity leads to performance-reducing reactions with common battery electrolytes and poses safety hazards, especially during charging. Aiming to exploit the metal's advantages while bypassing its problems, Stanford University scientists searched for a thin film to protect the electrode surface. The film had to be electrochemically stable; free from pinholes that allow dendrites to grow and short-circuit the battery, potentially igniting it; flexible enough to stretch and shrink during charging cycles without cracking; and able to allow unimpeded flow of lithium ions to and from the metal electrode. The team, which includes Yayuan Liu, Steven Chu, and Yi Cui, met those requirements by using a low-cost deposition method to grow a two-layer, nanometre-thin diamond film (Joule 2018, DOI: 10.1016/j.joule.2018.05.007). The double-layer design, which effectively blocks pinholes, led to energy-efficient cells that remained stable through more than 400 charge cycles.

Chemical & Engineering News, 18 June 2018

<http://pubs.acs.org/cen/news>

Chili pepper compound made to self-destruct

2018-06-26

Capsaicin, the compound that gives chili peppers their heat, soothes pain and itch by acting on an ion channel called TRPV1 in cells. But along with this relief, capsaicin and some of its derivatives can deliver troubling side effects, including a burning sensation and fever spikes. Now researchers have developed a modified capsaicin that skin enzymes inactivate within hours, averting some side effects while demonstrating pain and itch

Thin film of the hard material lets batteries benefit from the metal's electrochemical advantages while blocking unwanted reactions

Gossip

CHEMWATCH

relief in mice (J. Med. Chem. 2018, DOI: 10.1021/acs.jmedchem.8b00109). Asia Fernández-Carvajal of Miguel Hernández University, Tracey Piralì of the University of Eastern Piedmont, and their colleagues made capsaicin derivatives (example shown) with a built-in self-destruct switch: an ester bond in the tail of the compounds. Esterase enzymes in skin hydrolyse this bond, producing two metabolites that the body easily eliminates. The researchers tested the compounds for activity on TRPV1 and then assayed the most potent candidates in human skin cells to find those that were significantly hydrolysed. In mice, the best-performing molecule reduced sensitivity to heat, touch, and itch without producing body temperature spikes. The effects lasted up to 90 minutes.

Chemical & Engineering News, 17 June 2018

<http://pubs.acs.org/cen/news>

New form of matter may lie just beyond the periodic table

2018-06-26

Currently, the heaviest element on the periodic table is oganesson, which has an atomic mass of 294 and was officially named in 2016. Like every element on the periodic table, nearly all of oganesson's mass comes from protons and neutrons (types of baryons) that are themselves made of three quarks each. A crucial feature of all known baryonic matter is that its quarks are bound together so tightly by the strong force that they are inseparable. As particles made of bound quarks (such as protons and neutrons) are called hadrons, scientists refer to the ground state of baryonic matter as "hadronic matter." But oganesson may be one of the last of its kind. In a new paper, scientists predict that elements with masses greater than approximately 300 may be composed of freely flowing "up" and "down" quarks—the same kind that protons and neutrons are made of, but these quarks wouldn't be bound into triplets. The scientists predict that this type of matter, called "up down quark matter," or udQM, would be stable for extremely heavy elements that might exist just beyond the end of the current periodic table. If it could be produced on Earth, quark matter has the potential to be used as a new source of energy. The possibility that heavy baryonic matter has a udQM ground state rather than a hadronic one is described in a paper published in Physical Review Letters by University of Toronto physicists Bob Holdom, Jing Ren, and Chen Zhang. The idea that some kind of quark matter might form the ground state of baryonic matter is not new. In a famous paper from 1984, physicist Edward Witten suggested that strange quark matter (SQM)

In a new paper, scientists predict that elements with masses greater than approximately 300 may be composed of freely flowing "up" and "down" quarks—the same kind that protons and neutrons are made of, but these quarks wouldn't be bound into triplets.

Gossip

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might fulfil this role. However, SQM consists of comparable amounts of up, down, and strange quarks. One of the new results of the latest study is that quark matter without strange quarks, i.e., udQM, has lower bulk energy per baryon than either SQM or hadronic matter, making it energetically favourable. "Physicists have been searching for SQM for decades," the researchers told Phys.org. "From our results, many searches may have been looking in the wrong place. ... It is quite a basic question to answer: What is the lowest energy state of a sufficiently large number of quarks? We argue that the answer is not nuclear matter or strange SQM, but rather udQM, a state composed of nearly massless up and down quarks." The idea that quark matter may lie just beyond the periodic table is somewhat surprising because, in general, quark matter is thought to exist only in extreme environments, such as the cores of neutron stars, heavy ion colliders, hypothetical quark stars, and within the first milliseconds of the early universe. When produced in a collider, quark matter typically decays within a fraction of a second into stable hadronic matter (with bound quarks). The physicists hope that, if the minimum mass of elements with a udQM ground state is not much more than 300, it may be possible to produce this new form of stable matter by fusing together some of the other heavy elements. They expect that one of the challenges will be to supply enough neutrons in the reaction, but that udQM may be easier to produce than SQM. One reason for their optimism is that the new results point to the existence of a "continent of stability"—a large region in which udQM may have the most stable configuration, which may guide future production attempts. If producing udQM presents difficulties, the researchers note that it can also be searched for on Earth, since it can arrive via cosmic rays and then become trapped in normal matter. In the future, the researchers plan to explore the possibility of searching for quark matter, both on Earth and in more distant locations. "We would like to know more about the abundance of quark matter in the universe," the researchers said. "We are thus looking at the conversion rate of nuclear matter to udQM inside neutron stars. We would also like to identify those searches for SQM that are most relevant for udQM. It is then of interest to consider how those searches could be improved upon and/or extended." If scientists could produce or find quark matter of any kind, one very intriguing potential application is energy generation. "Knowing better where to look for udQM might then help to achieve an old idea, that of using quark matter as a new source of energy," the researchers said. "If quark matter is found (or produced in accelerators), it may be stored and then fed with slow neutrons or heavy ions. The absorption of these particles means a lower total mass and thus a release of energy, mostly in

Gossip

CHEMWATCH

the form of gamma radiation. Unlike nuclear fusion, this is a process that should be easy to initiate and control.”

Phys.org, 15 June 2018

<http://phys.org>

Is Fiskville the tip of an iceberg? PFAS detected across Victoria

2018-06-26

People left seriously ill after exposure to toxic chemicals at the Country Fire Authority's former Fiskville training college are yet to receive financial help, two years after the state government promised compensation. The government committed to a redress scheme in May 2016, after a parliamentary inquiry found CFA management had allowed its members and their families to be exposed to toxic chemicals with known links to cancer and other illnesses. There are at least another 16 sites in Victoria and 90 Australia-wide where elevated levels of per- and poly-fluoroalkyl chemicals – known as PFAS – have been detected, a Fairfax Media investigation has found. The mothballed Fiskville academy, 95 kilometres west of Melbourne, is so far the most widespread case of PFAS exposure in Victoria. Beyond Fiskville, locations including other CFA training areas, Defence bases, airports and corporate sites have been investigated over concerns about the effects of PFAS contamination on nearby residents, water sources, agriculture, livestock and other animals. Fairfax Media has since learnt of a further two sites in Melbourne where PFAS has been confirmed – at Essendon and Moorabbin airports – and a third location, near housing at the RAAF Laverton base, which will be assessed for the chemicals. PFAS has spread beyond the boundaries of at least five Victorian sites – including Melbourne Airport, Esso Longford and the East Sale RAAF base in Gippsland, and CFA training sites in Penshurst and Wangaratta. A Fairfax Media investigation revealed over the weekend that at least 21 children at a high school in the US have battled cancer through their school years while growing up in a city whose water supply was contaminated with PFAS. It has previously revealed 50 cancer cases over a 15-year period near the Williamstown air base in NSW, an area that has also been contaminated with PFAS chemicals from firefighting foam.

What is PFAS?

Australia is one of only a handful of countries that has failed to ban the chemicals. The federal government is defending multiple class actions

The state government has committed to a redress scheme for those who have fallen ill or died after being exposed to toxic chemicals at the former Fiskville CFA training college.

Gossip

CHEMWATCH

from towns where contamination has occurred. The Department of Health maintains there is no consistent evidence the toxins cause “important” health effects, in contrast to the US EPA, which has concluded they are a human health hazard that – at high enough levels – can cause immune dysfunction, hormonal interference and certain types of cancer in humans. Man-made PFAS chemicals have been described as “virtually indestructible” in the environment and repel grease, oil and water. They were manufactured by Fortune 500 company 3M for half a century, with the two best-known of the family called perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). PFOS was the key ingredient in 3M’s popular fabric protector Scotchguard, and was used widely in firefighting foams, food packaging and metal plating. By the time 3M made the surprise announcement it would voluntarily exit the PFAS business in 2000, PFOS had contaminated the blood of more than 95 per cent of the human population along with wildlife in remote corners of the globe. Due to their long biological half-life, the chemicals take years to exit the body, but average levels in the blood of Australians plummeted about 56 per cent in the decade following the phase-out announcement. The chemicals still pose a threat in Australia today, mainly because of their use in Aqueous Film Forming Foam (AFFF), a fire retardant manufactured by 3M and used by the military, commercial airports, fire brigades and heavy industry for decades.

Fiskville failings

The mothballed Fiskville academy, 95 kilometres west of Melbourne, is so far the most widespread case of PFAS exposure in Victoria. Up to 87,000 people are believed to have been put at risk of exposure to the carcinogens there over 30 years. The CFA’s Fiskville training college west of Melbourne was shut down in 2015. It has since had an \$80 million clean-up. A 2015 Monash University study of 606 people who worked at the site between 1971 and 1999 identified 69 cancer cases that resulted in 16 deaths. The findings delivered in the May 2016 final report of a Victorian parliamentary inquiry into Fiskville were damning. CFA management had allowed its members at Fiskville and their families to be exposed to toxic chemicals with known links to cancer and other illnesses, it found. The CFA had known about the possible health risks since the 1990s, the inquiry heard, but did not notify staff and volunteers past and present. That only came to light in 2011, in an expose in the Herald Sun. The inquiry made a number of recommendations, including a redress scheme. In May 2017, while announcing legislation giving firefighters who get cancer because of their job a presumptive right to

Gossip

CHEMWATCH

compensation, Victorian Premier Daniel Andrews said: "We will make further announcements about a proper redress scheme for those who were for too long lied to." It's their families we now deal with because they themselves are no longer with us anymore." Yet 12 months after he made those comments, and two years since his government agreed to compensate those affected, no scheme has been announced. In response to questions from Fairfax Media, the state government said it was "continuing to examine redress scheme options". When pressed it gave no indication of when a compensation package would be finalised. "Our focus has always been with those affected by their time spent at Fiskville," a spokeswoman said. "We acted swiftly to close the site in 2015, and we are acting on the recommendations of the Parliamentary Inquiry." In its response to the inquiry, the government acknowledged that many people had concerns about how their time at Fiskville may have affected them. It gave in-principle support to establishing a redress scheme, subject to consideration of who would be eligible, how it would affect their legal rights or other forms of compensation and how it should be resourced. "The government is in the process of examining these issues," a spokeswoman said. A class action has been on ice since the government committed to compensation. Some applicants have been told to expect an announcement on compensation within months. The family of one former Fiskville employee Brian Potter received a state government payout last year. Mr Potter, a former CFA chief officer who helped expose the Fiskville scandal, died in 2014 after losing a workers' compensation bid.

Other CFA sites

Half of the Victorian locations where PFAS has been found are CFA sites. In addition to Fiskville, its training grounds at Craigieburn, Bangholme, Fulham, Huntly, Longerenong, Penshurst and Wangaratta have been affected. Victoria's Environment Protection Authority issued clean-up notices for six of those sites and continues to monitor them. Tests on water supplies have found they are safe to drink. However, testing of groundwater has shown several nearby bores are contaminated with PFAS. "CFA and EPA are working with landowners to ensure any potential risks are known and managed," the EPA said. "CFA and the auditor have provided full briefings to neighbours, representatives from the community and key agencies such as local water corporations and the Department of Health and Human Services." An environmental audit last year found PFAS levels above drinking water guidelines at Murdum Creek, 6.5 kilometres from the CFA site, were likely to be from the training facility. The auditor said the southern portion of one nearby property should not be used

Gossip

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for livestock and crop production, and livestock production should be banned on all of another farm. Low levels of PFAS were detected at a disused bore near the Wangaratta site. "CFA is continuing to provide support, information and resources around the impacts to health and the environment PFAS could potentially have on local communities near our ... training centres," a CFA spokesman said in a statement to Fairfax Media. "Planned works are informed by independent environmental consultants, monitored by the EPA and scoped out in collaboration with government authorities, local councils, community stakeholders, member representatives, and other emergency service organisations. "CFA has now completed the decommissioning of the former Fiskville Training College and planning for rehabilitation works is well underway to return the site to beneficial use in line with EPA Notices."

Moving on

As recommended by the inquiry, Fiskville was decommissioned and remediated, at a cost to the state government of around \$80 million. The site was recently touted as a potential site for a new motorsport complex. While others affected wait for redress, Neville Callow, whose 37-hectare farm near Ballan neighbours Fiskville, is reluctantly moving on. On Sunday, Mr Callow confirmed to Fairfax Media that he had signed a settlement with the CFA, but due to the agreement could divulge little more. "They've bought my property and I've got about nine months to find somewhere else to live for me and my daughter," Mr Callow said. "There's a lot I could say but I'm not allowed to," he said. Mr Callow, who farmed sheep and cattle on his property for around 13 years, said he and his daughter were on a health surveillance program and received blood tests every six months. "It's a pity," he said. "I didn't want to move, it's a lovely spot. But life moves on. I'll just have to go and retire somewhere."

Airports affected

Air Services Australia, a government-owned corporation responsible for aviation services including firefighting, is investigating after PFAS was confirmed at fire stations and fire training grounds at Melbourne and Avalon airports. "Airservices Australia is currently undertaking a national program of work to better understand the impacts of PFAS," a spokeswoman told Fairfax Media on Friday. "We began phasing out foams containing PFAS in the early 2000s and have not used firefighting foam containing PFAS since 2010 at any of our civilian airport operations, including at Avalon and Melbourne Airports." It recently completed a preliminary investigation at Melbourne Airport and expects to release

Gossip

CHEMWATCH

a report in several months. "We are working with relevant organisations including Melbourne Airport, the Commonwealth Airport Regulator and state government agencies to determine an appropriate management plan," the spokeswoman said. "At Avalon Airport, we have commenced a PSI and expect to finalise this by the end of 2018." In recent weeks Melbourne Airport confirmed to the ABC that PFAS contamination had spread beyond the airport boundaries. The airport sits between two waterways: Maribyrnong River and Moonee Ponds Creek. Melbourne Airport Authority (MAA) was in the process of notifying neighbouring landholders of the contamination, airport spokesman Grant Smith told the broadcaster. It believed the health risk posed by the contamination to landholders downstream was low, but as a precaution it would ask neighbours whether they used surface water from waterways that flow through their properties, Mr Smith told the ABC. A Melbourne Airport spokeswoman told Fairfax Media it had no further comment on the matter. Fairfax Media has also learnt of PFAS detected at airports in the Melbourne suburbs of Essendon and Moorabbin. The chemicals had been found at both sites, which are owned by the government and leased out, according to a Department of Infrastructure and Regional Development submission to a Senate inquiry into PFAS contamination. "The department ... as the regulator for federal leased airports, has become aware of the potential impacts of current and legacy [PFAS]" at the two airports, among 20 nationally, the submission says. An Essendon Airport representative told a community consultation meeting in March 2017 that PFAS had been detected. "Essendon Airport has detected PFAS contamination near the former fire training ground which was occupied by Airservices Australia until the early 1990s," the minutes state. "The maximum PFOS soil concentration identified is well below the interim screening level for direct contact (industrial) of 90 mg/kg." Airport management hired an environmental consultant to do more detailed sampling in July 2017. It has yet to report back to the committee with the results. An Essendon Airport spokesman said investigations were ongoing and it would keep the community informed. "Our key priority is tackling the challenge of stopping any identified pollution from leaving the airport through surface run-off or ground water." Much of the airport's perimeter is close to Moonee Ponds Creek. Fairfax Media was unable to reach Moorabbin Airport for comment before deadline.

Defence bases

PFAS have been found at Defence Department sites including Royal Australia Navy base HMAS Cerberus on the Mornington Peninsula, RAAF

Gossip

CHEMWATCH

Base Williams at Point Cook in Melbourne's west, Bandiana Military Area in Wodonga, and RAAF Base East Sale in Gippsland. In May the federal government announced a new Parliamentary inquiry examining its handling of PFAS contamination in and around Defence bases. Submissions can be made to the committee, chaired by Liberal MP Andrew Laming, until July 6. It said it had conducted no PFAS testing at Point Cook but confirmed remedial works had been completed previously. The site was remediated a few years before Defence made PFAS contamination public. It is unclear what levels of PFAS were on or off the site at the time. The EPA said Defence would assess the nearby Laverton RAAF base, which has some housing. "DoD has appointed a land consultant and an environmental auditor and will soon commence assessment works at the site." Preliminary sampling at Cerberus and Bandiana have shown contamination exceeding drinking water guidelines. Further investigations are under way. Defence has held two investigations at East Sale base since 2016. A third probe, a human health and ecological risk assessment, is due to be completed this year. The site is in an environmentally sensitive area, close to the Gippsland Lakes – a wetlands site of international significance – and Heart Morass wetlands. Drainage from the site leads to these areas. Most surrounding land is farm zoned and used for dairy farming, cattle grazing and as rural residential areas. Beyond the base, there is a risk of contamination from incidental contact with shallow groundwater, consumption of livestock, fish, dairy products and ducks. In September last year the EPA issued warnings about consumption of ducks, fish and eels from Heart Morass. In March the state government refused to suspend shooting at Heart Morass during duck hunting season. In recent weeks it has taken samples of sediment, soil and water from Lake Wellington near East Sale to be tested for PFAS and other chemicals. The results won't be known for several months.

Industrial areas

There are several other sites in Gippsland where PFAS has been detected: at the Esso Longford gas plants, and near the shuttered Hazelwood power station in the Latrobe Valley. Esso is considering buying farmland neighbouring the gas plants affected by PFAS contamination, Fairfax Media's Gippsland Times reported earlier this year. At a community information session in February, attendees were told testing revealed contamination of surface water at the plant, and higher than normal levels in surface and ground water, as well as in soil samples around the plant. Esso has committed to a two-year independent audit, as ordered by the EPA. Some dams on Esso property, and some in neighbouring farms,

Gossip

CHEMWATCH

were fenced off as a “precautionary measure” to protect livestock. Posters at the drop-in session showed 26 out of 61 sampled dams on Esso land had been fenced, as were nine out of 75 dams on non-Esso land. “We’ve had some precautionary notifications to livestock owners within our boundaries, precautionary blood sampling, and as far as water, no issues with drinking water,” Longford plants manager David Anderson told the Times. Market gardeners in the vicinity are believed to be among nearby landowners affected. However, when Fairfax Media called Covino Farms, a grower bordering the Esso land, it was adamant it was not affected. “We don’t have any PFAS contamination”, a woman who answered said. Esso parent company Exxon Mobil said it had developed a clean-up plan for the area surrounding its Longford gas plants, which the EPA had accepted. “Our sampling and analysis program continues and, consistent with the information Esso provided to the local community at recent forums, we continue to observe decreasing levels of PFAS as we move away from the facility,” a spokesman said. “We are working with our neighbours on a one to one basis to support them where necessary. Each neighbour is being assessed individually.”

The Age, 18 June 2018

<http://www.theage.com.au>

Physicists Think The Weather Can Trigger Blackouts In An Unexpected Way

2018-06-26

A team of researchers built a model of power grids that transport electricity from solar and wind power. That means that there are places where the grid receives fluctuating inputs of power, since levels of sunlight and wind vary. You might think that a power grid failure would be the result of a single windstorm or thunderstorm at one node. But that isn’t the case, based on the researchers’ model, which uses the tools of statistical physics, a field whose maths describes a lot of interacting and randomly moving pieces. They found that small, unusual fluctuations combined over the entire network were more likely to take the power lines down, according to the paper published in Physical Review Letters. The model was also able to predict where a line would fail and how the failure would propagate, given information about the grid and the weather. The researchers compared their model to actual data from the German transmission grid, which gets about 33 per cent of its power from renewable sources, and things seemed to line up. Being a model, there are some assumptions built in that might not correspond to the

Renewable resources are great, but they bring a new element of uncertainty to a power grid. This element can lead to failure in surprising ways, according to a new paper.

Gossip

CHEMWATCH

real world. But perhaps these are the types of things that must be taken into account when designing a power grid that relies in part on the ever-temperamental weather.

Gizmodo, 24 June 2018

<http://gizmodo.com>

Toxic Secrets: Professor 'bragged about burying bad science' on 3M chemicals

2018-06-26

As a leading international authority on toxic chemicals, Professor John P. Giesy is in the top percentile of active authors in the world. His resume is littered with accolades, from being named in the Who's Who of the World to receiving the Einstein Professor Award from the Chinese Academy of Sciences. Professor Giesy was credited with being the first scientist to discover toxic per- and poly-fluoroalkyl [PFAS] chemicals in the environment, and with helping to persuade chemical giant 3M Company to abandon their manufacture.

Professor John Giesy was allegedly covertly doing 3M's bidding in a widespread campaign to suppress academic research on the dangers of PFAS. But Fairfax Media can now reveal that Professor Giesy was accused of covertly doing 3M's bidding in a widespread international campaign to suppress academic research on the dangers of PFAS. A trove of internal company documents has been made public for the first time following a \$US850 million (\$1150 million) legal settlement between the company and Minnesota Attorney-General Lori Swanson. They suggest that Professor Giesy was one weapon in an arsenal of tactics used by the company to - in a phrase coined by 3M - "command the science" on the chemicals. The documents have allowed the state to chronicle how 3M, over decades, allegedly misled the scientific community about the presence of its chemicals in the public's blood, undermined studies linking the chemicals with cancer and scrambled to selectively fund research to be used as a "defensive barrier to litigation". Experts have branded the strategies nearly identical to those used historically by the tobacco and pharmaceutical industries. At least 90 communities across Australia are being investigated for elevated levels of the contaminants, including 10 in Sydney. The Australian government is aggressively defending a growing number of class actions from towns where the chemicals were used for decades in fire retardants on military bases, the runoff tainting the soil and water of surrounding homes. The Department of Health

Professor Giesy was credited with being the first scientist to discover toxic per- and poly-fluoroalkyl [PFAS] chemicals in the environment, and with helping to persuade chemical giant 3M Company to abandon their manufacture.

Gossip

CHEMWATCH

maintains there is “no consistent evidence” that the chemicals can cause “important” health effects such as cancer. In arguing this, its experts have made reference to the work of 3M scientists, who insist the chemicals are not harmful at the levels found in the blood of humans. On Saturday, Fairfax Media exposed cancer cluster fears centring on a high school in Oakdale, Minnesota, in America’s upper mid-west, a few blocks from 3M’s global headquarters and where the water was contaminated with PFAS. 3M has vigorously denied the allegations. It did not accept liability in February, when it reached a settlement on the courthouse steps over alleged damage to Minnesota’s natural resources and drinking water. A spokesperson said: “The vast body of scientific evidence, which consists of decades of research conducted by independent third parties and 3M, does not show that these chemistries negatively impact human health at current exposure levels”. But several leading public health agencies in the United States have sounded warnings to the contrary. In 2016, the United States Environmental Protection Agency found the “weight of evidence” supported the conclusion that the chemicals were a human health hazard, warning that exposure over certain levels could result in immune and developmental effects and cancer. The US National Toxicology Program found they were “presumed to be an immune hazard” based on high levels of evidence from animal studies and a moderate level from humans. Immune suppression - usually as a result of conditions such as organ transplant or HIV - is known to increase the risk of several types of cancer by making the immune system less able to detect and destroy cancer cells or fight cancer-causing infections. DuPont, which used PFAS chemicals in the manufacture of Teflon, reached a \$US670 million settlement with residents living near its manufacturing plant in Ohio, West Virginia, last year, after an expert health panel conducted a large-scale epidemiological investigation. It concluded that residents’ drinking water, tainted with one of the chemicals called PFOA, had a “probable link” to six health conditions, including kidney and testicular cancer. One of 3M’s own material data safety sheets for a PFAS chemical included a warning that it could cause cancer in 1997 - that was subsequently removed - according to the Minnesota case. The chemical of greatest concern in Australia is perfluorooctane sulfonate, or PFOS, arguably the most toxic of the chemicals studied. This was widely used in Scotchgard and fire-fighting foams. Last month, there was a storm of controversy amid claims that the US EPA and the White House blocked the publication of a health study on PFAS carried out by the country’s Agency for Toxic Substances and Disease Registry. In emails leaked to Politico, a Trump administration aide warned that the report would be a “public relations nightmare” because it would show that the chemicals endangered human health at far lower levels than

Gossip

CHEMWATCH

what the EPA had previously deemed safe. Health warnings were echoed by Harvard Professor Philippe Grandjean and Professor Jamie DeWitt of North Carolina State University in their expert testimonies for the State of Minnesota. Professor Grandjean argued that PFAS chemicals pose a “substantial present and potential hazard” to human health, including to immune, thyroid, liver, endocrine, cardiovascular and reproductive functions, and by “causing or increasing the risk of cancer.” “Both PFOA and PFOS show convincing associations with these outcomes,” he said, adding that risks to human health had been identified at very low exposure levels.

Watching ‘bad papers’

To the outside world, Professor Giesy was a renowned and independent university academic. “But privately, he characterised himself as part of the 3M team,” alleged the State of Minnesota. “Despite spending most of his career as a professor at public universities, Professor Giesy has a net worth of approximately \$20 million. This massive wealth results at least in part from his long-term involvement with 3M for the purpose of suppressing independent scientific research on PFAS.” Professor Giesy’s consulting company appears to have received payments from 3M between at least 1998 and 2009. One document indicated his going rate was about \$US275 an hour. In an email to a 3M laboratory manager, Professor Giesy described his role as trying to keep “bad papers out of the literature”, because in “litigation situations they can be a large obstacle to refute”. Professor Giesy was an editor of several academic journals and, in any given year, about half of the papers submitted on PFAS came to him for review. “Some journals ... for conflict-of-interest issues will not allow an industry to review a paper about one of their products. That is where I came in,” he wrote in another email. “In time sheets, I always listed these reviews as literature searches so that there was no paper trail to 3M.” Professor Giesy is alleged to have passed confidential manuscripts on to 3M, as well as an email from an EPA scientist detailing its latest PFAS investigations in Athens, Georgia. He allegedly bragged about rejecting the publication of at least one paper containing negative information about PFAS. In another email chain, a 3M manager was concerned that a study Professor Giesy had drafted was “suggestive” of possible PFAS health hazards and should be cushioned with an accompanying document on the health effects. “This paper ... could set off a chain reaction of speculation that could reopen the issue with the media and move it back to a health story; something up to now we have avoided,” he wrote. Professor Giesy is based at the University of Saskatchewan in Canada, but he also holds positions with the University of Michigan and several Chinese universities.

Gossip

CHEMWATCH

An internal 3M document referred to him needing to “buy favours” when developing joint projects with Chinese colleagues “over whom he can exert some influence”. A spokesperson for the University of Saskatchewan said it had conducted two reviews of Dr Giesy’s conduct. “We found nothing out of the ordinary or evidence of conflict of interest,” she said. The university stressed that the “vast majority” of Professor Giesy’s work for 3M was conducted while at Michigan State University, despite evidence of 3M payments to Professor Giesy’s consulting company after he arrived in Canada. Professor Giesy’s explanations included that these were “possibly” payments for previous work or studies by other employees of his consultancy. “He cannot be absolutely sure of the timing,” the university spokesperson said. “With respect to the emails ... Dr Giesy explained to us that ‘bad papers’ referred to ‘bad science’ or ‘inaccurate’ papers or ‘poorly conducted’ research ... and ‘no paper trail to 3M’ was due to the sensitivity of research findings conducted on PFAS produced by companies, primarily in foreign countries, other than 3M.” But several academics were furious with the university’s position. Professor Arthur Schafer, an expert in applied ethics at the University of Manitoba, slammed the explanation for the “no paper trail” comment as “ludicrously implausible”. “I don’t think it matters a hoot whether Giesy’s ethically questionable activities all took place prior to his coming on staff at the University of Saskatchewan or whether they continued,” he said. “The evidence points to deeply troubling conduct which, if confirmed by a proper investigation, should lead to disciplinary action - probably termination, given the seriousness of the behaviour.” One of the university’s council members, Professor Len Findlay, was unconvinced by the university’s reviews. “A key question remains: If the University of Saskatchewan had known much sooner about those emails between Giesy and 3M, would they still have recruited him? If so, what does that say about their desperation to buy a more illustrious institutional reputation and ranking through hires?” Professor Findlay said. “And what about 3M’s agreement to settle out of court, after delaying that action until the very last minute? What does that suggest about the nature of work undertaken on their behalf?”

The actions of Professor Giesy were a jigsaw piece in a much broader puzzle, according to the State of Minnesota. It alleged that 3M:

- Formed an internal team to “command the science” on the chemicals, erect “defensive barriers to litigation” and ensure scientific papers did not include information contrary to the company’s “business interests”;

Gossip

CHEMWATCH

- Funded friendly research, on the condition the company could edit the draft scientific papers and, on occasion, control whether they were published at all;
- Referred reporters to “independent third-party experts” who were actually carefully vetted, paid for their services and signed confidentiality agreements;
- Destroyed documents, told staff to stamp all documents relating to PFAS as attorney-client privileged, throw away pencil notes from meetings and not to jot down thoughts because of how they could be viewed during legal discovery. One employee made a note to “clean out computer of all electronic data” on the chemicals.

Decades of inaction

When 3M announced the voluntary phase-out of PFOS in 2000, it was presented as an environmentally responsible decision - costing the company \$US480 million in annual revenue - and based on concerns over the discovery of PFOS in the blood of the general population in 1997. But according to internal documents, the company had actually made that discovery decades earlier, in the 1970s. Just before the phase-out announcement, the US EPA reviewed a PFOS study in rats, in which all of the offspring of the first generation died and many offspring of the second generation. “It is very unusual to see such second-generation effects,” the director of its Chemical Control Division wrote. About that time, scientist Richard Purdy quit 3M and copied the agency in on his resignation letter. He expressed “outrage” that his colleagues wanted to avoid collecting data on PFOS, which he described as “the most insidious pollutant” since polychlorinated biphenyl (PCB) and “probably worse”. PCB was an industrial chemical that was banned when it was found to be a human carcinogen. “I have worked to the best of my ability within the system to see that the right actions are taken on behalf of the environment,” he wrote. “Yet I see slow or no results. I am told the company is concerned, but their actions speak to different concerns than mine.” The failure of 3M to report information to the EPA on the adverse effects of the chemicals ultimately resulted in a \$US1.5 million fine. In his testimony, Professor Grandjean argued that 3M had documented adverse effects in animals as early as the 1970s, with one researcher warning that PFOS was “certainly more toxic than anticipated”. 3M did not pursue findings of PFAS in the breast milk of animals and published some of its studies after lags of 25 years, Professor Grandjean found. More concerning were several 3M-sponsored studies of its own exposed factory workers that showed elevated rates of prostate cancer, including statistically significant findings.

Gossip

CHEMWATCH

One paper put the spike in prostate cancer deaths down to chance or because of the higher prevalence of prostate cancer in Minnesota. "Subsequent analyses provided to 3M ... indicate that prostate cancer was actually less prevalent in Minnesota than in the US," Professor Grandjean wrote. "Early studies of worker health inappropriately sought to explain away any possible associations with ill health." In 1979, renowned scientist Dr Harold Hodge warned the company that if the chemicals were found to be widespread in the blood of the general population and had long half-lives, "we could have a serious problem". The phrase was removed in a later document referring to the conversation. In another internal email, a 3M scientist wrote that one consideration as to whether a study should be done on reproductive effects was "the possibility of finding reproductive effects when conducting such a study". Another controversy arose surrounding the work of a University of Minnesota thesis student, Frank Gilliland, who did early studies on 3M's exposed factory workers. He found signs of hormonal and immune system abnormalities in males. But follow-up studies authored by 3M "undermined" these findings, Professor Grandjean said. Professor Grandjean has pioneered research into the effects of the chemicals on childhood vaccines, finding that as PFAS exposure doubled, vaccines were about half as effective in children in the Faroe Islands. A "substantial" number of children had such low levels of antibodies that they had virtually no protection against the diseases. He expressed concern about the scarcity of research into the effect of chemicals on infants and unborn children, who were exposed through cord blood and breast milk and were "likely more vulnerable to toxic effects".

'A dirty game of survival'

It is no secret that 3M has poured significant funds into sponsoring PFAS research by consultancies and academic institutions. But the court documents indicate the company may have gone further - influencing studies but keeping its fingerprint hidden. According to court documents, the use of a "ghost writer" was floated at a 3M meeting in 2008. Professor Lisa Bero, of the University of Sydney, is internationally renowned for her investigations into the influence of industry on scientific research, as one of the first authors to scrutinise the tactics used by the tobacco and pharmaceutical companies. Much of her work has been based on documents that have come to light through litigation. "It's directly parallel, I would have to say - the strategies that were used in the PFAS case are really all the same as we've seen used across the other industries," she said. "Even the wording was identical." One of the most interesting elements,

Gossip

CHEMWATCH

she said, was that they all referred to scientific publication strategies. "That is all about generating evidence to either protect them from litigation or to market their products. It's not about creating new scientific knowledge." The key witness for 3M in the Minnesota case was Ellen Chang, a principal scientist at scientific consultancy Exponent. In her testimony, she argued that the weight of epidemiological evidence did not prove a causal link between exposure to PFAS and "specific adverse health outcomes in humans". Exponent, based in California, has courted controversy on several occasions in the US, with some critics labelling it a "hired gun" producing science to meet the needs of corporations in messy courtroom battles. The firm has come under fire for casting doubt on studies linking second-hand smoke with cancer, as well as rates of lung cancer among mechanics exposed to brakes containing asbestos. "That criticism is quite simply factually wrong," an Exponent spokesperson said. "We provide our clients with our engineering and scientific findings, which are frequently not what they would like to hear but rather what they need to know." A 2016 study authored by Ms Chang reviewed all available evidence and concluded that PFAS exposure did not increase the risk of cancer in humans. The study was cited by toxicologists working for Australia's Department of Defence as part of a human health risk assessment on exposed populations in Australia. It was also included in a report by the Department of Health's expert panel on PFAS, which concluded that the current evidence did not support a "large impact" from PFAS exposure on a person's health. However, the panel did admit that "important health effects" cannot be ruled out, and there was "fairly consistent" evidence linking PFAS exposure with changes in immune response, altered sex hormones, increased cholesterol, reduced kidney function and low birth weight. Professor Nicholas Buckley, of the University of Sydney, who chaired the panel, defended the use of Ms Chang's studies in its review and argued that the "most importance guidance" came from other independent studies. "The major potential conflicts of interest for Chang's 3M-funded reviews were noted in the PFAS report on multiple occasions, and the likely impact of that was considered," he said. "Their results get summarised on about half-a-dozen pages in a 400-page report." But lawyer Robert Bilott, who led the successful class action against Dupont in West Virginia, criticised the decision. "Papers prepared years after the fact to serve to manufacture doubt or perpetuate a false perception of uncertainty ... with respect to PFOA should not be relied upon or cited as a basis for minimising or ignoring potential health risks," he wrote. Dr Fardin Oliaei did not pause when asked whether 3M's studies on the chemicals could be trusted, responding "of course not". As a scientist with the Minnesota Pollution Control Agency, she was one of the first to begin investigating the

Gossip

CHEMWATCH

spread of PFAS chemicals in the state. She alleges she was blocked from conducting her research and eventually forced out of her job, at a time when the agency was headed by Commissioner Sheryl Corrigan, a former high-ranking 3M manager. "The reality is this is a game, a dirty game of survival, of big industry," said Dr Oliaei, who settled a whistleblower lawsuit filed in the federal court. "Seeing other scientists who lose their dignity and sleep in the same bed with this dirty corrupted industry? It's heartbreaking. "But when I look at it in a global level ... here's what it is: You just have to be someone that you can go to bed and put your head in peace on the pillow."

The Age, 16 June 2018

<http://www.theage.com.au>

'Green' coating protects plastics

2018-06-26

Devices that can flex and stretch, including wearable electronics, roll-up solar cells, and foldable displays, are all the rage these days. Engineers design those devices to keep working, bend after bend. A tough, transparent, eco-friendly coating applied to the plastic support might help those devices last even longer, a study suggests (ACS Nano 2018, DOI: 10.1021/acsnano.8b01057). Many plastic devices have thin coatings designed to go unnoticed. Measuring just a fraction of a micrometre in thickness, these nearly invisible films of organic and inorganic materials improve a wide range of commercial products. For example, polysiloxane coatings on polycarbonate eyeglass lenses make them scratch resistant. Knowing that manufacturers are always on the lookout for new types of cost-effective coatings, a team led by Stanford University materials scientists Farhan Ansari and Reinhold H. Dauskardt looked to an unusual place for source material—the forest. The team made hybrid coatings by embedding various concentrations of nanocellulose fibrils, a tough material derived from trees, in a glass matrix composed of zirconium alkoxide and an epoxy-functionalised silane. The team used low-cost colloidal chemistry methods to prepare the precursor solutions and then sprayed the mixtures onto flexible polymer substrates, including poly(ether imide) and poly(ethylene terephthalate), and then cured the films at low temperature. The results were highly transparent, nanometre-thick films. Tests indicate that coatings containing 20 wt % nanocellulose protect the polymer substrates by boosting hardness and fracture

Transparent film of nanocellulose in a glass matrix confers hardness and fracture toughness to plastic

Gossip

CHEMWATCH

resistance. Microscopy analysis shows that even after 20,000 bending cycles, the films revealed no signs of delamination or cracking.

Chemical & Engineering News, 14 June 2018

<http://pubs.acs.org/cen/news>

We Just Made a Huge Breakthrough in Creating Opioids That Won't Kill People

2018-06-26

In the past three years, more than 125,000 persons died from an opioid overdose – an average of 115 people per day – exceeding the number killed in car accidents and from gunshots during the same period. America desperately needs safer analgesics. To create them, biochemists like myself are focusing not just on the opioids, but on opioid receptors. The opioids “dock” with these receptors in the brain and peripheral nervous system, dulling pain but also causing deadly side effects. My colleagues and I in Bryan Roth’s lab have recently solved the atomic structure of a morphine-like drug interacting with an opioid receptor, and now we are using this atomic snapshot to design new drugs that block pain but without the euphoria that leads to addiction.

What has caused the opioid epidemic?

In the US, more than one-third of the population experiences some form of acute or chronic pain; in older adults this number rises to 40 percent. The most common condition linked to chronic pain is chronic depression, which is a major cause of suicide. To relieve severe pain, people go to their physician for powerful prescription painkillers, opioid drugs such as morphine, oxycodone and hydrocodone. Almost all the currently marketed opioid drugs exert their analgesic effects through a protein called the “mu opioid receptor” (MOR). MORs are embedded in the surface membrane of brain cells, or neurons, and block pain signals when activated by a drug. However, many of the current opioids stimulate portions of the brain that lead to additional sensations of “rewarding” pleasure or disrupt certain physiological activities. The former may lead to addiction, or the latter, death. Which part of the brain is activated plays a vital role in controlling pain. For example, MORs are also present in the brain stem, a region that controls breathing. Activating these mu receptors not only dulls pain but also slows breathing. Large doses stop breathing, causing death. Activating MORs in other parts of the brain, including the ventral tegmental area and the nucleus accumbens, block pain and

The problem with opioids is that they kill pain – and people.

trigger pleasure or reward, which makes them addictive. But so far there is no efficient way to turn these receptors “on” and “off” in specific areas. But there is another approach because not all opioids are created equal. Some, such as morphine, bind to the receptor and activate two signalling pathways: one mediating pain cessation and the other producing side effects like respiratory depression. Other drugs favour one pathway more than the other, like only blocking pain – this is the one we want.

“Biased opioids” to kill pain

But MOR isn't the only opioid receptor. There are two other closely related proteins called kappa and delta, or KOR and DOR respectively, that also alter pain perception but in slightly different ways. Yet, currently there are only a few opioid medications that target KOR, and none that target DOR. One reason is that the function of these receptors in the brain neurons remains unclear. Recently KOR has been getting attention as extensive studies from different academic labs show that it blocks pain without triggering euphoria, which means it isn't addictive. Another benefit is that it doesn't slow respiration, which means that it isn't lethal. But although it isn't as dangerous as MOR, activating KOR does promote dysphoria, or unease, and sleepiness. This work suggests it is possible to design a drug that only targets the pain pathway, without side effects. These kind of drugs are called “biased” opioids.

Discovering and designing drugs to target KOR

So far, there are two popular ways to discover new drugs. The first involves using existing commercially available libraries of compounds and testing them on cells or animals to find one that has the required characteristics. This hit-and-miss approach is straightforward but time-consuming, running anywhere from three months to two years to screen between 3,000 to 20,000 compounds. The other strategy is called “structure-based drug design”. With this approach, you first need a high-resolution photograph of the receptor – showing the arrangement of every atom in the molecule. Then, using a computer program, you can examine up to 35 million molecules from a virtual chemical library called ZINC 15 to find a molecule that will precisely interact – lock-and-key style – with the receptor. It is like having the precise dimensions of the International Space Station so that you can design a spacecraft that can fit perfectly in the docking site. I'm a crystallographer, which means I specialise in taking atomic resolution photographs of proteins. I became interested in solving the structure of KOR – when the protein is in its active state bound to a drug. Structure is considered the gold standard for figuring out how

Gossip

CHEMWATCH

a drug interacts with a receptor and produces a signal. To solve the KOR structure, I first manufactured the KOR protein to make KOR crystals, which consists of hundreds of millions of KOR molecules stacked in the same way, just like salt molecules in a salt crystal. Then I blasted the crystals with X-rays to generate an image of the receptor at atomic level. The key to these pictures was that I “froze” the KOR proteins in their active state to understand how these receptors interact with a drug. With an action shot of KOR, we recognised what parts of the molecule are critical for blocking pain signals. We are now using this structural data to construct a “biased” molecule that only activates the pain-blocking parts of the protein without triggering side effects. Deciphering the structure of a protein is also valuable for creating a drug that interacts only with only one receptor. All the members of the opioid receptor family – MOR, KOR and DOR – look similar, like siblings. Therefore, these high-resolution photos are essential for designing drugs that will only recognise and target KOR. Our structure is now used for virtual drug screening where the computational program randomly inserts millions of compounds into the structure and ranks each of them based on how well they fit. The better the score, the more likely that compound will yield a drug. The exciting news is that researchers in the Roth lab have discovered several promising compounds based on the KOR structure that selectively binds and activates KOR, without cavorting with the more than 330 other related protein receptors. Now our challenge is to transform these molecules into safer drugs.

Science Alert, 22 June 2018

<http://www.sciencealert.com.au>

US Army has made a plastic bandage that swells to patch wounds

2018-06-26

It's hard to patch up a bleeding wound. If it's not on a limb, a tourniquet won't help, gauze doesn't absorb enough blood, and many blood clotting agents can leave residue behind, resulting in potentially dangerous side effects. A new material that's bendable, easy to apply and remove, and incredibly absorbent may help fix that. A US Army study found that 80 to 90 per cent of “potentially survivable deaths” of US soldiers who died on the battlefield before they could get to a hospital were due to uncontrolled bleeding. Army researcher Erich Bain and his colleagues set out to make a new type of bandage that would control bleeding better so injured people can make it to hospital for treatment. Their material starts with a plastic made of polystyrene and rubber, to which acrylic acid is

A new material that's bendable, easy to apply and remove, and incredibly absorbent may help patch wounds.

Gossip

CHEMWATCH

added. The plastic is strong and flexible, so the bandage can be applied to a wound without ripping and removed without leaving any bits behind, and the acrylic acid is extremely absorbent, sucking water out of the blood to help it clot more easily.

Holding fast

Finally, the material is attached to a gauze bandage containing a clotting agent. In tests, the bandage absorbed 2 to 4 times as much water as the clotting gauze alone – up to 800 per cent of the material's weight in water. It swelled to its maximum absorption in under a minute. "A soldier can bleed out in a 2-minute time frame with a bad wound, so once you start to apply this, you really need it to swell extremely rapidly to be effective," says team member Joseph Lenhart. The researchers tested the toughness of the bandage by soaking it in water and then stretching it to see how it held up. They found that, depending on the abundances of some of the additives, some samples were up to 4.2 times as tough as the gauze alone, even while absorbing up to 5.7 times as much water. "It's a tough material, unlike say, a diaper, which is very absorbent but doesn't hold together like this material does," says Bain. "That allows you to pull it out of the wound when it's time for medical treatment and it comes out." It will likely be a few years before the material is used in combat. The team is now working on scaling up the process, and the next step will be animal testing.

New Scientist, 22 June 2018

<http://www.newscientist.com/>

Chemists report biorenewable, biodegradable plastic alternative

2018-06-26

Colorado State University polymer chemists have taken another step toward a future of high-performance, biorenewable, biodegradable plastics. Publishing in Nature Communications, the team led by Professor of Chemistry Eugene Chen describes chemical synthesis of a polymer called bacterial poly(3-hydroxybutyrate) – or P3HB. The compound shows early promise as a substitute for petroleum plastics in major industrial uses. P3HB is a biomaterial, typically produced by bacteria, algae and other microorganisms, and is used in some biomedical applications. Its high production costs and limited volumes render the material impractical in more widespread commodity applications, however. The team, which includes the paper's first author and research scientist Xiaoyan Tang, used

Colorado State University polymer chemists have taken another step toward a future of high-performance, biorenewable, biodegradable plastics.

Gossip

CHEMWATCH

a starting material called succinate, an ester form of succinic acid. This acid is produced via fermentation of glucose and is first on the U.S. Department of Energy's list of top 12 biomass-derived compounds best positioned to replace petroleum-derived chemicals. The researchers' new chemical synthesis route produces P3HB that's similar in performance to bacterial P3HB, but their route is faster and offers potential for larger-scale, cost-effective production for commodity plastic applications. This new route is enabled by a class of powerful new catalysts they have designed and synthesized. They have filed a provisional patent through CSU Ventures for the new technology.

Phys.org, 22 June 2018

<http://phys.org>

Chemists teach an enzyme a new trick, with potential for building new molecules

2018-06-26

Princeton chemists have found a way to make a naturally occurring enzyme take on a new, artificial role, which has significant implications for modern chemistry, including pharmaceutical production. Their work appears in the journal *Nature Chemistry*. "We have found a completely new way to get enzymes to do a non-natural reaction," said Todd Hyster, an assistant professor of chemistry. "A traditional perspective says that enzymes will only do one thing. This paper shows that this may not be true for all enzymes. More importantly, the strategy described in this paper can potentially be applied to other enzyme families, meaning we will be able to use this approach to invent completely new enzymatic reactions. I think this has the potential to alter the way we build molecules." Enzymes are nature's catalysts, the keys to making critical biochemical reactions happen quickly enough to sustain life. Organic chemists have exploited this for over 100 years, but until now, their use has been limited, as individual enzymes are often only able to catalyze a single reaction. Now, the researchers in Hyster's lab have removed an enzyme from its natural setting, added a few new ingredients, and succeeded in making it catalyze a different type of chemical reaction—where it performed surprisingly well. "Todd is uncovering hidden abilities in biology's vast repertoire of chemistry, some of which may not be useful to biology but will be very useful to us," said Frances Arnold, the Linus Pauling Professor of Chemical Engineering, Bioengineering and Biochemistry at the California Institute of Technology, who was not involved in this research. "He is showing that enzymes are capable of many feats," said

Todd Hyster's research group at Princeton University has found a way to make a naturally occurring enzyme take on a new, artificial role.

Gossip

CHEMWATCH

Arnold, who graduated from Princeton in 1979. "All you have to do is ask the right questions." The key was simplifying their understanding of how an enzyme catalyses a reaction, Hyster said. "I think I am always surprised that our simplified approach to enzyme catalysis actually works," Hyster said. "As students, we are taught that enzymes are incredibly complicated and specific catalysts. ... Every time we find that they are capable of doing something completely new that nature never intended, it is surprising and exciting." In their reaction, the researchers added a small amount of a carefully selected photoexcitable dye to the enzyme and flooded it with green light. In doing so, they brought together two usually unrelated branches of chemistry, noted Kyle Biegasiewicz, a postdoctoral research associate in Hyster's lab and one of two co-first-authors on the paper. "We have discovered an incredibly exciting marriage of enzymatic catalysis (biocatalysis) and photoredox catalysis," Biegasiewicz said. To chemists, getting more of the reaction you want and less of a reaction you don't is known as "selectivity." Enzymes are much more "selective" than most small molecule catalysts, and this new technique allows scientists to capitalise on that for their own desired reactions. "Significantly, this new transformation shows high levels of selectivity for a class of reactions that were previously very difficult to control," Hyster said. In essence, their breakthrough allows for a new "plug-and-play" approach, using enzymes to turn on new catalytic reactivity, which has many exciting implications, Biegasiewicz said. "While I can't give away any details of ongoing projects in the group, I would inform the synthetic community to stay tuned—the latest stuff is really cool!" This new discovery is another aspect of the visible light photocatalysis that is transforming modern chemistry, Hyster said. "The field of catalysis has been revolutionised in the last decade by the development of methods that use light," he said. "Princeton has really been a driver in this area. Princeton chemistry professors [David] MacMillan, [Abigail] Doyle and [Robert] Knowles all use light to do really incredible things using small molecule catalysts. We have shown that the utility of light is not limited to small molecule catalysts; it can also expand the types of things we can do with enzymes. I think that is pretty neat." The idea for this avenue of research came from following "the bread crumbs" in previous research, said Simon Cooper, a graduate student in Hyster's lab and a co-first-author on the paper. Other scientists had demonstrated that exposure to ultraviolet light caused a significant change in the behaviour of an abundant molecule, nicotinamide adenine dinucleotide phosphate (NADPH), which Hyster's team added to the enzyme along with the photosensitive dye. "When exposed to UV light, NADPH can switch from transferring two electrons and a proton in a single step to transferring first an electron and then a hydrogen atom (an electron and

Gossip

CHEMWATCH

a proton)," Cooper said. "We thought that if we could take advantage of this new pathway inside an enzyme, valuable new reactions awaited discovery. ... The most important aspect of the findings in this paper is controlling the transfer of a hydrogen atom to create only one of two possible mirror-image forms of a molecule. This type of selection between two mirror image forms has traditionally been very difficult to achieve for the transfer of a hydrogen atom, and the methods disclosed here are one solution to this challenge." Cooper added: "As we advance further in the 21st century, if a growing world population is to experience the comforts of what we take for granted in the developed world, we will need more cost-effective and sustainable forms of chemical catalysis to deliver many of the products that are attributable to the modern way of life. The methods disclosed in our paper will begin to pave the way, perhaps." "Our chemistry may seem to be niche or esoteric, but these examples only serve as proofs-of-concept for what can become powerful methods for making new molecules that can have tangible societal impact: pharmaceuticals, agrochemicals, fragrances and the list goes on," said Megan Emmanuel, a graduate student in Hyster's lab and a co-author on the paper. "The implication that our work may, one day, be used to make meaningful contributions to people's lives is exciting." The paper, "Catalytic promiscuity enabled by photoredox catalysis in nicotinamide-dependent oxidoreductases" by Kyle Biegasiewicz, Simon Cooper, Megan Emmanuel, David Miller and Todd Hyster, was published in Nature Chemistry on June 11, 2018.

Phys.org, 22 June 2018

<http://phys.org>

Game-changing finding pushes 3-D printing to the molecular limit

2018-06-26

New University of Nottingham research proves that advanced materials containing molecules that switch states in response to environmental stimuli such as light can be fabricated using 3-D printing. The study findings have the potential to vastly increase the functional capabilities of 3-D-printed devices for industries such as electronics, healthcare and quantum computing. The research, led by Dr. Victor Sans Sangorrin from the Faculty of Engineering and Dr. Graham Newton from the School of Chemistry, is published in the academic journal, Advanced Materials. "This bottom-up approach to device fabrication will push the boundaries of additive manufacturing like never before. Using a unique integrated

New University of Nottingham research proves that advanced materials containing molecules that switch states in response to environmental stimuli such as light can be fabricated using 3-D printing.

Gossip

CHEMWATCH

design approach, we have demonstrated functional synergy between photochromic molecules and polymers in a fully 3-D-printed device. Our approach expands the toolbox of advanced materials available to engineers developing devices for real-world problems," explains Dr. Sans. To demonstrate their concept, the team developed a photoactive molecule that changes from colourless to blue when irradiated with light. The colour change can then be reversed by exposure to oxygen from the air. The researchers then 3-D-printed composite materials by combining the photoactive molecules with a tailor-made polymer, yielding a new material that can store information reversibly. Dr. Newton, said: "We can now take any molecules that change properties upon exposure to light and print them into composites with almost any shape or size. In theory, it would be possible to reversibly encode something quite complex like a QR code or a barcode, and then wipe the material clean, almost like cleaning a whiteboard with an eraser. While our devices currently operate using colour changes, this approach could be used to develop materials for energy storage and electronics."

Phys.org, 19 June 2018

<http://phys.org>

Groundbreaking discoveries could create superior alloys with many applications

2018-06-26

Many current and future technologies require alloys that can withstand high temperatures without corroding. Now, researchers at Chalmers University of Technology, Sweden, have hailed a major breakthrough in understanding how alloys behave at high temperatures, pointing the way to significant improvements in many technologies. The results are published in the highly ranked journal Nature Materials. Developing alloys that can withstand high temperatures without corroding is a key challenge for many fields, such as renewable and sustainable energy technologies like concentrated solar power and solid oxide fuel cells, as well as aviation, materials processing and petrochemistry. At high temperatures, alloys can react violently with their environment, quickly causing the materials to fail by corrosion. To protect against this, all high temperature alloys are designed to form a protective oxide scale, usually consisting of aluminium oxide or chromium oxide. This oxide scale plays a decisive role in preventing the metals from corroding. Therefore, research on high temperature corrosion is very focused on these oxide scales – how they are formed, how they perform at high heat, and how they

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Gossip

CHEMWATCH

sometimes fail. The article in *Nature Materials* answers two classical issues in the area. One applies to the very small additives of so-called 'reactive elements' – often yttrium and zirconium – found in all high-temperature alloys. The second issue is about the role of water vapour. "Adding reactive elements to alloys results in a huge improvement in performance – but no one has been able to provide robust experimental proof why," says Nooshin Mortazavi, materials researcher at Chalmers' Department of Physics, and first author of the study. "Likewise, the role of water, which is always present in high-temperature environments, in the form of steam, has been little understood. Our paper will help solve these enigmas". In this paper, the Chalmers researchers show how these two elements are linked. They demonstrate how the reactive elements in the alloy promote the growth of an aluminium oxide scale. The presence of these reactive element particles causes the oxide scale to grow inward, rather than outward, thereby facilitating the transport of water from the environment, towards the alloy substrate. Reactive elements and water combine to create a fast-growing, nanocrystalline, oxide scale. "This paper challenges several accepted 'truths' in the science of high temperature corrosion and opens up exciting new avenues of research and alloy development," says Lars Gunnar Johansson, Professor of Inorganic Chemistry at Chalmers, Director of the Competence Centre for High Temperature Corrosion (HTC) and co-author of the paper. "Everyone in the industry has been waiting for this discovery. This is a paradigm shift in the field of high-temperature oxidation," says Nooshin Mortazavi. "We are now establishing new principles for understanding the degradation mechanisms in this class of materials at very high temperatures." Further to their discoveries, the Chalmers researchers suggest a practical method for creating more resistant alloys. They demonstrate that there exists a critical size for the reactive element particles. Above a certain size, reactive element particles cause cracks in the oxide scale, that provide an easy route for corrosive gases to react with the alloy substrate, causing rapid corrosion. This means that a better, more protective oxide scale can be achieved by controlling the size distribution of the reactive element particles in the alloy. This ground-breaking research from Chalmers University of Technology points the way to stronger, safer, more resistant alloys in the future. High temperature alloys are used in a variety of areas and are essential to many technologies which underpin our civilisation. They are crucial for both new and traditional renewable energy technologies, such as "green" electricity from biomass, biomass gasification, bio-energy with carbon capture and storage (BECCS), concentrated solar energy, and solid oxide fuel cells. They are also crucial in many other important technology areas such as jet engines, petrochemistry and materials processing. All these

Gossip

CHEMWATCH

industries and technologies are entirely dependent on materials that can withstand high temperatures – 600 ° C and beyond – without failing due to corrosion. There is a constant demand for materials with improved heat resistance, both for developing new high temperature technologies, and for enhancing the process efficiency of existing ones. For example, if the turbine blades in an aircraft's jet engines could withstand higher temperatures, the engine could operate more efficiently, resulting in fuel-savings for the aviation industry. Or, if you can produce steam pipes with better high-temperature capability, biomass-fired power plants could generate more power per kilogram of fuel. Corrosion is one of the key obstacles to material development within these areas. The Chalmers researchers' article provides new tools for researchers and industry to develop alloys that withstand higher temperatures without quickly corroding. The Chalmers researchers' explanation of how oxide scale growth occurs – which has been developed using several complementary methods for experimentation and quantum chemistry modelling – is completely new to both the research community, and the industry in the field of high-temperature materials. The research was carried out by the High Temperature Corrosion Centre (HTC) in a collaboration between the Departments of Chemistry and Physics at Chalmers, together with the world leading materials manufacturer Kanthal, part of the Sandvik group. HTC is jointly funded by the Swedish Energy Agency, 21 member-companies and Chalmers. The paper was published in Nature Materials.

Phys.org, 19 June 2018

<http://phys.org>

Curiosities

CHEMWATCH

HPV vaccine has almost wiped out infections in young women, figures show

2018-06-27

The HPV vaccine has almost completely wiped out infections in young women, and if expanded to men could prevent thousands of cancer cases in Britain each year, new figures suggest. New figures from Public Health England show that the rate of Human Papilloma Virus (HPV) in women aged between 16 to 21 who were vaccinated between 2010 and 2016 has fallen by 86 per cent. More than 3,000 women are diagnosed with cervical cancer each year, and more than 800 will die from the disease, with most cases caused by the HPV virus. The vaccination is also expected to be extended to boys after the government's Joint Committee on Vaccination and Immunisation (JCVI) changed its advice showing the jab is cost-effective. HPV causes around 2,000 cases of cancer in men each year and around 650 deaths, mainly from throat cancer. Men with the condition also risk passing it on to partners. Professor Christopher Nutting, Consultant oncologist at The Royal Marsden Hospital in London said: "Implementation of the HPV vaccination program will save thousands of lives, and the addition of boys to the vaccination program is especially welcome. "Almost all cervical cancer is HPV related so almost all of these cases are avoidable." "There will be a latency period of at least 10-15 years before we see the throat cancer rates drop." The HPV vaccination program was first introduced in 2008 and 80 per cent of girls aged 15-to-24 have now been vaccinated in the UK. It is available free on the NHS to all girls from the age of 12 until they turn 18. Girls in England are routinely offered their first HPV vaccination when they are in year 8 of school. The second dose is offered six to 12 months later. The Public Health England (PHE) study, published in the Journal of Infectious Diseases, suggests the vaccine program could trigger future reductions in cervical cancer rates. Mary Ramsay, Head of Immunisations at PHE, said: "These results are very promising and mean that in years to come we can expect to see significant decreases in cervical cancer, which is currently one of the biggest causes of cancer in women under 35." "This study also reminds us how important it is to keep vaccination rates high to reduce the spread of this preventable infection. "I encourage all parents of girls aged 12 to 13 to make sure they take up the offer of this potentially life-saving vaccine." The data shows declines across five high-risk HPV types in total, which cause around 90 per cent of cervical cancer cases. Robert Music, chief executive of Jo's Cervical Cancer Trust, said: "It is extremely positive to see the impact that the vaccination has had on prevalence of cervical cancer-causing HPV infection among vaccinated women. "One day we hope to see cervical cancer become

The HPV vaccine has almost completely wiped out infections in young women, and if expanded to men could prevent thousands of cancer cases in Britain each year, new figures suggest.

Curiosities

CHEMWATCH

a disease of the past and it is only through high vaccination rates that we will get there. "For women who have had the vaccine, it is important to remember it does not offer full protection against cervical cancer so attending cervical screening when invited is still important."

The Telegraph, 18 June 2018

<http://www.telegraph.co.uk/news>

Copper regulates sleep in zebrafish

2018-06-27

Copper plays a role in how the brain regulates sleep, suggests a new study in zebrafish. Christopher J. Chang and co-workers at the University of California, Berkeley, induced a copper deficiency in zebrafish by genetically engineering the animals to express a mutated version of a protein responsible for copper uptake. This modification made the fish sluggish and disrupted their sleep-activity cycle (Nat. Chem. Biol. 2018, DOI: 10.1038/s41589-018-0062-z). "We show that just modulating the copper status has grave consequences for sleep behaviour," Chang says. The fish were harder to wake and they became more tired during their day compared with normal fish, he notes. The researchers suspected that copper might be important for sleep because it's needed by the enzyme dopamine β -hydrolase. The enzyme is involved in the biosynthesis of the neurotransmitter norepinephrine in a part of the brain known as the locus coeruleus. This region is involved in many behaviours, including sleep, and the neurotransmitter is responsible for much of the region's activity. "You only get the synthesis of norepinephrine if you have sufficient amounts of copper, which is required to activate this enzyme," Chang says. The researchers haven't yet tested whether selectively elevating copper in this brain region can enhance sleep. The researchers imaged the distribution of copper in zebrafish brains with the help of a new pair of fluorescent probes, one that responds to copper and one that serves as a control. The probes are the same size and shape. The difference between the probes is in the number of sulfur atoms capable of coordinating with the metal. The copper-responsive one has four sulfurs. In the control probe, two sulfurs have been replaced by carbons. The team also used a complementary probe-free method—laser ablation inductively coupled mass spectrometry—to measure copper levels. Both methods indicated that the locus coeruleus was highly enriched in copper. Anthony White, a neurodegeneration expert at the University of Melbourne, calls the work "a great example of how traditional chemical and biophysical approaches to

Metal may play sleep role through an enzyme responsible for synthesis of norepinephrine

Curiosities

CHEMWATCH

understanding copper can be combined with genetic approaches to tease out new roles for copper in biology.”

Chemical & Engineering News, 6 June 2018

<http://pubs.acs.org/cen/news>

Heart disease stem cell therapy can shrink deadly scar tissue

2018-06-27

A breakthrough stem cell treatment that promises the first effective cure for heart disease will be offered to British patients this year. Hundreds of thousands of people stand to eventually benefit after regulators approved a major trial of the regenerative drug capable of shrinking fatal scar tissue after a heart attack. The “off-the-shelf” therapy, which can be harvested for thousands of recipients from a single donor, will begin being administered to patients at London’s Royal Brompton Hospital in November. It is being pioneered by Professor Stephen Westaby, one of Britain’s preeminent surgeons, who described the approval as “bloody marvellous” for patients who currently have “very poor length and quality of life”. Currently around 50,000 people a year suffer heart attacks so severe the organ becomes scarred and cannot effectively pump blood around the body. These make up more than half a million people living with heart failure, for which there is no cure. Developed by Celixir, a Warwickshire-based biomedical firm, the treatment delivers stem cells into the organ via an injection which then regenerates the heart cells, restoring function. The drug, called Heartcel, has been tried on 11 heart failure patients in Greece in 2012 and 2013, none of whom were expected to live more than two years. Subsequent results showed the stem cells had rendered the hearts 78 per cent scar-free, meaning six years on all 11 are still alive and far more active than they previously were. The recent approval by the US Food and Drugs Administration (FDA) means a co-ordinated international trial can now begin. It will involve 250 European participants spread across the Royal Brompton and two other undisclosed hospitals in the UK and mainland Europe, as well as 250 patients at centres in the US. If the trial replicates the “astonishing” results seen in the first Greek cohort, Celixir could apply for permission to provide Heartcel widely in the UK by 2021, according to Ajan Reginald, the company’s chief executive. “It has taken a long time to get to this stage but getting approval is absolutely massive for these patients. What is unique about Heartcel is that we are taking cells from a healthy donor and giving them to an unhealthy recipient, whereas previously people have tried using the patient’s own cells,” Prof Westaby

A breakthrough stem cell treatment that promises the first effective cure for heart disease will be offered to British patients this year.

Curiosities

CHEMWATCH

said. Heartcel takes bone marrow stem cells from a donor with no heart problems, making them into enough doses to treat thousands of patients. During production it undergoes genetic engineering making it "immune privileged", meaning it is biologically acceptable to all recipients and will not be rejected. Previous trials at Barts and Great Ormond Street hospitals in London gave patients their own stem cells but were met with "modest results", said Prof Westaby. Patients in the forthcoming Royal Brompton Hospital trial will be injected with Heartcel during the surgery they would have undergone anyway.

The Telegraph, 10 June 2018

<http://www.telegraph.co.uk/news>

Engineered cotton grows on alternative fertiliser

2018-06-27

Wily weeds can develop resistance to herbicides, allowing them to compete with genetically modified crops designed to tolerate weed-killing chemicals. Now, a team is proposing another approach to genetically engineering crops to outgrow weeds: cotton that feeds on an alternative fertiliser, one that weeds can't use (Proc. Natl. Acad. Sci. USA 2018, DOI: 10.1073/pnas.1804862115). "This work is exactly the sort of genetic engineering that I would like to see more of, traits that expand the realm of what farmers can do while protecting the environment," says Anastasia Bodnar, a plant geneticist who was not involved with the work and is the policy director for Biology Fortified, a nonprofit organization that fosters discussion on biotechnology and agriculture. Regular plants need phosphate to grow, but the new cotton can survive on phosphite instead because the crop is engineered to contain a bacterial gene that confers the ability to convert phosphite to phosphate, explains Luis Herrera-Estrella of Mexico's National Laboratory of Genomics for Biodiversity, who co-led the work with Texas A&M University's. Keerti Rathore. Their combined teams developed transgenic cotton that grows just as well on phosphite as regular cotton grows on phosphate. In soils with varied chemical and nutrient profiles, the plants outcompeted a bane of cotton farmers' existence: Palmer amaranth, or pigweed, which resists the common herbicide glyphosate. The first trials outside the greenhouse commence later this month in Texas. A spin-off company cofounded by Herrera-Estrella, StelaGenomics, is developing the technology for use with other crops. Phosphite is used to kill fungi in crops, but manufacturers would need to scale up production to accommodate fertiliser demands, if this strategy ever reaches widespread use. Farmers might be able to apply

Crop feeds on phosphite, potentially allowing it to outwit weeds and mitigate pollution from traditional fertiliser runoff

Curiosities

CHEMWATCH

less phosphite than they would phosphate, Bodnar says. Phosphate can run off farmlands into waterways, where the compound promotes the growth of toxic and harmful algal blooms. But phosphite should be used carefully, Bodnar adds, because long-term use might select for bacteria in soil and waterways that convert phosphite to phosphate, thus recreating the phosphate problem.

Chemical & Engineering News, 17 June 2018

<http://pubs.acs.org/cen/news>

Children exposed to 30% more pollution than adults on walk to school due to proximity to exhaust fumes, study says

2018-06-27

Primary school children are being exposed to 30 per cent more pollution than adults while walking along busy roads due to their closer proximity to vehicle exhaust fumes, a study claims. The new research by NGO Global Action Plan, released to coincide with Clean Air Day on 21 June, was based on experiments across four UK cities – Manchester, Leeds, Glasgow and London. The researchers used thermal imaging techniques which use CO₂ as a tracer gas to illustrate how children's height makes them more vulnerable to exhaust fumes including nitrogen oxide (NO_x), nitrogen dioxide (NO₂) and diesel particulates. The results also revealed that for children who are driven to school, the situation is far worse. They are exposed to double the pollution inside a vehicle than those walking on busy streets. It showed that pollution levels from petrol and diesel vehicles were 2.5 times lower for children walking along quiet roads. Air pollution is associated with reduced lung growth in childhood, as well as increased severity of asthma and pneumonia, according to research by Queen Mary University's Professor Jonathan Grigg. "Children's lungs are especially vulnerable for those at primary school and younger, as they are still developing," Professor Grigg said. "It's critical that we protect the health of our children's lungs from air pollution, in order to prevent lasting damage. My research has shown that exposure of young children to higher amounts of air pollution from traffic, has a major impact on their lungs. Although parents can reduce this impact by walking on less polluted roads and taking public transport, the UK government must take further steps to reduce toxic emissions from all roads."

Youngsters driven to school are exposed to twice as much pollution as those who walk

[Toxic air zones](#)

Curiosities

CHEMWATCH

Separate research also released to coincide with Clean Air Day reveals that 30 per cent of British children live in “toxic air zones”, according to analysis by Unicef UK. The charity says 4.5 million children are growing up in areas with unsafe levels of particulate pollution. Unicef said of the 20 local authorities with the largest proportion of babies living in them, almost three-quarters breach safe levels for particulate matter. Among the worst affected are children in Birmingham, London, Manchester, Liverpool and Bristol. The health effects of exposure to small particulate pollution are estimated to cost the NHS and social care sector in excess of £40m each year. Public Health England research shows that even the smallest improvement in air quality could reap massive rewards for children and the UK taxpayer. During road closures for the London Marathon, traffic-free streets saw pollution levels drop by 89 per cent, research by Kings College London revealed. Unicef UK’s Amy Gibbs said: “We already know that air pollution is harmful, but these findings force us to face a shocking reality about the acute impact on children’s health. Worryingly, one-third of our children could be filling their lungs with toxic air that puts them at risk of serious, long-term health conditions. “It’s unacceptable that the most vulnerable members of society, who contribute the least to air pollution, are the ones suffering most from its effects. We wouldn’t make our children drink dirty water, so why are we allowing them to breathe dirty air? Speaking about Global Action Plan’s research on children’s greater exposure to vehicle pollution, the environment secretary, Michael Gove, said: “This troubling new research is a further demonstration of why we need to take strong action now to improve air quality. “Our new Clean Air Strategy sets out how we will be the first major developed economy to reduce air pollution in line with World Health Organisation limits and we have invested £3.5bn to reduce harmful emissions. “But Clean Air Day reminds us that by taking simple steps, like leaving the car at home for the school run, we can work together to reduce air pollution and protect our health.”

The Independent, 21 June 2018

<http://news.independent.co.uk>

Fracking may alter fat cells: Study

2018-06-27

Chemicals released by fracking may increase the size and amount of fat cells, even at low concentrations often released into the environment, according to a new study released today. Researchers at Duke University and University of Missouri exposed cells to 23 chemicals associated with

A look at chemicals commonly found in fracking wastewater finds sign that they are influencing cell growth.

Curiosities

CHEMWATCH

fracking, wastewater and surface water contaminated with wastewater from fracking sites. They found that exposure at both low and high concentrations of the chemicals and water samples led to changes in the fat cells, according to results published today in the journal *Science of the Total Environment*. "One of the perhaps surprising things about this is that we actually saw effects diluting the water," said lead author Chris Kassotis, a postdoctoral researcher at Duke's Nicholas School of the Environment. The effects at low concentrations were unexpected, but they suggest that at environmentally-relevant levels, fracking chemicals may interfere with how fat cells are regulated. The changes were comparable to effects of a pharmaceutical known to increase fat cells, Kassotis said. The experiment produced "pretty high levels of activity," he said, "at low concentrations." The study also looked into underlying mechanisms triggering the cell growth. Approximately half the cells were found with an activated receptor called "PPAR-gamma." The PPAR-gamma receptor promotes fat cell development. When switched on, dormant fat precursors cells awaken. But given that this only happened in about half the cells, researchers suspect other undetermined underlying causes are at play. The study was a follow-up to earlier work by Kassotis and others looking at links between fracking and endocrine disruption. In one study, Kassotis exposed pregnant mice to fracking chemicals and found that the offspring had higher weights for the first few weeks of life, prompting a deeper look into fat cell development. The study published recently was a cell study, so there is not a direct link to humans, yet. But the effects on fat cells may be an underlying cause of the increased weights, Kassotis said, and he and others hope to see future research to determine how exposure to chemicals from fracking affect human fat cells. "We know that the chemicals have negative health impacts," said Susan Nagel, one of the co-authors and associate professor of obstetrics, gynaecology and women's health at University of Missouri. And researchers regularly find those chemicals in fracking wastewater. "So, it is imperative to examine the health impacts in people near fracking operations," she added. Kassotis said he sees some relevance to human health, noting that he has conducted both animal and cell studies, looking at fracking chemicals and endocrine disruptors. Many hormone regulators are comparable between rodents and humans, he said. Still, it is unclear at what concentrations these chemicals could be harmful to humans, he said. Hence the need for further studies, Nagel said, pointing to the fact that the most "dramatic effects" came from low concentrations, which are in the range that humans could be exposed to. The published study helps researchers look for effects in humans and can help researchers design precise epidemiological studies, she said. "This is a completely unresearched area

Curiosities

CHEMWATCH

of potential impacts on human health, and if we are contributing in any way to metabolic syndrome in the country with this process then that is of utmost importance," she said.

Environmental Health News, 21 June 2018

<http://www.environmentalhealthnews.org/>

Threshold for harmful chemicals in drinking water lower than thought: Study

2018-06-27

A government study found that chemicals found in drinking water around the country could pose risks to human health at lower levels than the government currently recognises, potentially opening the door for more states to begin cleaning up or regulating the chemical. The report released by a branch of the Office of Health and Human Services examined a category of chemicals commonly called PFAS that have been used to make non-stick products, firefighting foam and water-repellent coatings. They've been found in water systems and soil around the country. The most researched types of these chemicals are referred to as PFOA and PFOS, both of which remain in the environment for a long time after they're introduced, raising concerns about the health effects to people living near areas contaminated by the chemicals. The report found that PFOA and PFOS caused negative health effects in rodents at a lower equivalent level in humans than previously recognised by the EPA. The finding could cause a ripple effect, possibly requiring new rules or laws as states work on cleaning up areas with high levels of the chemicals. The study reported that the EPA's advisory level of 70 parts per trillion is seven to 10 times higher than when HHS first said it noticed health effects in animals. The agency that evaluates potentially toxic chemicals also said that drinking fluids or eating food contaminated with the chemicals could potentially increase the risk of cancer, interfere with hormones and the immune system, and affect growth and development of children and infants. But, overall, more research is needed to understand the impacts of all type of chemicals in the PFAS category on human health. The study did not specifically recommend a new level that is safe for humans but advocacy groups working on this issue said the new data show states and the federal government should act to clean up the chemicals. "This study confirms that the EPA's guidelines for PFAS levels in drinking water woefully underestimate risks to human health," Olga Naidenko, senior science advisor at the Environmental Working Group, said in a statement. "We urge EPA to collect and publish all water results

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Curiosities

CHEMWATCH

showing PFAS contamination at any level, so Americans across the country can take immediate steps to protect themselves and their families.” The Environmental Working Group has estimated that drinking water for 16 million Americans has levels of the chemicals higher than the EPA’s recommended limit and that some amount of it has been found in more than 1,500 water systems serving more than 110 million people. The study was the centre of a controversy earlier this year after Politico reported that officials from the Environmental Protection Agency, Pentagon and White House talked about delaying the public release of the report, writing in an email that it would be a “public relations nightmare.” Those emails were obtained by the Union of Concerned Scientists through a public records request. EPA Administrator Scott Pruitt announced in May that the EPA will move to label PFAS chemicals “hazardous” and will look into a maximum level at which the chemicals are safe and provide recommendations to states looking to clean up contaminated sites. The agency held a summit with state officials that generated further controversy after reporters and a member of Congress reported they weren’t allowed to attend some of the sessions. Dealing with PFAS “is one of EPA’s top priorities and the agency is committed to continuing to participate in and contribute to a coordinated approach across the federal government,” the director of the agency’s water office, Peter Grevatt, said in a statement. “Federal agencies are developing a variety of tools, including toxicity values, analytical methods, and treatment options, that can work together to provide states, tribes, local governments, health professionals, and communities with information and solutions to address these chemicals.” Michigan is one state that has been testing for PFAS substances in water systems. The director of the Michigan Department of Environmental Quality said at the EPA summit that the only reason her state has found so much PFAS contamination is that the state is “actively and aggressively looking,” according to MichiganLive.com. An official with Michigan’s environmental agency said the state is pleased the report was released and wants EPA to work with state and local governments to set standards for PFAS. In one site near the airport in Grand Rapids, officials have identified levels of PFAS chemicals in wells between 54 and 461 parts per trillion. The state has also been working with the EPA to test a site of a former tannery where very high levels of PFOS were found in the groundwater. Democratic Rep. Dan Kildee represents Flint, Michigan, and called for the federal government to release the CDC study earlier and take more action to limit exposure to the chemicals. “This federal study is deeply concerning because it demonstrates that PFAS chemicals are more dangerous to human health than the EPA has previously acknowledged. The Trump Administration must address PFAS contamination with more urgency. We must ensure

Curiosities

CHEMWATCH

that families and veterans exposed to these dangerous chemicals receive the health care and clean-up resources they need," Kildee said in a statement.

ABC News, 21 June 2018

<http://abcnews.go.com>

Herpes Has Been Linked to Alzheimer's, Reigniting a Controversial Hypothesis About The Disease

2018-06-27

Nobody really knows what causes Alzheimer's disease. But with someone in the world developing dementia every three seconds, according to Alzheimer's Disease International, there's a lot of research going on to try and figure it out. A new study from the Icahn School of Medicine at Mount Sinai, published in the journal *Neuron*, has reignited a controversial theory about what causes the neurodegenerative disease by studying the brains of people from three different brain banks. The researchers found that the 622 brains from people who had signs of Alzheimer's had twice the level of herpes virus present than the 322 from people who did not. "The title of the talk that I usually give is, 'I Went Looking for Drug Targets and All I Found Were These Lousy Viruses,'" said geneticist Joel Dudley, one of the authors of the study. "We didn't set out to find what we found. Not even close. We were trying to find drugs that could be repurposed to treat Alzheimer's patients, but the patterns that emerged from our data-driven analysis all pointed towards these viral biology themes." The theory that viruses could contribute to the development of dementia arose in the 1950s. It was hypothesised that Alzheimer's was a "slow virus disease," where one or several viruses steadily degraded the neurological processes in the brain after decades of lying dormant. In more recent years, dementia researchers have leaned towards the amyloid hypothesis – where sticky plaques made from amyloid proteins accumulate outside nerve cells, or neurons, in the brain, potentially killing or blocking them. But a study in 2014, published in the journal *Alzheimer's Research & Therapy*, found that this theory might have been wrong all along. The paper examined over a decade of clinical trials of drugs that targeted amyloid plaques and found them to have a failure rate of 99.6%. Since then, the old viral hypothesis has had a new lease of life. And the new research did find human herpes virus DNA and RNA were both more abundant in the brains of people with Alzheimer's disease. The two strains they found most strongly associated with the disease were HHV-6A and HHV-7, which were not as prevalent in the brains of people with different neurodegenerative disorders. Also, the

A new study has found that in people who showed signs of Alzheimer's had twice the level of herpes virus present than people who did not.

Curiosities

CHEMWATCH

researchers were able to show how viral and human genes interacted, and that genes associated with increased Alzheimer's risk were impacted by the viral DNA. "I don't think we can answer whether herpes viruses are a primary cause of Alzheimer's disease," said Dudley. "But what's clear is that they're perturbing networks and participating in networks that directly accelerate the brain towards the Alzheimer's topology." Another possibility is that the two theories are both at work. It might be that viruses may in some way interact with human DNA and stimulate the growth of amyloid plaques. Researchers also found in the new study that the herpes virus was involved in networks that regulate the generation of amyloid proteins. While the findings help potentially open the door for new therapies, nothing has fundamentally changed about how to treat Alzheimer's for now, said another of the authors Sam Gandy. Also, HHV-6A and HHV-7 are extremely common viruses, often not having any symptoms. In fact, in North America, approximately 90 percent of children have at least one of the strains in their blood in their early lives. "Similar to other studies in this area, while this is robust research, it could not prove that the viruses actually were responsible for the disease," said James Pickett, the head of research at Alzheimer's Society. "It therefore doesn't change what we already know about the causes of dementia, doesn't mean that having cold sores put you at increased risk of getting it and people shouldn't be unduly worried." There's likely to be a lot of different and complicated mechanisms at play in developing Alzheimer's, which is why it has been such a challenging disease for scientists to understand. But the authors of the new study are hopeful that resurrecting the viral hypothesis can help them explore new avenues. "All these Alzheimer's brains in these separate, major brain banks have previously unsuspected substantial populations of herpesvirus genomes and that deserves an explanation wherever it falls in the pathogenesis," Gandy said. "It doesn't deserve to just be brushed away."

Science Alert, 23 June 2018

<http://www.sciencealert.com.au>

Biologists Say This Is The Ideal Number of Coffees a Day For Heart Health, And It's Totally Nuts

2018-06-27

A team of German researchers, led by the molecular biologists Judith Haendeler and Joachim Altschmied, thinks it has discovered clues about how coffee works its caffeine-fuelled magic on our heart health and how much caffeine we should drink each day to see the best benefits. By studying caffeinated lab mice and dosing human tissues with caffeine,

Four cups of strong coffee a day might be the recipe for a healthy heart, especially for older adults.

Curiosities

CHEMWATCH

the researchers discovered how a jolt of the stimulant could improve the way cells inside our blood vessels work - essentially, by making certain proteins inside older adult cells perform more like young and nimble ones. The study was published in the journal PLOS Biology. "When you drink four to five cups of espresso," Altschmied told Business Insider, "that seems to improve the function of the powerhouses of our cells, and therefore seems to be protective." Scientists have for years noticed that people who drink coffee seem to be less likely to die from all sorts of causes, including heart disease, stroke, or diabetes. Perhaps the best evidence yet for this comes from two massive studies: one of more than 400,000 people in the US by the National Institutes of Health, and another of more than 500,000 Europeans. Both studies found that regular coffee drinkers were less likely to die from any cause than people who don't sip a daily brew. Coffee is also associated with a whole host of other health benefits, including a lower risk of liver disease (cirrhosis), a lower risk of developing certain kinds of cancer, lower rates of dementia and Alzheimer's, and a reduced risk of depression. It's also great for your heart - people who drink three or four cups a day may be 19 percent less likely to die from cardiovascular disease. Altschmied said he hoped his new study would debunk the old advice that people with heart problems shouldn't drink coffee, and he argues that drinking the equivalent of about four shots of espresso a day could help reduce the risk of heart attacks, especially for people who are obese or prediabetic. "It will not replace other things," he said. "Keep on doing your sports, eat healthy, and add coffee to your diet." If you don't like the taste, green tea has similar levels of caffeine and could also be an effective way to boost heart health. It's important not to overdo it with the new recommendation, as too much coffee can quicken your heartbeat and cause other health problems. But drinking up to six cups a day should be OK, cardiologists say, and may even reduce arrhythmias in people with irregular heartbeats. One caveat: The study wasn't done in humans - only in human tissues and lab mice. What works in a hypercontrolled environment of mice, dosed with very specific amounts of caffeine, may not be the same as what happens when you drink a cup of joe at home. "If I had four cups of espresso and you had four cups of espresso, we cannot guarantee that we reach the same level in the blood," Altschmied said. He also offers a word of caution: Because caffeine can make blood vessels grow, providing more oxygen to fuel tumours, the coffee-drinking advice might not hold for people who have cancer. "Where people have a diagnosed tumour, we would say better take your hands off the coffee," Altschmied said. "But if you're otherwise healthy, it will not harm you, and

Curiosities

CHEMWATCH

it might help your heart and circulatory system stay better functional for a longer time.”

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Ghosts And Demons That Visit You at Night Could Be Explained by Science

2018-06-27

If you believe in the paranormal you might not be surprised if you hear stories of deceased loved ones appearing during the night, huge explosions heard just as someone is drifting off with no obvious cause, and other peculiar occurrences. But what if you don't? My interest in the paranormal started with an impromptu coffee with a colleague, Chris French, who researches reports of paranormal experiences. He told me stories of countless people who had recounted such events. These experiences tended to start while lying in bed. Then something unusual would happen – perhaps a demon would appear or the environment would seem strange or there would be a sensed presence. The person having this experience might also report being glued to their mattress, tarmacked into the bed, totally unable to move. It's unsurprising that people who experience such things might interpret them as paranormal. But certain phenomena such as sleep paralysis provide an alternative to paranormal explanations for such occurrences. Hence my interest in the subject, as a sleep researcher.

Sleep paralysis

When we sleep, we cycle through different stages. We start the night in non-rapid eye movement (NREM) sleep – which gets progressively deeper. We then cycle back until we hit rapid eye movement (REM) sleep. During REM sleep we are most likely to have vivid dreams. At this stage we are also paralysed, perhaps as a safety mechanism to stop us acting out our dreams so that we don't end up attempting to fly. But during sleep paralysis, features of REM sleep continue into waking life. Those who experience it will feel awake yet might experience dream-like hallucinations and struggle to move. This experience is pretty common, occurring in around 8 percent of people (although estimates vary dramatically depending on who we are asking). It's even possible to induce sleep paralysis in some people, by disrupting their sleep in specific ways. Certain researchers, French among them, believe that this explains a

Curiosities

CHEMWATCH

huge number of paranormal accounts. Information about sleep paralysis is finally seeping into public awareness, but we now need to understand more about this common complaint. Our preliminary work, which I recount in my new book *Nodding Off: The science of sleep from cradle to grave*, hints at possible genetic and environmental explanations for why some people are more likely than others to experience sleep paralysis. This now needs to be replicated using much larger samples. Reviewing the literature, we have also highlighted a host of other variables associated with this common experience, including stress, trauma, psychiatric difficulties and physical illnesses.

Exploding head syndrome

Sleep paralysis aside, how else are sleep researchers helping to explain paranormal experiences? People sometimes describe experiencing huge explosions during the night which simply can't be explained. There is no sign that a shelf has fallen down or a car has backfired. There is no one playing the electric guitar next to their head. Again, this can be linked to our sleep - this time explained by "exploding head syndrome", a term coined relatively recently by the neurologist JMS Pearce. When we fall asleep, the reticular formation of the brainstem (a part of our brain involved in consciousness) typically starts to inhibit our ability to move, see and hear things. When we experience a "bang" in our sleep this might be because of a delay in this process. Instead of the reticular formation shutting down the auditory neurons, they might fire at once. As with sleep paralysis, this phenomenon is also under-researched. For this very reason, in 2017 my colleagues and I joined forces with BBC Focus and Brian Sharpless, a leading expert on this phenomenon, to collect data on this topic.

Imps and ghouls

Finally, what might scientists make of precognitive dreams? We might dream of a friend we haven't seen for years only to have them call us the very next day. French thinks science can provide an explanation for this too. Referencing work by John Allen Paulos that focuses on probabilities, he explains how such an occurrence may be surprising on any single day, but over time, quite likely to occur. Researching my book, I spoke to Mrs Sinclair, who is 70, and lives alone. She told me about what she had thought was a ghost living in her house, an imp throttling her during the night and other things that had left her petrified. Having scientific explanations provided her with immense comfort and she no longer believes in paranormal explanations for the things that she experienced.

Curiosities

CHEMWATCH

Our hope is that scientific explanations of paranormal experiences might help others by lowering anxiety. Decreasing anxiety has also been hypothesised as a potential method by which to reduce sleep paralysis. So, perhaps providing more information about these unusual experiences might even mean that things are less likely to go bump in the night.

Science Alert, 22 June 2018

<http://www.sciencealert.com.au>

Autoimmune Diseases Could Be Linked to Living With a Stress Disorder, Study Shows

2018-06-27

Stress disorders of various kinds could go on to do more damage to the body according to a new study covering data on over one million people. The study has found an association between a range of such disorders and the risk of developing autoimmune diseases like arthritis or Crohn's disease. While links between mental stress and physical deterioration have been highlighted before, few previous studies have closely examined the relationship between psychiatric stress and the immune system. Now it looks as though the risk of autoimmune diseases – where the body's defence mechanism turns on itself – could be pushed up by disorders including Post-Traumatic Stress Disorder (PTSD). That's a worrying link, but it might also give us clues for developing better methods of treatment. "We know from previous research that too much stress can disrupt our immune system, but this is the first study that shows the link between PTSD and other stress disorders and increased risk of autoimmune diseases in a large sample of individuals," says one of the researchers, Unnur Anna Valdimarsdóttir from the University of Iceland. Looking at data collected by the Swedish national health system, the researchers identified 106,464 people diagnosed with stress disorders, including PTSD. Over 30 years of records, they were checked against individuals without stress disorders – 126,652 related siblings and over a million people from the general population. Those with stress disorders were 30-40 percent more likely to go on to develop one of 41 autoimmune diseases as well, on average – 9.1 people per thousand for the stress disorder group, 6.5 people per thousand for their siblings, and 6 people per thousand for a matched group without PTSD or other stress disorders. The exact relationships between disorders and diseases varied – for instance, individuals with PTSD taking antidepressants known as selective serotonin reuptake inhibitors (SSRIs), were at a particularly high risk of developing autoimmune diseases. This might be a marker for the severity of the stress

Stress disorders of various kinds could go on to do more damage to the body according to a new study covering data on over one million people.

Curiosities

CHEMWATCH

disorder, the researchers say, with the people who are worse affected more likely to be prescribed antidepressants. It's also worth noting that the longer SSRI use continued for, the more the risk fell. "The main message to patients suffering from severe emotional reactions after trauma or other life stressors is to seek treatment," one of the researchers, Huan Song from the University of Iceland, told Lisa Rapaport at Reuters. "There are now several treatments, both medications and cognitive behavioural approaches, with documented effectiveness." As usual with these types of studies, we can't say for sure that stress disorders cause autoimmune diseases. Only that there appears to be an association between the two. The researchers suggest people living with PTSD might end up drinking more or sleeping less, for example, which could push up the risk of autoimmune problems. Another possibility is that some unknown third factor increases the risk of both autoimmune diseases and stress disorders together. Ultimately, we need more research and more data to refine our understanding of what's really happening. Even if the conclusions that researchers can take right now are limited, there is a statistically significant link here, and the sheer size of the cohort and the length of the time involved means this is definitely worthy of further investigation. As the research progresses, it's possible that improving treatments for individuals with stress disorders could also cut down the risk of autoimmune disease later in life. The next challenge is to work out the biological mechanisms causing this association. According to Mayer Bellehsen from the Unified Behavioural Health Centre for Military Veterans and Their Families in New York, who wasn't involved in the study, it's more evidence that extreme stress has a direct impact on our bodies. "Regardless of cause, this study adds to the evidence of the link between stress conditions and physical well-being, warranting further attention to the reduction of trauma and other causes of stress conditions, as well as improving treatment of these conditions," Bellehsen told Steven Reinberg at HealthDay. The research has been published in the Journal of the American Medical Association.

Science Alert, 21 June 2018

<http://www.sciencealert.com.au>

Which Is Worse For Your Health, Marijuana or Alcohol? Here's The Science

2018-06-27

It's a tough call, but based on the science, there appears to be a clear winner. Keep in mind that there are dozens of factors to account for, including how the substances affect your heart, brain, and behaviour,

It's a tough call, but based on the science, there appears to be a clear winner.

Curiosities

CHEMWATCH

and how likely you are to get hooked. Time is important, too - while some effects are noticeable immediately, others only begin to shape up after months or years of use. The comparison is slightly unfair for another reason: While scientists have been researching the effects of alcohol for decades, the science of cannabis is a lot murkier due to its mostly illegal status.

1. 30,722 Americans died from alcohol-induced causes in 2014.

There have been 0 documented deaths from marijuana use alone. Last year, more than 30,000 people died from alcohol-induced causes in the US - and that does not count drinking-related accidents or homicides. If those deaths were included, the number would be closer to 90,000, according to the CDC. Meanwhile, no deaths from marijuana overdoses have been reported, according to the US Drug Enforcement Agency (DEA). A 16-year study of more than 65,000 Americans published in the American Journal of Public Health found that the healthy marijuana users were not more likely to die of an early death than the healthy men and women who did not use cannabis.

2. Marijuana appears to be significantly less addictive than alcohol.

Close to half of all adults have tried marijuana at least once, making it one of the most widely used illegal drugs. Yet research suggests that a relatively small percentage of people become addicted. For a large 1994 survey, epidemiologists at the National Institute on Drug Abuse asked more than 8,000 people between the ages of 15 and 64 about their drug use. Of those who had tried marijuana at least once, roughly 9 percent eventually fit a diagnosis of addiction. For alcohol, the figure was about 15 percent. To put that in perspective, the addiction rate for cocaine was 17 percent, while heroin was 23 percent and nicotine was 32 percent.

3. Marijuana may be harder on your heart; while moderate drinking could be beneficial.

Unlike alcohol, which slows down your heart rate, marijuana speeds it up, which could have negative short-term effects on the heart. Still, the largest-ever report on cannabis from the National Academies of Sciences, which was released in January 2017, found insufficient evidence to support or refute the idea that cannabis might increase the overall risk of a heart attack. On the other hand, low to moderate drinking - about a glass a day - has been linked with a lower risk of heart attack and stroke when compared to complete abstinence. Still, James Nicholls, a director at Alcohol Research UK, told The Guardian that those findings should be

Curiosities

CHEMWATCH

taken with a grain of salt since “any protective effects tend to be cancelled out by even occasional bouts of heavier drinking”.

4. Alcohol is strongly linked with several types of cancer; marijuana is not.

In November 2017, a group of US top cancer doctors issued a statement asking people to drink less. They cited strong evidence that drinking alcohol - as little as a glass of wine or beer per day - increases the risk of developing both pre- and postmenopausal breast cancer. The US Department of Health lists alcohol as a known human carcinogen. Research highlighted by the National Cancer Institute suggests that the more alcohol you drink - particularly the more you drink regularly - the higher your risk of developing cancer. For marijuana, some evidence initially suggested a link between smoking and lung cancer, but that has been debunked. The large January report found that cannabis is not connected to any increased risk of the lung cancers or head and neck cancers tied to smoking cigarettes.

5. Both drugs may be linked with risks while driving, but alcohol is worse.

A research note published by the US National Highway Traffic Safety Administration concluded that having a detectable amount of THC (the main psychoactive ingredient in cannabis) in your blood did not increase the risk of car accidents. Having a blood-alcohol level of 0.05 percent or higher increased the chances of being in a crash by 575 percent. Still, combining the two appears to have the worst results. “The risk from driving under the influence of both alcohol and cannabis is greater than the risk of driving under the influence of either alone,” the authors of a 2009 review wrote in the American Journal of Addiction.

6. Several studies link alcohol with violence, particularly at home. That has not been found for cannabis. It’s impossible to say whether drinking alcohol or using marijuana causes violence, but several studies suggest a link between alcohol and violent behaviour. According to the National Council on Alcoholism and Drug Dependence, alcohol is a factor in 40 percent of all violent crimes, and a study of college students found that the rates of mental and physical abuse were higher on days when couples drank. On the other hand, no such relationship appears to exist for cannabis. A recent study looked at cannabis use and intimate partner violence in the first decade of marriage and found that marijuana users were significantly less likely to commit violence against a partner than those who did not use the drug.

Curiosities

CHEMWATCH

7. Both drugs negatively impact your memory, but in different ways. These effects are the most common in heavy, frequent, or binge users. Both weed and alcohol temporarily impair memory while they are being used, and alcohol can cause blackouts by rendering the brain incapable of forming memories. In terms of their long-term effects, the most severe impacts are seen in heavy, chronic, or binge users who begin using in their teens. For marijuana, studies have shown that these effects can persist for several weeks after stopping marijuana use. There may also be a link between daily weed use and poorer verbal memory in adults who start smoking young. Chronic drinkers display reductions in memory, attention, and planning as well as impaired emotional processes and social cognition - and these can persist even after years of abstinence.

8. Both drugs are linked with an increased risk of psychiatric disease.

For weed users, psychosis and schizophrenia are the main concern; with booze, it's depression and anxiety. The largest existing review of marijuana studies found substantial evidence of an increased risk among frequent marijuana users of developing schizophrenia - something that studies have shown is a particular concern for people at risk of getting the disease in the first place. Weed can also trigger temporary feelings of paranoia and hostility, but it's not yet clear if those symptoms are linked with an increased risk of long-term psychosis. On the other hand, self-harm and suicide are much more common among people who binge drink or drink too frequently. But scientists have had a hard time deciphering whether excessive alcohol use causes depression and anxiety or whether people with depression and anxiety drink in an attempt to relieve those symptoms.

9. Alcohol appears to be linked more closely with weight gain than marijuana, despite weed's tendency to trigger the munchies.

Weed gives you the munchies. It makes you hungry, reduces the natural signals that tell you you're full, and may even temporarily make food taste better. But despite eating over 600 extra calories when smoking, marijuana users don't - on the whole - have higher BMIs. In fact, studies suggest that regular smokers are actually at a slightly reduced risk of obesity. Alcohol, on the other hand, appears to be linked with weight gain. A study published in the American Journal of Preventative Medicine found that people who drank heavily had a higher risk of becoming overweight or obese. Plus, alcohol itself is caloric: A can of beer has roughly 150 calories; a glass of wine has about 120.

Curiosities

CHEMWATCH

10. All things considered, alcohol's effects seem markedly more extreme - and risky - than marijuana's.

When it comes to their addiction profile and their risk of death or overdose combined with their ties to cancer, car crashes, violence, and obesity, the research suggests that marijuana may be less of a health risk than alcohol. Still, because of marijuana's largely illegal status, long-term studies on all of its health effects have been limited - meaning that more research is desperately needed.

Science Alert, 21 June 2018

<http://www.sciencealert.com.au>

Oral antibiotics tied to increased risk of kidney stones

2018-06-27

Children and adults who take five commonly prescribed types of antibiotics may be more likely to develop kidney stones than people who don't use these medicines, a recent study suggests. Researchers examined electronic health records collected from 1994 to 2015 for 25,981 people who developed kidney stones and a control group of 259,797 similar individuals who did not. Using the kidney stone diagnosis as an "index date," researchers then looked for prior antibiotic prescriptions in both groups. Exposure three to 12 months before the index date to any of five antibiotics - sulfas, cephalosporins, fluoroquinolones, nitrofurantoin/methenamine, and broad-spectrum penicillins - was associated with an increased risk of kidney stones. The risk increase associated with these antibiotics ranged from 27 percent higher odds with broad-spectrum penicillins to more than doubled odds with sulfas. "Without a doubt, antibiotics have saved millions of lives and are needed to prevent death and serious harm from infections; the benefits outweigh the potential harms," said lead study author Dr. Gregory Tasian of the Children's Hospital of Philadelphia. "These results don't suggest that antibiotics should not be prescribed when indicated," Tasian said by email. "However, they do support antibiotic stewardship - the judicious and appropriate use of antibiotics and reducing inappropriate use of antibiotics for a viral illness." Scientists already knew that antibiotics alter the composition of the human microbiome - all of the bacteria, viruses and fungi that live in and on the body. Changes in the intestinal and urinary microbiome have also been linked to kidney stones, but no previous studies revealed an association between antibiotics and stones, researchers note in the *Journal of the American Society of Nephrology*. The strongest risks for

Children and adults who take five commonly prescribed types of antibiotics may be more likely to develop kidney stones than people who don't use these medicines, a recent study suggests.

Curiosities

CHEMWATCH

kidney stones were in children and adolescents, the study found. The risk of kidney stones decreased over time but remained elevated several years after antibiotic use. Not all antibiotics were associated with an increased risk of kidney stones, however. The study examined 12 types of antibiotics and found seven that didn't appear to influence the risk of kidney stones. The study wasn't a controlled experiment designed to prove whether or how antibiotics might cause kidney stones. Another limitation is that some people might have had undiagnosed kidney issues before they took antibiotics, potentially inflating the risk associated with antibiotics. Kidney stones can also take years to develop, and affect only about 10 percent of people, making it challenging to prove a direct link to antibiotics that most people will take at some point in their lives, said Jeremy Burton a researcher at the University of Western Ontario and deputy director of the Canadian Centre for Human Microbiome and Probiotics, Lawson Health Research Institute in London, Ontario. "Kidney stone disease rates have been increasing steadily for no apparent reason, and many theories have been postulated. These range from global warming resulting in decreased hydration, to the microbiome changing due to an unhealthy Western diet," Burton, who wasn't involved in the study, said by email. "It is important to note that even with these enormous samples sizes (in the study) some confounding factors may remain, such as antibiotic use for the treatment of a urinary tract infection, a condition associated with kidney stones," Burton added. "Nonetheless these data suggest that there is a risk associated with certain antibiotic use and kidney stones."

Reuters Health, 21 June 2018

<http://www.reuters.com>

Gaming addiction classified as mental health disorder by WHO

2018-06-27

Many parents already have concerns, but some may now have a new argument for limiting their children's 'screen time' - addiction to video games has been recognised by World Health Organization as a mental health disorder. The WHO's International Classification of Diseases (ICD), a reference bible of recognised and diagnosable diseases, describes addiction to digital and video gaming as "a pattern of persistent or recurrent gaming behaviour" that becomes so extensive it "takes precedence over other life interests". The WHO's expert on mental health and substance abuse, Shekhar Saxena, said some of the worst cases seen in global research were of gamers playing for up to 20 hours a day,

Addiction to video games has been recognised by World Health Organization as a mental health disorder.

Curiosities

CHEMWATCH

forgoing sleep, meals, work or school and other daily activities. He stressed that only a small minority of people who play digital and video games would develop a problem but said recognition of early warning signs may help prevent it. "This is an occasional or transitory behaviour," he said, adding that only if such behaviour persists for around a year could a potential diagnosis of a disorder be made. Responding to the decision to including gaming addiction, the Video Games Coalition - an industry lobby group - said their products were "enjoyed safely and sensibly by more than 2 billion people worldwide" across all kinds of genres, devices and platforms. It added that the "educational, therapeutic, and recreational value" of games was well-founded and widely recognised and urged the WHO to reconsider. The ICD, which has been updated over the past 10 years, covers 55,000 injuries, diseases and causes of death. It forms a basis for the WHO and other experts to see and respond to trends in health. "It enables us to understand so much about what makes people get sick and die, and to take action to prevent suffering and save lives," WHO Director-General Tedros Adhanom Ghebreyesus said in a statement as the ICD was published. The ICD is also used by health insurers whose reimbursements depend on ICD classifications. This latest version - known as ICD-11 - is completely electronic for the first time, in an effort to make it more accessible to doctors and other health workers around the world. ICD-11 also includes changes to sexual health classifications. Previous editions had categorised sexual dysfunction and gender incongruence, for example, under mental health conditions, while in ICD-11 these move to the sexual health section. The latest edition also has a new chapter on traditional medicine. The updated ICD is scheduled to be presented to WHO member states at their annual World Health Assembly in May 2019 for adoption in January 2022, the WHO said in a statement.

Reuters Health, 18 June 2018

<http://www.reuters.com>

I've always wondered: why do we get dark circles under our eyes?

2018-06-27

I've always wondered why we get dark circles under our eyes, and whether anything can be done about them. Many people have an appearance of dark circles on the lower eyelids, and they have many different causes. Dark rings under the eyes are worsened by general fatigue, especially lack of sleep. The daily fluctuation is due to swelling of the skin, leading to a change in light diffusion, which looks like increased darkness of the skin.

The skin under our eyes is thinner than elsewhere on our face, meaning our blood vessels are more visible.

Curiosities

CHEMWATCH

For some people, all we can say is that their parents had dark circles under their eyes and therefore they do too. This trait can run in families and is more pronounced in certain ethnic groups. Sun exposure can also create dark circles under the eyes, by increasing the melanin content. The skin in this region can pigment more than the surrounding skin because it's more sensitive. Because the skin is thinnest under the eyes, the blood vessels here will be closer to the surface, meaning they look darker. As we age, our skin gets thinner and we lose collagen (the main structural protein in skin) and elastin (a highly elastic protein in connective tissue), which is why we get wrinkles. This often makes the blood vessels (which are dark in colour) under our eyes stand out more. The tear trough (the depression below the eye) also deepens with age because of movement of fat under the eye forwards, creating shadowing below it. The dark circles could also be a mere shadow from tired, puffy eyelids, or just from the anatomical shape of someone's eye sockets: some are hollowed more than others. People with this appearance could be suffering from a skin condition of the eyelid skin such as eczema or allergic contact dermatitis. Inflammation from dry and sore skin, and also rubbing, cause melanin production. Some people may not always have dark circles but may have been rubbing their eyes from fatigue or itchiness caused by hayfever. In these cases, the dark rings will simply go away after a while.

Can dark circles under the eyes be treated?

Darker skin under the eyes is a perfectly normal and natural appearance. But if it bothers you, there are a few options. Treatment will depend on what causes the dark circles, and these causes need to be addressed. In some cases, only an improvement may be possible. Removing the cause of inflammation of the eyelids will stop the melanin factory from overproducing. Then a fading cream can be used to reduce the colour. Be careful to use a cream without hydroquinone, which is a bleach that can harm our skin if used for too long, as it will be necessary to treat for a very long time. Ideally a fading cream would contain liquorice root extract, as there is some evidence this inhibits the melanin factory in the cells without causing toxicity to the cells. Uva-Ursi plant leaf extract and a type of nanopptide (Nanopeptide-1) are also commonly used. But while we know they are safe to use their effectiveness hasn't been tested.

The Conversation, 22 June 2018

<http://www.theconversation.com>

Curiosities

CHEMWATCH

Can a Bar of Soap Transmit Infection?

2018-06-27

Are there any health risks to using a communal bar of soap in, say, a health club? No. Bar soap does not appear to transmit disease. The most rigorous study of this question was published in 1965. Scientists conducted a series of experiments in which they intentionally contaminated their hands with about five billion bacteria. The bacteria were disease-causing strains, such as Staph and E. coli. The scientists then washed their hands with a bar of soap and had a second person wash with the same bar of soap. They found that bacteria were not transferred to the second user and concluded: "The level of bacteria that may occur on bar soap, even under extreme usage conditions (heavy usage, poorly designed non-drainable soap dishes, etc.) does not constitute a health hazard." In 1988, scientists employed by a soap manufacturer confirmed these findings. They inoculated bars of soap with pathogenic bacteria, in this case E. coli and Pseudomonas, and had 16 subjects wash their hands with the inoculated bars. After washing, none of the subjects had detectable levels of bacteria on their hands. They concluded that "little hazard exists in routine hand washing with previously used soap bars." Occasional studies since then have documented the presence of environmental bacteria on bar soap, but none have shown bar soap to be a source of infection. On the contrary, recent studies continue to demonstrate the ability of simple bar soap to combat infection, even during outbreaks of serious infections like Ebola virus. But would a jar of liquid soap be a better bet than bar soap? Scientists with conflicting proprietary interests jostled about the putative benefits of bar soap versus liquid soap beginning in the 1980s. Much of the contention revolved around the numbers of bacteria found on the surfaces of the bar or bottle of soap. But the key question remains not whether environmental bacteria are present but whether they pose a risk of infection. The Centres for Disease Control and Prevention recommends hand washing as the primary defence against infection and gives the same endorsement to bar soap as it does to liquid soap. Therefore, the only mistake one could make would be to fail to wash one's hands because of an unfounded fear of contamination.

New York Times, 22 June 2018

<http://www.nytimes.com/>

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Curiosities

CHEMWATCH

Night Owls May Have Higher Depression Risk

2018-06-27

Night owls may be at greater risk for depression than early birds. Previous studies have found a link between a person's unique circadian rhythm, or chronotype, and depression, but none were able to tell whether sleep habits were a cause or an effect of the disease. This new prospective study, in the *Journal of Psychiatric Research*, is a step closer to establishing causality. Researchers gathered health and behavioural data on 32,740 women whose average age was 55. Each categorised herself as a definite evening or morning type, a somewhat morning or evening type, or neither. All were free of depression at the start of the study, and over the following four years 2,581 of them developed depression, defined by antidepressant use or a clinical diagnosis. After adjusting for marital status, living alone, being retired, alcohol consumption and other variables, the researchers found that compared to the intermediate types, morning people were 12 percent less likely to develop depression, and night owl's 6 percent more likely to develop it. The relationship was linear: the more a woman tended toward the night-owl type, the more likely she was to develop depression. "The effect is modest, a modest association for chronotype and incident depression," said the lead author, Céline Vetter, an assistant professor at the University of Colorado. "But the overall pattern remains constant. We need to get much deeper into what the genetic and environmental contributions are between mood and chronotype."

New York Times, 20 June 2018

<http://www.nytimes.com/>

Why Do Our Brains Have Folds?

2018-06-27

Most of us have long accepted that our brains look like overgrown, shrivelled walnuts. But why do our brains have those tell-tale wrinkles? The cortex, or the outer surface of the brain — what's colloquially referred to as "grey matter" — expands and subsequently folds as our brains develop in the womb, said Lisa Ronan, a research fellow in the Department of Psychiatry at the University of Cambridge in England. In essence, this expansion causes pressure to increase in that outer surface, which is then mitigated by folding, Ronan, told Live Science. Basically, imagine pushing at either end of a piece of rubber — at some point, the surface will bend in response to the increasing pressure. Or, if you're into geology, think of it like two tectonic plates crashing into each other: The

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Curiosities

CHEMWATCH

pressure during the collision eventually becomes so great that those plates experience a geological fold. These countless folds allow humans to pack in more neurons which, in turn, can mean more advanced brains with increased cognitive abilities, Ronan said. However, folded brains are hardly ubiquitous, as most animals' brains aren't folded. For instance, the cortex of mice and rats does not expand enough during development to lead to folding, meaning their brains are wholly smooth surfaces. When brain folding does happen, it tends to occur in animals with larger brains, Ronan told Live Science in an email. "But this isn't always the case — some large mammals like the manatee have far fewer folds than researchers would otherwise expect based on the size of their brain," she said. There's a good reason for this: whether a fold forms depends not only on the overall growth of the cortex, but also the physical properties of that part of the cortex. For example, thinner regions tend to fold more easily than others, Ronan said. "You're born with a folded brain," said Ronan. "But a key and intriguing point of gyrification [the study of cortical folding] is that the brain folds in specific patterns." Though the brains' ridges and valleys — called gyri and sulci, respectively — look random, they're actually consistent across individuals, and even some species. Ronan said this consistency is important because it indicates that the folding has meaning. Ultimately, the physical properties and unique folding patterns of each cortex region are linked to its function. "Having the largest surface area in and of itself isn't enough; it's also about cortex function," Ronan said. "Elephants have way larger, and more folded, brains than humans do. But obviously, we're at the top of the evolutionary tree, and they're not." In other words, the function of our cortex is more advanced, at least in some respects, than the function of the elephant cortex, even though the elephant's brain has more wrinkles. So, those wrinkles that make our brains look like raisins are ultimately useful; they help us pack a bigger cerebral punch in the same amount of skull space.

Live Science, 23 June 2018

<http://www.livescience.com>

Kidney cells engineered to produce insulin when caffeine is present in the body

2018-06-27

A team of researchers from ETH Zurich and the University of Basel in Switzerland and Institut Universitaire de Technologie in France has that found that embryonic kidney cells engineered to produce insulin when exposed to caffeine were able to reduce glucose levels in mouse models.

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Curiosities

CHEMWATCH

In their paper published in the journal *Nature*, the group describes their efforts and how well it worked in the mouse models. People with diabetes suffer from higher than normal levels of glucose in the blood, which can lead to a host of health problems. Current treatments include drugs that make cells more sensitive to insulin, or injection of insulin to make more of it available to cells that need it. In this new effort, the researchers have developed a new way to get more insulin into the body when it is needed most. Instead of adding insulin externally, the researchers engineered embryonic kidney cells to produce it—but only when they were exposed to caffeine. The team chose caffeine because it has been so extensively studied and because the majority of people consume caffeinated beverages, such as coffee and soft drinks. They point out that caffeine is also a substance that appears very rarely in other foods, making its ingestion easy to regulate. The engineered cells were covered with a material that protected them from the immune system and were then put into a device that was implanted into the abdomens of mice that had been engineered to have diabetes. The researchers note that glucose levels tend to spike after people (and mice) eat sugar or food material that the body converts to sucrose. Thus, the optimal time for giving the mice caffeine would be after eating. The researchers report that they were able to attain relatively stable glucose levels in the mice by varying the amount of caffeine they were given after eating. Putting such a device in human test patients is still a long way off, the researchers acknowledge, but they note their method might also be applicable for treating other ailments.

Medical Xpress, 22 June 2018

<http://medicalxpress.com>

Accurate measurements of sodium intake confirm relationship with mortality

2018-06-27

Eating foods high in salt is known to contribute to high blood pressure, but does that linear relationship extend to increased risk of cardiovascular disease and death? Recent cohort studies have contested that relationship, but a new study published in the *International Journal of Epidemiology* by investigators from Brigham and Women's Hospital and their colleagues using multiple measurements confirms it. The study suggests that an inaccurate way of estimating sodium intake may help account for the paradoxical findings of others. "Sodium is notoriously hard to measure," said Nancy Cook, ScD, a biostatistician in the Department of Medicine at BWH. "Sodium is hidden—you often don't know how much of it

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Curiosities

CHEMWATCH

you're eating, which makes it hard to estimate how much a person has consumed from a dietary questionnaire. Sodium excretions are the best measure, but there are many ways of collecting those. In our work, we used multiple measures to get a more accurate picture." Sodium intake can be measured using a spot test to determine how much salt has been excreted in a person's urine sample. However, sodium levels in urine can fluctuate throughout the day so an accurate measure of a person's sodium intake on a given day requires a full 24-hour sample. In addition, sodium consumption may change from day to day, meaning that the best way to get a full picture of sodium intake is to take samples on multiple days. While previous studies have used spot samples and the Kawasaki formula, the team assessed sodium intake in multiple ways, including estimates based on that formula as well as ones based on the gold-standard method, which uses the average of multiple, non-consecutive urine samples. They assessed results for participants in the Trials of Hypertension Prevention, which included nearly 3,000 individuals with pre-hypertension. The gold-standard method showed a direct linear relationship between increased sodium intake and increased risk of death. The team found that the Kawasaki formula suggested a J-shaped curve, which would imply that both low levels and high levels of sodium consumption were associated with increased mortality. "Our findings indicate that inaccurate measurement of sodium intake could be an important contributor to the paradoxical J-shaped findings reported in some cohort studies. Epidemiological studies should not associate health outcomes with unreliable estimates of sodium intake," the authors wrote.

Medical Xpress, 21 June 2018

<http://medicalxpress.com>

Technical Notes

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

ENVIRONMENTAL RESEARCH

Ecotoxicological and biochemical mixture effects of an herbicide and a metal at the marine primary producer diatom *Thalassiosira weissflogii* and the primary consumer copepod *Acartia tonsa*

Numerical-ecotoxicological approach to assess potential risk associated with oilfield production chemicals discharged into the sea

Is the aquatic environment sufficiently protected from chemicals discharged with treated ballast water from vessels worldwide? - A decadal environmental perspective and risk assessment

Can excreted thiocyanate be used to detect cyanide exposure in live reef fish?

Animal models of endocrine disruption

MEDICAL RESEARCH

Adverse events of smoking cessation treatments (nicotine replacement therapy and non-nicotine prescription medication) and electronic cigarettes in the Food and Drug Administration Adverse Event Reporting System, 2004-2016.

Cost-Effectiveness of Ribociclib plus Letrozole Versus Palbociclib plus Letrozole and Letrozole Monotherapy in the First-Line Treatment of Postmenopausal Women with HR+/HER2- Advanced or Metastatic Breast Cancer: A U.S. Payer Perspective

Factors impacting the efficacy of venlafaxine extended release 75-225 mg/day in patients with major depressive disorder: exploratory post hoc subgroup analyses of a randomised, double-blind, placebo-controlled study in Japan

The Case of Ketamine Allergy

Methylation of L1RE1, RARB, and RASSF1 function as possible biomarkers for the differential diagnosis of lung cancer

Technical Notes

CHEMWATCH

OCCUPATIONAL RESEARCH

An increase of fractional exhaled nitric oxide after specific inhalation challenge is highly predictive of occupational asthma

Lead Exposure among Workers at a Shipyard - Wisconsin, 2015-2016

Occupational exposure to platinum drugs during intraperitoneal chemotherapy. Biomonitoring and surface contamination

Workplace relationships impact self-rated health: A survey of Swedish municipal health care employees

Persistent Organic Chlorinated Compound Residues in the Breast Milk of Agricultural Workers

PUBLIC HEALTH RESEARCH

A ternary mixture of common chemicals perturbs benign human breast epithelial cells more than the same chemicals do individually

Chemical-induced phenotypes at CTD help inform the pre-disease state and construct adverse outcome pathways

An evaluation of emergency guidelines issued by the World Health Organisation in response to four infectious disease outbreaks

House Dust and Its Adverse Health Effects

Health Risk Factors for Housing Environment and Risk Management