Bulletin Board
AUG. 16, 2019

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CHEMWATCH

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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

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Therapeutic goods advertising: update 31 July 2019

2019-08-09

Minor corrections and clarifications have been made to the Therapeutic Goods Advertising Code (No.2) 2018. These came into effect on 30 July 2019. TGA are also taking the opportunity to:

- update medicine advertisers on a change in name and address for the Australian Self-Medication Industry, and
- clarify advertising pre-approval application arrangements, including those for catalogues containing a mix of different medicine types, and timeframes.

Changes to the Therapeutic Goods Advertising Code (No.2) 2018

The Therapeutic Goods Advertising Code (No.2) 2018 came into effect on 1 January 2019. Following feedback from industry and the Therapeutic Goods Advertising Consultative Committee (TGACC), TGA have identified and made minor corrections and clarifications to the Code. These amendments are effective from 30 July 2019.

Key corrections and clarifications

The amendment instrument contains a full list of the changes made to the Code. Key amendments include:

- clarifications to the definition of 'health warnings' for medical devices and other therapeutic goods (section 4);
- clarification that the section 11 mandatory statement applies to advertising of any therapeutic good that includes a Schedule 3 substance when the advertising is permitted by inclusion of the substance in Appendix H of the Poisons Standard;
- provision for advertisers to vary the wording of the indications or intended purpose used in the advertisement from that included on the good's label or instructions for use – provided that it does not differ in meaning or intent (sections 12 and 13);
- a change to section 13 to clarify that, for the purposes of that section, the test for whether there is a health warning for a medicine is limited to the inclusion of an ingredient listed in Part 1 or Part 2 of Schedule 1 (i.e. Parts 3 and 4 are not relevant);
- the exemption for picture / price / point of sale from the requirements of section 13 has been amended so that representations other than

therapeutic claims can still be used without affecting the exemption; and

- clarification that references to pregnancy, other than complicated pregnancies, are not captured as restricted representations (section 28).

The agency has also taken the opportunity to provide advertisers with the option to use a single mandatory statement when telling consumers to 'read the label' when advertising multiple medicines at once (section 13(2A)). Further information about the changes is available from the explanatory statement. TGA consulted with the TGACC prior to making these corrections and clarifications and incorporated member feedback where appropriate. These changes are effective from 30 July 2019. A consolidated Code containing the amendments will also be published. In addition, the agency is updating the guidance to reflect the changes to the Code. Further announcements will be made when the consolidated Code and revised guidance is published.

Which version of the Code applies when?

Medicine advertising pre-approvals

When deciding whether to approve an application for pre-approval of medicines advertising in specified media, the Advertising Services Managers (ASM) will apply the amended Code to all decisions made from 30 July 2019, irrespective of the date on which the application was received. As the amendments to the Code are minor in nature and also provide advertisers with additional flexibility, they are not expected to impact applications under consideration at the time the Code amendments were made.

Compliance

When considering complaints about the advertising of therapeutic goods, the TGA will consider:

- for pre-approved advertising of medicines – the Code in force at the time the advertising was approved (provided the approval has not expired or been withdrawn)
- for all other advertising from 1 January 2019 onwards - the Code as amended.
- No transition arrangements have been implemented with the amendments to the Code as the amendments to the Code are minor in nature.

Regulatory Update

Important information about applications for medicine advertising pre-approval

Change in name and address for Australian Self-Medication Industry

The Australian Self-Medication Industry (ASMI) is now Consumer Healthcare Products Australia (CHP Australia). CHP Australia has also relocated from North Sydney to St Leonards. The name change does not affect CHP Australia's authority to approve advertisements. Applications for advertisements for OTC medicines in specified media and for complementary medicines appearing in broadcast media should now be sent to:

Advertising Services
Consumer Healthcare Products Australia (CHP Australia)
PO Box 209, ST LEONARDS NSW 1590
Tel: 02 9955 7205
Email: advertising@chpaustralia.com.au

The application form is being updated to reflect these new details.

Catalogues

Catalogues are commonly used by retailers (such as pharmacies) to advertise therapeutic goods to consumers. Pharmacy catalogues, in particular, often contain a mixture of complementary medicines, over-the-counter medicines and medical devices. Medicine advertisements to appear in catalogues will generally require pre-approval under the Therapeutic Goods Regulations 1990 before being printed. If you intend to advertise complementary medicines and other medicines in the same catalogue, it is your responsibility to get approvals from both Advertising Services Managers (ASMs), namely:

- the Complementary Healthcare Council of Australia, for complementary medicines and
- Consumer Healthcare Products Australia, for all other kinds of medicines.

Where a catalogue (rather than the individual medicine advertisement) has been lodged for pre-approval, the approval will indicate to which specific medicines the approval applies.

Timeframes for deciding applications and extensions

Under the Therapeutic Goods Regulations 1990 (the Regulations), an application lodged for pre-approval of medicines advertising in specified

media must be decided within 60 days. When preparing an application for pre-approval, you should note that the different Advertising Services Managers (ASMs) may have different processes that you will need to factor in when planning your advertising and application. These processes will include, where necessary, sufficient time to write formal reasons for a decision. The Regulations do allow for extensions to timeframes by mutual agreement between the ASM and the applicant. If you need additional time to respond to queries raised by a delegate, you can request an extension in writing. However, if you provide a significant amount of information to an ASM and they request additional time to assess that information, failure to agree to that request may adversely affect your application.

TGA, 31 July 2019

http://www.tga.gov.au/

Ozone, uh oh: Fumigator roasted for spraying pesticide at fruit market

2019-08-09

A fumigation company at Melbourne's fruit and vegetable wholesale market has been ordered to stop releasing a gas it sprays to deter pests because it depletes the ozone layer.

A fumigation company at Melbourne's fruit and vegetable wholesale market has been ordered to stop releasing a gas it sprays to deter pests because it depletes the ozone layer. It's the first time the Environment Protection Authority has issued a pollution abatement notice for methyl bromide, a colourless and odourless gas often used to control insects, spiders, mites, snails and rodents. Madiklumi Pty Ltd – the company whacked with the clean-up edict at the Epping markets – challenged the decision. However, it was recently upheld in the Victorian Civil and Administrative Tribunal. The environment watchdog used powers that stem from the United Nations Montreal Protocol, an international agreement first signed in 1989 to prevent the hole in the ozone layer from getting bigger. Methyl bromide has been banned in Australia for all but certified quarantine and feedstock uses since 2005. Sitting in the stratosphere between 15 and 35 kilometres above earth, the ozone layer filters out harmful ultraviolet light that causes skin cancer, agricultural disasters and other damage. The Montreal Protocol is credited with reversing its degradation. After receiving a tip-off, the EPA discovered in late 2017 that Robinson's Unloading, a logistics company connected to Madiklumi, was releasing diluted methyl bromide into the atmosphere after it had finished fumigating. Under the VCAT order, Madiklumi was given until next February to stop. The company will also be required to provide regular reports on its compliance. The tribunal heard that the

most effective way to prevent the release of methyl bromide was to recapture it and then bury it in landfill. Lawyers for Madiklumi argued that this would have a significant financial impact on the fumigation company, starting with a capital outlay of between $70,000-$100,000. However, VCAT senior member Geoffrey Code and member Catherine Wilson rejected the argument, pointing out that other fumigators were able to continue operating while capturing methyl bromide. The EPA's CEO, Dr Cathy Wilkinson, praised the tribunal for sending "a clear message" to businesses that protection of the environment was more important than financial considerations. "Methyl bromide is a necessary evil for many fresh produce operators, but that doesn't mean we should abandon all environmental considerations, especially when there are viable options available for reducing its impact," she said. Russell Kennedy principal Stefan Fiedler said Madiklumi was disappointed with the tribunal's decision. "Madiklumi estimates the requirement will increase the cost of fumigation for consignment of fresh produce for distribution predominantly to the interstate domestic market and also overseas," he said. Mr Fiedler said the company would work to comply with the decision. It was important that other fumigators had the same standard imposed on them to prevent "market distortion", he said. "Madiklumi will continue its work alongside leading industry partners in pursuit of alternative technology avoiding the future use of methyl bromide," he said. EPA senior air quality scientist Dr Paul Torre said methyl bromide was a popular method of pest control because it was fast-acting and could be applied across large surfaces. "But there's the other side," he said. "There are these environmental impacts and that's why they have been trying to phase this out for a number of years. It's about finding an alternative."

The Age, 3 August 2019

http://www.theage.com.au

New Zealand's Environmental Protection Authority (EPA) held a hearing on 24 July 2019 for a new fungicide, Vimoy Iblon.

Hearing for a new fungicide

2019-08-09

New Zealand's Environmental Protection Authority (EPA) held a hearing on 24 July 2019 for a new fungicide, Vimoy Iblon. The application is from Bayer New Zealand Limited. The fungicide contains a new active ingredient, isoflucypram, that is yet to be approved in any country. The Decision-Making Committee is now considering their decision.

Further details on the application are available at: Read the application documents.

NZ EPA Hazardous Substances Bulletin, July 2019

http://www.epa.govt.nz

Reassessment of methyl bromide

2019-08-09

New Zealand's Environmental Protection Authority (EPA) are current receiving submissions on a reassessment of the fumigant methyl bromide. Submissions close at 29 August 2019. Stakeholders in Methyl Bromide Reduction Inc (STIMBR) applied for a reassessment of the approval for methyl bromide. Methyl bromide is used as a fumigant in the quarantine and pre-shipment treatment of logs, produce, flowers and other goods. It is also used for the treatment of potato wart. The agency is processing this application as a modified reassessment. This means that the reassessment will only consider specific aspects of the approval, such as the required controls. The approval to import or manufacture methyl bromide cannot be revoked in this type of reassessment. Further information is available at: Read the application documents and submission guidelines.

NZ EPA Hazardous Substances Bulletin, July 2019

http://www.epa.govt.nz

New Zealand's Environmental Protection Authority (EPA) are current receiving submissions on a reassessment of the fumigant methyl bromide.

China Publishes Petrochemical Sector Carbon Emissions Norm

2019-08-09

On 30 July 2019, Standardisation Administration of China (SAC) publicly announced the schedule for development of "*The Norm of Carbon Emission Caps per Unit Product of Petroleum and Chemical Industry*" on the national public service platform for standards information. This public announcement precedes the actual drafting of the new standard which will not begin until the public announcement period ends on 13 August 2019. *The Norm of Carbon Emission Caps per Unit Product of Petroleum and Chemical Industry* will be drafted by several authorities including the China Petroleum and Chemical Industry Federation and China National Institute of Standardisation. The new standards aim to provide a scientific basis for government to implement carbon emission quotas and provide guidance for enterprises to reduce carbon emissions. This standard regulates the requirements, scope of statistics, calculation methods, and carbon

emission management and measures for carbon emission caps, and is applicable to the calculation and evaluation of carbon emission caps for key products (refining, ethylene, urea, synthetic ammonia, methanol, soda ash, caustic soda, monoammonium phosphate, diammonium phosphate). This standard will also apply to newly established enterprise to manage carbon emission per unit product. Further information is available at: SAC

Chemlinked, 6 August 2019

http://chemlinked.com/en/news

Zhejiang Prohibits Night-time Transport of Hazardous Chemicals on Highways

2019-08-09

On 24 July, Zhejiang Provincial Public Security Department, Communications Department and Emergency Management Department jointly released a notice stating that vehicles loaded with hazardous chemicals are prohibited from driving on highways within the province from 12am to 6 am. The measures came into force from 1 August 2019. Five provisions were stipulated in the notice, including:

Zhejiang released a notice mandating that hazardous chemical transport vehicles will be prohibited from driving on the highways within the province from 12 am to 6 am.

- Hazardous chemicals transport vehicles will be prohibited from driving on provincial highways from 12 am to 6 am. A reporting management system has been established.
- Drivers should strictly abide by the restrictions and should prepare in advance to exit highways before the daily deadline. It is forbidden to stay in service areas or station squares during restricted times.
- Related manufacturers, retailers, logistics and users should make efforts to ensure that vehicles loaded with hazardous chemical aren't on highways during the restricted period.
- Highway management should set conspicuous no-access signs for vehicles at the entrances of highways and strengthen management to keep vehicles off highways during the restricted period.
- Penalties for violations to the restriction will be executed according to People's Republic of China Road Traffic Safety Law, Implementation Regulations of the People's Republic of China Road Traffic Safety Law and Regulations on the Control over Safety of Hazardous Chemicals (Decree 591).

More details were published at a press conference held on the same day; three reasons were given to explain why the restrictions need to be implemented. Firstly, the hidden dangers of hazardous chemicals

accidents on highways are high, and the damage caused by accidents at night-time is greater than during the daytime. 736 accidents happened in 2018, up from 373 in 2017. Secondly, night rescue is more difficult, making accidents involving hazardous chemicals even worse. Thirdly, compared with other provinces in the surrounding area, Zhejiang's policy on the restriction of hazardous chemical transport vehicles is weak. For example, Jiangxi and Jiangsu have taken this action for years and Jiangsu extended the restricted period at the beginning of the year, from 10 pm to 6 am. In Shanghai, there is only one highway where transport of hazardous chemicals is permitted. As a result of these policies, vehicles would gather in Zhejiang during the restricted periods of other provinces, significantly increasing the risk of accidents in Zhejiang. On the evening of 22 July, a tanker loaded with 30 tons of bromoethane leaked while driving in Pan'an County, Zhejiang Province. The rescue operation lasted for 43 hours and the neighbouring villagers were evacuated for a couple of days. After the restriction is implemented, the number of accidents and the impact should be significantly reduced. Further information is available at: The notice

Chemlinked, 5 August 2019

http://chemlinked.com/en/news

Agency takes unprecedented step to make additional information about the status of chemical reviews available to the public

AMERICA

EPA Announces Updated Chemical Review Tool

2019-08-09

The United States Environmental Protection Agency (EPA) is continuing its commitment to transparency by making additional information about new chemical notices available to the public on the agency's website. Visitors to the updated chemical review status tracker can view and search monthly updates for any active Premanufacture Notice (PMN), Significant New Use Notice (SNUN) and Microbial Commercial Activity Notice (MCAN) of interest by case number. It is important to note that this tool will continue to keep confidential business information confidential. "By making this tracker available online, for the first time the public will easily be able to learn where a particular new chemical is in the EPA review process," said EPA Administrator Andrew Wheeler. "With this step the agency is following through on its commitment to transparency and is providing applicants, stakeholders and the public with an easy-to-use tool to monitor the progress of new chemical safety reviews." Visitors to

the site will also be able to download a spreadsheet with a list of all active cases and each case's status. Previously, the agency only presented the number of cases in each step of the review process without identifying case numbers. This enhancement supplements the existing status tables describing the received date, the interim status, and final determinations for each case reviewed by EPA since the amendments to Toxic Substances Control Act (TSCA) were passed in 2016. The update also supports the agency's ongoing efforts to more efficiently review new chemicals submissions by proactively providing status updates to submitters. This action is another important step toward meeting EPA's transparency goals and complements other recent actions, including publishing all new chemical notices and their attachments (May 2019) and publishing information about TSCA Confidential Business Information claim reviews (July 2019). Later this year, website visitors will be able to connect to certain PMN and SNUN cases of interest on ChemView through quick links in our status tracker. The agency plans to continue to increase access to this information next year by increasing the frequency of updates to the tracker. These efforts to enhance the availability of TSCA information reaffirms Administrator Andrew Wheeler's commitment to increase transparency regarding the work of EPA's new chemicals program.

U.S EPA, 1 August 2019

http://www.epa.gov

U.S. Department of Labor Launches Redesigned OSHA Whistleblower Protection Program Website

2019-08-09

The United States Department of Labor's Occupational Safety and Health Administration (OSHA) announced the recent launch of a redesigned website for its Whistleblower Protection Program.

The United States Department of Labor's Occupational Safety and Health Administration (OSHA) announced the recent launch of a redesigned website for its Whistleblower Protection Program. The interactive, streamlined design highlights important information and data on more than 20 statutes OSHA enforces. The redesign includes a new homepage with a video that showcases industries the program covers, and menu options that allow employers and employees to easily find information about their rights and responsibilities. Users can access information on protected activities, filing deadlines, and resources based on subject/industry or statute. OSHA used feedback received at recent whistleblower stakeholder meetings to inform the redesign. Under OSHA's Whistleblower Protection Program, employees may file whistleblower complaints with the Agency if they believe they have been retaliated against for engaging in protected activities related to workplace safety and health,

airline, commercial motor carrier, consumer product, environmental, financial reform, food safety, motor vehicle safety, healthcare reform, nuclear, pipeline, public transportation agency, railroad, maritime, and securities laws. For more information on whistleblower provisions, visit the Whistleblower Protection Program webpage at www.whistleblowers.gov.

U.S OSHA, 1 August 2019

http://www.osha.gov

Upcoming Legislation to Address Plastic Waste

2019-08-09

United States Senator Tom Udall (D-NM) and Representative Alan Lowenthal (D-CA) plan to introduce legislation in the fall aimed at reducing plastic waste. The legislation will include phase-out requirements for certain single-use products, extended producer responsibility (EPR) initiatives, and deposit or charge requirements at point-of-purchase. The EPR initiatives will include requiring producers to design, manage, and finance programs for end-of-life management of their products and packaging as a condition of sale. In addition, producers will be required to help cover the costs of waste management and clean-up, as well as awareness raising measures for a variety of plastic products, including food and drink containers, packets and wrappers, and lightweight plastic bags. "By shifting the large and growing financial burden of cleaning up plastic pollution from state and local governments to the companies that manufacture and sell the products, the bill will increase the effectiveness of pollution control," according to a press release on the legislation. Some of the other components of the legislation are described below. A national deposit on beverage containers will be collected at point-of-sale and returned to consumers when the containers are returned. Money that is not refunded would go into a Federal Fund to assist with collection infrastructure. A fee will be placed on the distribution of carryout paper and non-reusable bags that will be deposited into a Federal Fund. Where alternatives are reasonably available, certain plastic products—including lightweight plastic carryout bags, cups and lids, and drink stirrers—and expanded polystyrene in food-ware and other specified products will be banned. Plastic consumer products will require labels with disposal instructions. Plastic bottles, packaging, and certain other products will be required to include a minimum level of post-consumer recycled materials and to be made from 100% recyclable materials. The American Chemistry Council (ACC) responded to the announcement from Sen. Udall and Rep. Lowenthal by stating that while America's plastic makers are committed

United States Senator Tom Udall (D-NM) and Representative Alan Lowenthal (D-CA) plan to introduce legislation in the fall aimed at reducing plastic waste.

to doing their part to help end plastic waste. They also stated that the new legislation "would have the unintended consequences of increasing greenhouse gas emissions and other environmental impacts. A robust study completed in 2015 by the firm Trucost shows that replacing plastics with alternatives in common packages and consumer products would raise environmental costs nearly fourfold."

National Law Review, 1 August 2019

http://www.natlawreview.com

Cal/OSHA Standards Board Adopts New Emergency Regulation to Protect Outdoor Workers from Wildfire Smoke

2019-08-09

California's Department of Industrial Relations' Occupational Health & Safety Standards Board adopted an emergency regulation to protect workers from hazards associated with wildfire smoke. The regulation is expected to go into effect in early August. The emergency regulation will be effective for one year and applies to workplaces where the current Air Quality Index (AQI) for airborne particulate matter is 151 or greater, and where employers should reasonably anticipate that employees could be exposed to wildfire smoke. Under the new regulation, employers must take the following steps to protect workers, according to a news release: Identify harmful exposure to airborne particulate matter from wildfire smoke before each shift and periodically thereafter by checking the AQI for PM 2.5 in regions where workers are located. Reduce harmful exposure to wildfire smoke if feasible, for example, by relocating work to an enclosed building with filtered air or to an outdoor location where the AQI for PM 2.5 is 150 or lower. If employers cannot reduce workers' harmful exposure to wildfire smoke so that the AQI for PM 2.5 is 150 or lower, they must provide:

- Respirators such as N95 masks to all employees for voluntary use.
- Training on the new regulation, the health effects of wildfire smoke, and the safe use and maintenance of respirators.

The Standards Board has also requested that Cal/OSHA conduct a follow-up comprehensive review of the regulation with an advisory committee using the regular rule making process in order to adopt permanent

California's Department of Industrial Relations' Occupational Health & Safety Standards Board adopted an emergency regulation to protect workers from hazards associated with wildfire smoke.

regulations. The emergency regulation will remain in effect during that process.

Occupational Health & Safety News, 24 July 2019

http://www.ohsonline.com

EUROPE

No safe exposure to chlorpyrifos, EU regulators say

2019-08-09

No safe exposure level can be set for the pesticide chlorpyrifos, the European Food Safety Authority says in an Aug. 2 statement. The announcement suggests that the European Union is unlikely to allow chlorpyrifos use after its approval expires in January. A peer-review panel is currently evaluating applications for chlorpyrifos renewal in the EU. Those applications were submitted by manufacturers Corteva Agriscience (formerly Dow AgroSciences), Adama Agriculture, and Sapec Agro. Chlorpyrifos is an organophosphate insecticide used on a large number of crops worldwide. In July, the European Commission asked EFSA to weigh in on the mammalian toxicology and human health effects of chlorpyrifos. European regulators identified two areas of concern: neurodevelopmental effects in children—effects that are supported by epidemiological studies—and potential genotoxic effects. The pesticide "does not meet the criteria required by legislation for the renewal of its approval in the European Union," EFSA says in its statement. Corteva Agriscience disputes that conclusion. "No active ingredient had been more thoroughly researched than chlorpyrifos," the company says in a statement. "The EFSA conclusions do not match the conclusions of other major regulatory bodies." Last month, the US Environmental Protection Agency announced that chlorpyrifos can stay on the US market. The pesticide has been at the centre of a legal fight in the US since 2007, when environmental and farmworker groups first petitioned the EPA to ban use of chlorpyrifos on food crops. The EPA agreed to the ban under the Obama administration because of concerns about health risks to children. The agency reversed that decision in March 2017, under the Trump administration. "The EU is doing what the science demands: putting public health ahead of the narrow interests of the pesticide industry," Ken Cook, president of the Environmental Working Group, an advocacy group, says in a statement. "Tragically for Americans kids and their parents, the Trump administration

Food safety authority finds insecticide does not meet criteria for renewal

is kowtowing to chemical agribusiness and allowing a dangerous pesticide to be sprayed on foods children eat every day."

Chemical & Engineering News, 5 August 2019

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

Directive 2019/983: what's new?

2019-08-09

On 5 June 2019 the European Directive 2019/983 was published. This directive updates Annex III Directive 2004/37/CE, containing the occupational exposure limit values by adding new entries. The two substances added by Directive 2019/983 are the following:

- Formaldehyde (CAS: 50-00-0)
- 4,4' -Methylene-bis (2-chloroaniline) (CAS: 101-14-4)

Some exposure limit values indicated in this directive are not linked to single substances but they refer to a multiplicity of inorganic compounds. The three generic groups that have been added are:

- Cadmium and its inorganic compounds
- Beryllium and inorganic beryllium compounds
- Arsenic acid and its salts, as well as inorganic arsenic compounds

Directive 2019/983 came into force on 10 July 2019, therefore member States have time until 11 July 2021 to adopt this update. Concerning the entry into force of limit values, transitional measures are in place for some agents. Further information is available at: **Directive 2019/983**

On 5 June 2019 the European Directive 2019/983 was published.

Selerant, 2 August 2019

https://resources.selerant.com

Final Amended Version of Renewable Energy Sources Act in Poland is Now Pending the President's Signature

2019-08-09

On 2 August 2019, the Senate – the upper house of the Polish Parliament – passed the law amending the Renewable Energy Sources (RES) Act and certain other laws, which is now pending the President's signature. Compared to the drafts discussed, there have been several material changes which may potentially have a bearing on the business. What is particularly hazardous for investors still using the green certificate support is the amendment, which briefly appeared at the commissions stage,

introducing a maximum total price per MWh of energy and on property rights. Thankfully, it has been removed from the wording of the act in the course of the legislative process. Once the act has been signed by the President and published in the Journal of Laws, it will come into effect within 14 days.

Expanding the Prosumer Catalogue

The RES Act amendments in their current shape not only add entrepreneurs to the prosumer catalogue, but also energy cooperatives, which generate electricity for their and their members' purposes. Unlike under the non-cooperative regime, electricity generation will be balanced at the ratio of 1 to 0.6, which will make the use of RES slightly less competitive for these entities than for individuals or entrepreneurs.

Removing the Amendment Related to the Advantageous Settlement System After the Support Period

Ultimately, the passed act will not feature the solution from its previous incarnations, allowing for obtaining further funding for generating more electricity than provided for in the auction bid. Removing this amendment will result in a situation in which, even under highly favourable weather conditions, a RES installation owner who has won the auction will not be able to take advantage of this fact.

Auction Bids from Installations Already Generating Energy Prior to Auction Results Date

What was also changed was the solution which allowed entities previously generating and selling electricity to participate in the auction. Unlike in the draft amendment, entities need not sell all the energy at the energy exchange prior to the auction results – it is enough for the price for the electricity sold on a given day not to exceed the average daily market price.

Amount and Value of Energy to Be Purchased at the Auction

There were no changes as to the amount and value of energy intended for purchase at the auction in the wind farm and PV baskets (compared to the draft.

Expanding Grid Access Agreement Validity

In the passed act, the validity period of grid access agreements was expanded to June 30, 2021. In order to expand the period, an appropriate

motion must be filed within three months following the amendment effective date.

Other Solutions Unchanged Compared to the Previous Incarnations

The solutions of the following issues have remained unchanged:

- Expanding the validity of wind turbine building permits
- Expanding the sale commencement period for electricity generated by the auction-winning installation and the maximum acceptable installation age
- Highly simplified procedure for reporting prosumer installations and principles of settling with grid operators

Further Support for Prosumers

The introduced market changes, however, are not limited just to amending the laws. The government has adopted a two-pronged strategy by introducing the "My Electricity" program, whereby individuals can expect a PV installation purchase subsidy. Under the program, the support provided will be up to PLN 5,000 per installation. A budget reserve of PLN 1 billion has been earmarked for executing the program. The Minister of Energy claims that, in the event of a warm public welcome and the budget drying up quickly, a possibility of expanding the support pool may not be ruled out. Further financial support for prosumers, apart from already existing mechanisms (the possibility to make the installation costs tax deductible, preferential loans and voivodeship-wide support systems), will certainly result in increased popularity of household PV installations. All this will make such installations increasingly attractive.

Final Outcome – Transformation Moved on SME, Cooperatives and Individuals; 2019 Will Be a PV Year in Poland

We believe that the government, unable to counter the coal energy price spikes in Poland, has come to a reasonable realisation that business and some individuals might try to tackle high energy prices out of their own pockets – and, at the same time, help Poland reach the EU RES quota along the way. Looking at the amended legislation, we may conclude that the next several years may see a PV installation boom in Poland. The government's initiative in this regard is still highly valuable. This way, enterprises, cooperatives and individuals will be able to shoulder some of the efforts to limit energy consumption costs, while at the same time,

bringing Poland a tad closer to meeting the RES energy generation quota set by the EU for 2020.

National Law Review, 5 August 2019

http://www.natlawreview.com

EU will not ban artificial turf pitches but could impose restrictions

2019-08-09

The European Union will not ban artificial turf pitches, at least yet, but the European Chemical Agency (ECHA) is looking at alternatives, as this material is an important source of microplastics. "No such proposal is under preparation form the Commission," EU's executive spokesperson Natasha Bertaud said, denying media reports that the Commission was planning to ban artificial turfs. "What we are doing and we continue to do is consider how to best address the environmental and health impact of microplastics and encourage the development of sustainable alternatives," Bertaud added. Microplastics are very small particles of plastic produced either unintentionally as a consequence of the wear and tear of larger pieces of plastic, for example, synthetic textiles; or deliberately manufactured for a specific purpose, as it is the case with infill material for artificial turfs. Microplastics are a source of pollution and once in the environment can be transferred to the soil, cumulated by animals and end up being consumed by human beings.

The European Union will not ban artificial turf pitches, at least yet, but the European Chemical Agency (ECHA) is looking at alternatives, as this material is an important source of microplastics.

Artificial turfs as a source of microplastics

Artificial turf pitches "are a substantial source of microplastics to the environment", between 18,000 and 72,000 tonnes per year, and according to ECHA the infill material used in this facility -small pieces of end-of-life tyres- falls under the definition of "intentionally added microplastics." Although artificial turfs used for sports practice are considered to be an environmentally friendly alternative to grass as they are often made out of recycled plastics and allow to reduce the use of water in the pitches, their ecological impact could be important too. After an investigation launched in 2018, ECHA decided to propose an EU-wide restriction of the use of intentionally added microplastics aimed at avoiding the release of 400,000 tonnes of micro-plastics within 20 years. Artificial turfs would be affected by restrictive measures if ever agreed. However, "neither ECHA nor the European Commission is proposing that these pitches should be closed," the EU body clarified. Actually, ECHA launched a public consultation on

the socio-economic impact of phasing out microplastic infill material, including the need to use alternative substances on existing pitches "such as cork, coconut fibre, olive cores or other alternative materials."

Potential health risks

In 2016, the Commission commissioned ECHA to analyse potential risks for the health of plastic-made artificial turfs as well, as the material used in its production often contains hazardous substances. ECHA assessment concluded that there was "at most, a very low level of concern from exposure," as the concentration of hazardous material was very "negligible" and below the limits the EU allows. However, the Dutch National Institute for Public Health and the Environment and ECHA put forward a proposal for a potential restriction of eight polycyclic aromatic hydrocarbons found in granules and mulches used in synthetic turf pitches.

Euractiv, 31 July 2019

http://www.euractiv.com/

REACH Update

New guidance on occupational exposure limits

2019-08-09

The European Chemicals Agency (ECHA) has published guidance for preparing a scientific report for health-based exposure limits and occupational exposure limits (OELs) in the workplace. It aligns the methodologies in REACH and occupational health and safety legislation, to establish safe levels of exposure to chemicals in the workplace. The document takes the findings of the ECHA/RAC – SCOEL joint task force into account. This is a follow-up of the REACH review, improving the interface between REACH and occupational health and safety legislation. As of 2019, ECHA has started providing recommendations for occupational exposure limits that protect workers exposed to hazardous chemicals. Further information is available at:

- Guidance
- Occupational exposure limits

ECHA News, 7 August 2019

http://echa.europa.eu

The European Chemicals Agency (ECHA) has published guidance for preparing a scientific report for health-based exposure limits and occupational exposure limits (OELs) in the workplace.

New contributions from Eurometaux and EuRIC

2019-08-09

The European Chemicals Agency (ECHA) invites stakeholders to contribute articles on their work and priorities related to chemicals in our everyday life in a new initiative called the Guest corner. Check the latest contributions where *Violaine Verougstraete* from the European Association of the Metals Industry (Eurometaux), writes about how the metals industry is working to evaluate risks and taking actions to control them. Also online is *Louis Ollion's* piece about waste and circular economy. Ollion is a Scientific Officer at the European Recycling Industries' Confederation (EuRIC). Further information is available at: Chemicals in our life - Guest corner

ECHA News, 7 August 2019

http://echa.europa.eu

REACH Update

New proposals and intentions to harmonise classification and labelling

2019-08-09

Three intentions to harmonise the classification and labelling have been received for:

- reaction mass of N,N'-ethane-1,2-diylbis(decanamide) and 12-hydroxy-N-[2-[(1-oxodecyl)amino]ethyl]octadecanamide and N,N'-ethane-1,2-diylbis(12-hydroxyoctadecanamide) (EC 430-050-2, CAS -),
- dichloromethane; methylene chloride (EC 200-838-9, CAS 75-09-2), and
- 1,4-Benzenediamine, N,N'-mixed Ph and tolyl derivs. (EC 273-227-8, CAS 68953-84-4).

One proposal has also been submitted for bentazone (EC 246-585-8, CAS 25057-89-0) by The Netherlands.

Further information is available at: Registry of CLH intentions

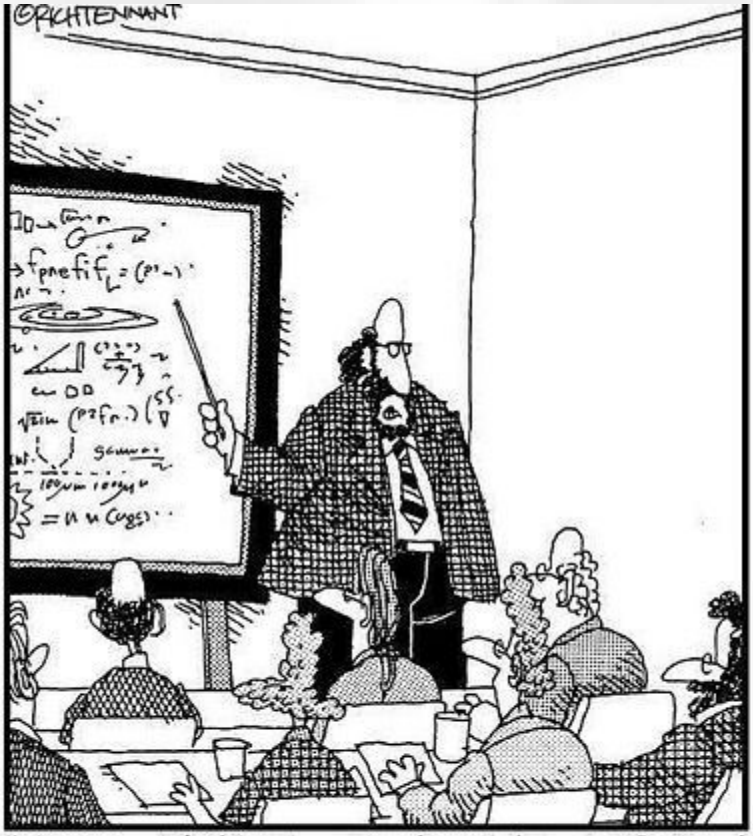
ECHA News, 7 August 2019

http://echa.europa.eu

Janet's Corner

Doesn't Matter

2019-08-02



"Along with 'Antimatter,' and 'Dark Matter,' we've recently discovered the existence of 'Doesn't Matter,' which appears to have no effect on the universe whatsoever."

Hazard Alert

Diethyl Sulfate

2019-07-29

Diethyl sulfate is a highly toxic and likely carcinogenic chemical compound with formula $(C_2H_5)_2SO_4$. [1] It is the diethyl ester of sulfuric acid and exists at room temperature as a colourless oily liquid with a faint peppermint odour. Diethyl sulfate is slightly soluble in water, but miscible with alcohol, diethyl ether, and most polar solvents. It readily decomposes in hot water to ethyl hydrogen sulfate and ethyl alcohol. [2]

USES [2]

The primary use of diethyl sulfate is as a chemical intermediate (ethylating agent) in synthesis of ethyl derivatives of phenols, amines, and thiols; as an accelerator in the sulfation of ethylene; and in some sulfonation processes. It is used to manufacture dyes, pigments, carbonless paper, and textiles. It is an intermediate in the indirect hydration (strong acid) process for the preparation of synthetic ethanol from ethylene. Smaller quantities are used in household products, cosmetics, agricultural chemicals, pharmaceuticals, and laboratory reagents. In 1966, it was used as a mutagen to create the Luther variety of barley.

IN THE ENVIRONMENT [2]

Diethyl sulfate can be released to the environment during its production and use in the synthesis of various intermediates and products. If released to air, diethyl sulfate will exist as a vapour, with a half-life of 9 days by reaction with photochemically produced hydroxyl radicals and a half-life of less than 1 day by hydrolysis. In soil and water, diethyl sulfate will hydrolyse rapidly, with a half-life in water of 1.7 hours. Because of its sensitivity to hydrolysis, the processes of volatilisation, adsorption to soil and sediment, biodegradation, and bioaccumulation are not expected to be significant. Hydrolysis of diethyl sulfate produces monoethyl sulfate and ethanol.

SOURCE & ROUTES OF EXPOSURE

Sources of Exposure [3]

- The most probable routes of exposure to diethyl sulfate are by dermal contact or inhalation during its production or use.

- Individuals may also be exposed to diethyl sulfate in the ambient environment from fugitive emissions.

Routes of Exposure [2]

The routes of potential human exposure to diethyl sulfate are inhalation, ingestion, and dermal contact during its production and use.

HEALTH EFFECTS [3]

Acute Effects

- No information is available on the acute effects of diethyl sulfate in humans.
- Tests involving acute exposure of rats, mice, and rabbits have demonstrated diethyl sulfate to have moderate acute toxicity when ingested and high acute toxicity from dermal exposure.

Chronic Effects

- No information is available on the acute effects of diethyl sulfate in humans.
- Tests involving acute exposure of rats, mice, and rabbits have demonstrated diethyl sulfate to have moderate acute toxicity when ingested and high acute toxicity from dermal exposure.

Reproductive/Developmental Effects

- No information is available on the reproductive or developmental effects of diethyl sulfate in humans.
- After a single subcutaneous dose to pregnant rats, malignant tumours of the nervous system were reported in the offspring.

Cancer Risk

- In an epidemiological study, an excess mortality rate from laryngeal cancer was associated with occupational exposure to high concentrations of diethyl sulfate.
- In one study, rats exposed to diethyl sulfate by gavage (experimentally placing the chemical in the stomach) developed tumours in the forestomach. In another study, local tumours and metastasis of the lung were observed in rats exposed by subcutaneous injection.
- EPA has not classified diethyl sulfate with respect to potential carcinogenicity.

SAFETY [4]

First Aid Measures

- General advice: Consult a physician. Show safety data sheet to the doctor in attendance.
- If inhaled: Move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
- In case of skin contact: Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.
- In case of eye contact: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.
- If swallowed: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

Exposure Controls & Personal Protection

Engineering Controls

- Avoid contact with skin, eyes and clothing.
- Wash hands before breaks and immediately after handling the product.

Personal Protective Equipment

The following personal protective Equipment is recommended when handling diethyl sulfate:

- Eye/face protection: Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
- Skin protection: Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.
- Body Protection: Complete suit protecting against chemicals. The type of protective equipment must be selected according to the

concentration and amount of the dangerous substance at the specific workplace.

- Respiratory protection: Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

REGULATION

United States [5]

No workplace exposure standards established.

Australia [6]

No workplace exposure standards established.

International [3]

IARC has classified diethyl sulfate as a Group 2A, probably carcinogenic to humans, based on limited evidence in humans and sufficient evidence in animals.

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Gossip

Researcher discovers how mosquitoes integrate vision and smell to track victims

2019-07-31

Scientists have found that mosquitoes are changing their hunting routines in response to host cues. For example, in Africa, mosquitoes now recognise when people emerge from bed nets in the morning and have begun hunting more often during the day than at night. Virginia Tech researcher Clément Vinauger has discovered new neurobiology associated with mosquito vision and sense of smell that explains how Aedes aegypti mosquitoes track their victims. Aedes aegypti mosquitoes spread dengue fever, chikungunya, Zika fever, Mayaro, and yellow fever viruses. "Mosquitoes are impacting millions of people every year. I've been working to understand how mosquitoes navigate space and time. Analysing how mosquitoes process information is crucial to figuring out how to create better baits and traps for mosquito control," said Vinauger, an assistant professor in the Department of Biochemistry in the College of Agriculture and Life Sciences at Virginia Tech. While scientists understand a lot about the mosquito's sense of smell and how it targets CO2 exhalations to find their hosts, very little is known about how the mosquito uses vision. Vinauger discovered that the interaction between the olfactory and visual processing centres of mosquitoes' brains is what helps these insects target their victims so accurately. These findings were recently published in the journal Current Biology. When mosquitoes encounter CO2, they become attracted to dark, visual objects, such as their hosts. What this new study shows is that CO2 affects the responses of neurons in mosquitoes' visual centres, to helps them track visual objects with a greater accuracy. Vinauger and his research team were able determine this by fitting the mosquitoes with tiny 3D-printed helmets and tethering them in a LED flight simulator and exposing the mosquitoes to puffs of CO2. "We monitored the mosquitoes' responses to visual and olfactory cues by tracking wingbeat frequency, acceleration, and turning behaviour," said Vinauger. Using calcium imaging experiments of the mosquitoes' brains, the research team found CO2 modulates mosquito neural responses to discrete visual stimuli. In previous research, Vinauger also used imaging and neural recordings to show how responses in the olfactory centres were modulated by mosquitoes' previous experience, as they learned from swats and other attempts to throw them off our scent. "The global strategy for management of mosquito-borne diseases involves controlling vector populations, to a large extent through insecticide application. However, mosquito-borne diseases are now resurgent, mostly because of rising insecticide resistance in populations. In this context, my research aims at

This new study shows is that CO2 affects the responses of neurons in mosquitoes' visual centres, to helps them track visual objects with a greater accuracy.

closing the key knowledge gaps in our understanding of the mechanisms that allow mosquitoes to be such efficient disease vectors and, more specifically, to identify and characterise factors that modulate their host-seeking behaviour," said Vinauger, who is also an affiliated faculty member of the Fralin Life Sciences Institute and the BIOTRANS program. The focus of Vinauger's laboratory is to investigate circadian and pathogen induced modulations of mosquito-host interactions while leveraging interdisciplinary tools from biochemistry, neuroscience, engineering, and chemical ecology to study how this affects genes, neurons, and insect behaviour.

EurekAlert, 22 July 2019

http://www.eurekalert.org

A toxic chemical in marine ecosystems turns out to play a beneficial role

2019-07-31

Reactive oxygen species associated with cellular damage actually aid photosynthesis, according to study

Advocates of healthy eating often extol the benefits of adding antioxidants to one's diet. These compounds are thought to suppress "free radical" molecules in the body that can age cells as a response to stress. These destructive free radicals - known as reactive oxygen species - also exist in marine ecosystems and are thought to degrade the cells of phytoplankton and other organisms. A new paper, however, suggests that these molecules actually play a beneficial role, upending some conventional wisdom. Julia Diaz, a newly hired marine biogeochemist at Scripps Institution of Oceanography at the University of California San Diego, and colleagues report that the reactive oxygen species produced by one type of phytoplankton, the diatom Thalassiosira oceanica, protects cells from overproduction of a compound that is used to power photosynthesis. In essence, that reactive oxygen species acts to protect cells' batteries from the effects of overcharging. The study, "NADPH-dependent extracellular superoxide production is vital to photophysiology in the marine diatom Thalassiosira oceanica," appears July 22 in the journal Proceedings of the National Academy of Sciences. "Our findings point to a new role for reactive oxygen species in the photosynthetic health of this diatom. The next challenge is to determine whether this process also exists in other phytoplankton species," said Diaz. The findings could have implications for marine organisms and their chemical environment. The type of reactive oxygen species studied by Diaz is known as superoxide, which is a charged oxygen atom. Superoxide has been identified as a probable culprit in die-offs of fish and marine animals when toxic algae

blooms spread in the ocean, suggesting a need for scientists to better understand how and why it is produced in certain circumstances. The varying positive and negative roles of superoxide could be a critical factor in how marine ecosystems respond to climate change. It is possible, Diaz said, that superoxide production could mitigate stress, which is a form of ocean resilience to changing climate that has not been understood previously. Superoxide is present throughout ocean ecosystems but how it is used by diatoms like T. oceanica had been a mystery. They need sunlight and carbon to conduct photosynthesis and have a variety of ways to perform the task to adapt to either low or intense-light conditions. A compound they make called NADPH is the power source that lets them take up and "fix" carbon into carbohydrates. Very bright light can cause diatoms to overproduce NADPH. After studying superoxide production in diatoms at various light levels, Diaz and colleagues concluded that, akin to a surge protector, making superoxide protects cells at times when too much NADPH is produced and restores balance to keep photosynthesis at peak efficiency. Diaz, who joined the Scripps faculty as an assistant professor this month, performed this research as a postdoctoral scholar at Woods Hole Oceanographic Institution in Woods Hole, Mass., and as an assistant professor at the University of Georgia Skidaway Institute of Oceanography. Sydney Plummer, who also contributed to the study, will continue this research as Diaz's student in the Scripps PhD program beginning this fall.

EurekAlert, 22 July 2019

http://www.eurekalert.org

Metal oxide-infused membranes could offer low-energy alternative for chemical separations

2019-07-31

Chemical manufacturers consume a massive amount of energy each year separating and refining feedstocks to make a wide variety of products including gasoline, plastics and food. In a bid to reduce the amount of energy used in chemical separations, researchers at the Georgia Institute of Technology are working on membranes that could separate chemicals without using energy-intensive distillation processes. "The vast majority of separations out in the field in a variety of industries are thermally-driven systems such as distillation, and because of that we spend an inordinate amount of energy on these separation processes—something like 10 to 15 percent of the global energy budget is spent on chemical separations," said Ryan Lively, an associate professor in Georgia Tech's School of

In a bid to reduce the amount of energy used in chemical separations, researchers at the Georgia Institute of Technology are working on membranes that could separate chemicals without using energy-intensive distillation processes.

Gossip

Chemical & Biomolecular Engineering. "Separations that avoid the use of heat and a chemical phase-change are much less energy intense. In practice, using them could produce a 90 percent reduction in energy cost." Plastic membranes are already able to separate certain molecules based on size and other differences, such as in seawater desalination. But until now, most membranes have been unable to withstand harsh solvent-rich chemical streams while also performing challenging separation tasks. In a study published July 18 in Chemistry of Materials and sponsored by the Department of Defence and the National Science Foundation, the researchers outline a process for taking a polymer-based membrane and infusing it with a metal oxide network. The resulting membrane is far more effective at standing up to harsh chemicals without degrading. "After placing the pre-fabricated membrane inside of our reactor, we simply expose it to metal-containing vapours that infuse themselves inside the membrane material," said Mark Losego, an assistant professor in the School of Materials Science and Engineering. "This process is called vapor phase infiltration, and it creates a uniform network of metal oxide throughout the polymer membrane. We call it a 'hybrid' membrane." Ryan Lively, an associate professor in Georgia Tech's School of Chemical & Biomolecular Engineering and Mark Losego, an assistant professor in the School of Materials Science and Engineering Credit: Rob Felt

Not only was the hybrid membrane better able to withstand solvents, its chemical separation capabilities also improved. "Some chemicals that need to be separated are very similar in terms of their size, shape and other properties, which makes them even harder to process using membranes," Lively said. "These new hybrid membranes are much more selective. They can separate chemicals that are more similar to each other." The research team, which included graduate students Fengyi Zhang, Emily McGuinness and Yao Ma, tested the new hybrid membranes in harsh chemicals such as tetrahydrofuran, dichloromethane and chloroform, organic solvents that dissolve the pure polymer membrane in minutes. The hybrid membranes remained stable for several months during testing. The researchers also tested separating two chemicals very close in size. The hybrid membranes were able to differentiate aromatic molecules that differed in size by as little as 0.2 nanometres. "One of the most exciting things about this work was how straightforward this process is from a manufacturing perspective," Losego said. "We're essentially taking pre-made membranes and applying a treatment to them. That's something that would be very simple to translate to an industrial scale." Future research on the membranes will involve looking at how to fine tune the

oxide infusions and make new types of hybrid membranes capable of separating a variety of other chemicals.

Phys.org, 18 July 2019

http://phys.org

Cancer testing revamp races on, worrying greens and industry

2019-07-31

Environmental Protection Agency (EPA) leaders are pushing forward with an overhaul of the way the agency evaluates the dangers of environmental contaminants after a brief consultation with outside scientists — a process that environmentalists claim was rushed and could be misused. Even the chemical industry, which is broadly supportive of the deregulatory fervour of the Trump administration's EPA, fears the agency may be attempting to do too much too soon in its bid to reconsider a set of crucial but complicated protocols. At issue is EPA's effort to update its cancer and non-cancer risk assessment guidelines. They help EPA staff gauge and minimise the dangers posed by chemicals, pollutants, climate change and other threats to human health and the environment. EPA's cancer testing protocols were most recently updated in 2005 after more than a dozen years of review. But the agency has struggled for decades to create unified guidance for evaluating noncancer risks. For the latest revamp, EPA Science Advisory Board Chairman Michael Honeycutt in June gave his fellow board members less than a month to highlight issues they thought the agency should consider when evaluating risks. Now, 16 of the SAB's 45 members and 11 members of the board's Chemical Assessment Advisory Committee have individually weighed in. Their more controversial suggestions include embracing hormesis — the theory that low doses of toxic chemicals and radiation can have beneficial effects — and advocating for the inclusion of economic considerations in risk assessments, a move that's specifically barred by some environmental laws. Yet the biggest concern for critics of current EPA leaders is not that some SAB members are pushing disputed concepts while others choose to stay silent. It's that board members aren't being given the time to debate those ideas together and reach a scientific consensus. "The premise that the SAB should quickly (in just a few weeks) cobble together ad hoc comments from its members, rather than engage an appropriately constituted panel to carefully deliberate on complex issues, is silly," Chris Frey, an engineering professor at North Carolina State University, wrote in an email. "In my experience serving on and chairing various scientific review and advisory panels, interactive deliberation by a

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well-chosen highly qualified group of recognised experts, without obvious motivational biases such as getting a paycheck from regulated industries, substantially improves the overall quality of scientific advice to an agency," said Frey, a SAB member from 2012 until last year. "A consultation process based on individually prepared comments is highly susceptible to cherry picking by the agency." That selectively applied feedback "could mean less health-protective risk assessments of hazardous chemicals," said Genna Reed, a top analyst at the Union of Concerned Scientists watchdog group. "The degradation of a consultative, peer-review process in its science advisory committees stands to bear fruit for an administration interested in stripping away protections that are inconvenient for the oil and gas and chemical industries." Congressional auditors this month faulted EPA for repeatedly bypassing normal procedures in making appointments to the SAB and Clean Air Scientific Advisory Committee. Instead of selecting from the nominees who staffers determined had the strongest qualifications, agency leaders often chose ones with strong industry ties. Asked about its plans for the SAB's feedback, EPA said it would take the members' responses into consideration along with comments on the guidelines made at the board's June meeting. But it's unclear whether the SAB will collectively have an opportunity to provide input on EPA's risk assessment process. "The typical SAB consensus process, which can take many months, was not deemed as necessary at this point in our effort," an agency spokesperson said in a statement. "Future engagement with SAB on this issue is envisioned." Reaching scientific consensus, however, would be extremely difficult on the timeline EPA is pursuing. Agency sources previously told E&E News that EPA leadership is looking to make changes to the guidelines by the end of the year. But a great deal of scientific research has been published about carcinogens in the 14 years since EPA's cancer risk assessment guidelines were last updated, much of which would need to be reviewed. And issuing formal non-cancer guidelines has previously been derailed over internal disputes about how to define "adverse," according to a former EPA staffer.

Chemical industry concerns

Even some supporters of EPA leaders are troubled by the intended speed of the overhaul. EPA should "allow sufficient time for expert input and peer review of any new or modified guidelines," SAB member Kimberly White, a senior director at the American Chemistry Council trade group, wrote in her comments. "It generally takes multiple years to draft, review and update guidance of this nature to ensure it adequately reflects the current state of scientific discourse and relevant approaches. Effective and

timely peer review is essential to ensure the development of scientifically defensible guidelines and applicability of the guidance to inform decision-making." White, who was appointed to the board by former Administrator Scott Pruitt, urged EPA to "not unduly truncate this review process." Nevertheless, critics suspect EPA's aggressive timeline for the overhaul is driven more by political than scientific considerations. If the guidelines are released this year, they could be in place by the end of President Trump's first — and potentially only — term in office. EPA political leaders aren't serious about "listening to and engaging with the scientific advisers," said Penny Fenner-Crisp, who was a staff scientist at EPA for 22 years. "They're just doing this for perfunctory reasons — just to say they did — and to be less criticized than if they were to absolutely ignore them and never convened another advisory committee meeting." Selectively applying the SAB's feedback to support weaker EPA risk assessment guidelines would not only be bad for public health, according to Bernard Goldstein, dean emeritus of the University of Pittsburgh Graduate School of Public Health. It would also damage the agency and board. "EPA, the way it's built by having its own science within the agency, has over the years developed very strong scientific advisory processes so as to limit the possibility that the EPA political leadership can lean on the scientists to get the answers they want," he said. "This is a way of crippling it." Goldstein served as EPA's assistant administrator for research and development during the Reagan administration and is now, like Fenner-Crisp, a member of the EPA advocacy group the Environmental Protection Network. "A very quick process is not appropriate for something as complex as these guidelines," he added.

E&E News, 26 July 2019

https://www.eenews.net

Electronic cigarettes and heated tobacco products are not helping fight cancer, the World Health Organization (WHO) said recently

WHO says e-cigarettes, 'smoke-free' products do not help reduce cancer

2019-07-31

Electronic cigarettes and heated tobacco products are not helping fight cancer, the World Health Organization (WHO) said recently, urging smokers and governments not to trust claims from cigarette firms about their latest products. The seventh "WHO report on the global tobacco epidemic" said blocking the industry's interference was critical to cutting the harm from tobacco use. "The tobacco industry has a long history of systemic, aggressive, sustained and well-resourced opposition to tobacco control measures," the report said. "While some strategies are public and

others more covert... all have the goal of weakening tobacco control." The report said tobacco giant Philip Morris International was trying to position itself as a responsible public health partner via its "Unsmoke" campaign, which encourages people to "change to a better alternative". The WHO said the campaign aimed to ensure tobacco remained socially acceptable, while confusing consumers with terms such as "smoke-free products", which may refer to products with toxic emissions and unknown short-term and long-term health effects. Philip Morris spokesman Ryan Sparrow said the WHO's message made it harder to provide safer options for people who cannot quit smoking. "There is no question that the best choice for smokers is to quit cigarettes and nicotine altogether. The reality is many people do not. We cannot turn our backs on them," he said. "Organisations like the World Health Organization need to stop talking at smokers and start listening." The WHO report said the industry hoped to win respectability through manipulative messages such as claiming their products were part of a "harm reduction" strategy, even though cigarettes still account for 97% of the global tobacco market. Vinayak Prasad, programme manager of WHO's tobacco control unit, said development of new products was solely intended to expand the markets of tobacco firms. "There is no difference between cigarettes and heated tobacco products except that in terms of exposure: the exposure is less and the smoke is not visible," he said. Electronic cigarettes, containing nicotine but not tobacco, were promoted as a way to quit smoking. But there was no evidence to justify the claim, and evidence from the United States showed they had increased the prevalence of young people smoking, he said. "So, it's also a gateway for young people," Prasad said. "The answer is it needs to be regulated. WHO has clear guidelines – to get electronic cigarettes regulated, and if you are banning it, fine, but if you aren't banning it don't let it (go) free in the market, because the young people are taking it up."

Reuters Health, 27 July 2019

http://www.reuters.com/news/health

Scientists have created artificial cells that mimic biological cells by responding to a chemical change in their surroundings.

Artificial cells that can sense and respond to their environment

2019-07-31

Imperial College London scientists have created artificial cells that mimic biological cells by responding to a chemical change in their surroundings. The artificial cells could be used to sense changes in the body and respond by releasing drug molecules, or to sense and remove harmful metals in the environment. Responding to chemical changes is a crucial

function of biological cells. For example, cells can respond to chemicals by creating certain proteins, boosting energy production, or self-destructing. Chemicals are also used by cells to communicate with each other and coordinate a response or send a signal, such as a pain impulse. However, in natural cells these chemical responses can be very complex, involving multiple steps. This makes them difficult to engineer, for example if researchers wanted to make natural cells produce something useful, like a drug molecule. Instead, the Imperial researchers are creating artificial cells that mimic these chemical responses in a much simpler way, allowing them to be more easily engineered. Now, the team have created the first artificial cells that can sense and respond to an external chemical signal through activation of an artificial signalling pathway. They created cells that sense calcium ions and respond by fluorescing (glowing). Their results are published today in Proceedings of the National Academy of Sciences. First author James Hindley, from the Department of Chemistry at Imperial, said: "These systems could be developed for use across biotechnology. For example, we could envisage creating artificial cells that can sense cancer markers and synthesise a drug within the body, or artificial cells that can sense dangerous heavy metals in the environment and release selective sponges to clean them up." The team created an artificial cell that has smaller cells ('vesicles') inside. The edge of the cell is formed of a membrane that contains pores, which allow calcium ions to enter. Inside the cell, the calcium ions activate enzymes that cause the vesicles to release particles that fluoresce. James added: "Biology has evolved to be robust by using complex metabolic and regulatory networks. This can make editing cells difficult, as many existing chemical response pathways are extremely complicated to copy or engineer. "Instead, we created a truncated version of a pathway found in nature, using artificial cells and elements from different natural systems to make a shorter, more efficient pathway that produces the same results." The researchers' system is simpler because it doesn't need to account for many of the things cells need to get around in natural systems -- such as by-products that are toxic to the cell. Within the system, the membrane pores and the enzymes activated by calcium are from existing biological systems -- the enzyme is taken from bee venom for example -- but they would not be found in the same environment in nature. The researchers say this is the strength of using artificial cells to create chemical responses -- they can more easily mix elements found apart in nature than they can add an external element into an existing biological system. Advances from chemistry and nanotechnology can also be integrated, creating systems and pathways difficult to engineer in biology. Co-author Professor Oscar Ces, from the Department of Chemistry at Imperial, said: "The plug-and-play aspect of

our system means researchers can take elements from across nature to create new chemical pathways designed with specific aims in mind. "Our template system is also easy to set up and can be used to quickly test any new combination of elements researchers come up with."

Science Daily, 29 July 2019

http://www.sciencedaily.com

Transforming biology to design next-generation computers, using a surprise ingredient

2019-07-31

Moore's law -- which says the number of components that could be etched onto the surface of a silicon wafer would double every two years -- has been the subject of recent debate. The quicker pace of computing advancements in the past decade have led some experts to say Moore's law, the brainchild of Intel co-founder Gordon Moore in the 1960s, no longer applies. Particularly of concern, next-generation computing devices require features smaller than 10 nanometres -- driving unsustainable increases in fabrication costs. Biology creates features at sub-10nm scales routinely, but they are often structured in ways that are not useful for applications like computing. A Purdue University group has found ways of transforming structures that occur naturally in cell membranes to create other architectures, like parallel 1nm-wide line segments, more applicable to computing. Inspired by biological cell membranes, Purdue researchers in the Claridge Research Group have developed surfaces that act as molecular-scale blueprints for unpacking and aligning nanoscale components for next-generation computers. The secret ingredient? Water, in tiny amounts. "Biology has an amazing tool kit for embedding chemical information in a surface," said Shelley Claridge, a recently tenured faculty member in chemistry and biomedical engineering at Purdue, who leads a group of nanomaterials researchers. "What we're finding is that these instructions can become even more powerful in nonbiological settings, where water is scarce." In work just published in Chem, sister journal to Cell, the group has found that stripes of lipids can unpack and order flexible gold nanowires with diameters of just 2 nm, over areas corresponding to many millions of molecules in the template surface. "The real surprise was the importance of water," Claridge said. "Your body is mostly water, so the molecules in your cell membranes depend on it to function. Even after we transform the membrane structure in a way that's very nonbiological and dry it out, these molecules can pull enough water out of dry winter air to do their job." Their work aligns with

A group has found ways of transforming structures that occur naturally in cell membranes to create other architectures, like parallel 1nm-wide line segments, more applicable to computing.

Gossip

Purdue's Giant Leaps celebration, celebrating the global advancements in sustainability as part of Purdue's 150th anniversary. Sustainability is one of the four themes of the year-long celebration's Ideas Festival, designed to showcase Purdue as an intellectual centre solving real-world issues. The research team is working with the Purdue Research Foundation Office of Technology Commercialisation to patent their work. They are looking for partners for continued research and to take the technology to market.

Science Daily, 25 July 2019

http://www.sciencedaily.com

Tiny Particles Monitor Oxygen During Hydrogel Healing

2019-07-31

Soft microparticle sensors can monitor oxygen levels in hydrogels that serve as scaffolds for growing tissues, researchers report. When scientists place hydrogels in development at an injury site, they encourage the growth of new muscle, cartilage or, perhaps someday, entire organs because they contain live cells. Ideally, the hydrogel attracts blood vessels that infuse the material and bring nourishment to the cells. Jane Grande-Allen, a professor of bioengineering and chair of the bioengineering department at Rice University, and her team designed fluorescent particles to report on oxygen levels inside gels. Their work appears in the journal ACS Biomaterials Science and Engineering. "We've been collaborating with investigators in intestinal mechanobiology and wanted a straight-forward way to tell what level of oxygen we had throughout our 3D tissue cultures," Grande-Allen says. "Where we intend a specific level of oxygen, we want to be sure that's what the cells are getting. "There are multiple ways of doing this," she says. "We can have computational models, but we'd have to make several assumptions about the way oxygen permeates the culture medium and 3D scaffold material. A better way is to measure it directly, so that was our goal." Lead author Reid Wilson, an MD/PhD student at Rice and Baylor College of Medicine, developed soft microparticles that that incorporate an oxygen-triggered fluorescent molecule based on palladium and a reference fluorophore. Wilson went through several iterations of dye combinations and concentrations to develop those microparticles. "The problem with using oxygen-responsive fluorophores in three-dimensional cultures is their signal isn't bright enough to measure reliably," he says. "So, we loaded the microparticles with high concentrations of dye, which allowed more reproducible measurements of the oxygen concentration." The particles can be suspended in hydrogel along with living cells, and tests show they are not toxic to those cells. Researchers can read the

Soft microparticle sensors can monitor oxygen levels in hydrogels that serve as scaffolds for growing tissues, researchers report.

signals from the fluorescent components at their individual wavelengths, but their power lies in combining the response from both, which gives clinicians the ability to measure oxygen content as far as 2 millimetres (less than one tenth of an inch) into tissues. "That's small, but oxygen diffusion limits are usually tiny," Grande-Allen says. "Some cells are quite close to a blood supply, with a high oxygen level brought in by blood cells with haemoglobin. But some bacteria in the microbiome are normally anaerobic and survive better without oxygen." Grande-Allen says the particles aren't susceptible to photobleaching (fading) when illuminated at the proper wavelength, nor did they sink out of the hydrogel, as larger fluorescent particles were prone to do, even after a year in storage. She notes that tissues like cartilage and certain types of diseased heart valves don't have vascular networks, yet their cells thrive. "I've always wondered how these cells get nourishment and what they need to survive," she says. "With oxygen-sensing microparticles and other techniques we use in my lab to stretch living and engineered materials, we can start to work toward answering these questions." The National Institute of Allergy and Infectious Disease and the National Institute of Diabetes and Digestive and Kidney Diseases supported the research.

Futurity, 29 July 2019

http://www.futurity.org

Every transistor has a unique quantum fingerprint—but can it be used as a form of ID?

2019-07-31

Single-electron effects in transistors can lead to unique electric properties that could be used for security purposes.

We might imagine that electric current flows as a smooth, even stream of electrons through our electronics devices, but at the quantum scale the flow of electric current might be more accurately pictured as a bubbling brook containing many tiny ripples. These ripples can be caused by single-electron effects, which arise due to the repulsion among electrons confined in very small spaces, such as trap sites in transistors. Single-electron effects can lead to tiny changes in the current-voltage characteristics of these devices. As trap sites are basically tiny defects that are randomly distributed in an uncontrollable way during fabrication, the number, location, and energy levels of trap sites differ for every transistor. As a result, single-electron effects lead to a unique modification in the current-voltage characteristics, effectively giving each transistor a unique "fingerprint." Recently, researchers have been investigating how these quantum fingerprints might one day be used as an inexpensive form of ID to protect users' personal information for technologies in the emerging

network of internet-connected devices known as the Internet of Things. In a new paper published in Applied Physics Letters, physicists T. Tanamoto and Y. Nishi at the Toshiba Corporation in Kawasaki, Japan, and K. Ono at RIKEN in Saitama, Japan, have demonstrated that single-electron effects may be detected by image-recognition algorithms and used for computer chip identification and security. "So far, no widespread application exists for single-electron devices," Tanamoto told Phys.org. "Our research opens a different way of using the single-electron effect: as a security device. The importance of security is increasing day by day." As the physicists explain, the fingerprint of an electronic device can be thought of as a physically unclonable function (PUF). Like a human fingerprint, PUFs are based on unique, naturally occurring physical variations and cannot be transferred to other devices. In addition, PUFs retain their key features throughout the lifetime of the device, despite some degradation due to aging effects. In their work, the physicists applied image-matching algorithms in order to identify different current-voltage features called Coulomb diamonds. The Coulomb diamonds are so-named because the regions of a current-voltage diagram in which current is suppressed by single-electron effects sometimes have the shape of a diamond. As the number of trap sites increases, the diamond patterns because more complex. Just as human fingerprints change depending on conditions, such as being wet, dry, or oily, the Coulomb diamond images can also look slightly different when measured under different conditions. Despite these variations, the researchers demonstrated that currently available feature detection and image-matching algorithms could successfully extract the key features (such as corners and edges) and distinguish between different Coulomb diamonds. One of the advantages of the method is that, although an average computer chip today contains more than a billion transistors, just a single transistor is needed to generate the fingerprint for the entire chip. This makes it potentially feasible to use this method for practical devices, since only one transistor needs to be measured. On the other hand, there are still challenges that remain before implementing the method. For one thing, the Coulomb diamonds here were measured at cryogenic temperatures of around 1.5 degrees above absolute zero. Previous research has shown that it's possible to measure single-electron effects at room temperature, but currently this ability requires expensive fabrication processes. In the future, the physicists plan to explore other ways of fingerprinting transistors. One possibility is to measure the spin-qubit behaviours of electrons in traps, as these quantum behaviours are expected to be affected by the traps. As with single-electron effects, the unique and random distribution of traps in transistors is expected to result in a unique fingerprint for each transistor. Going forward, the researchers

would also like to investigate ways to implement transistor fingerprint security into future quantum computers. "Quantum computers are one of the hottest issues right now," Tanamoto said. "We would like to combine our quantum PUF into the security system of quantum computers in the future."

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http://phys.org

Study: "Dark Matter Bullets" Could Tear Human Flesh Apart

2019-07-31

A new preprint study suggests that tiny amounts of dark matter — the mysterious material that seems to make up about 85 percent of the matter in the universe — could behave like high-speed projectiles, capable of tearing through human flesh. It's a pretty outlandish claim to make — especially considering we haven't really found direct evidence of dark matter yet. We don't really know what it looks like, what it's made of, and how it interacts with other matter, as Live Science points out. But lead author, Jagjit Singh Sidhu, a doctoral candidate in the physics department at Case Western Reserve University in Cleveland, makes the distinction between tiny subatomic dark matter particles and huge collections of dark matter particles — or macros, as Sidhu calls them. "Collisions of a macro with a human body would result in serious injury or death," reads the abstract of the preprint of Sidhu's research, published by arXiv earlier this month. His submission has yet to be peer reviewed. "Macros could possibly have masses up to the size of a small planet," Sidhu told Live Science. Upon impact, the heat generated would be enough to melt a tunnel through human flesh — a gory and terrifying theory as to what would happen when the human body is exposed to dark matter, and perhaps a blueprint for futuristic military weapons. "The closest analogy to a macro collision with a human being is a gunshot wound," reads the study. Other studies have explored what would happen with the human body if it were to ever collide with dark matter, or more specifically Weakly Interacting Massive Particles (WIMPs) — the most popular hypothesis as to what dark matter is made of for many years. WIMPs are believed to be about a million times heavier than an electron and were created thermally during the creation of the universe. They don't interact with other matter in the same way that our Standard Model of particle physics suggests. Important to note: not all dark matter human body collision theories are quite as grim as Sidhu's. A 2012 study published by preprints archive arXiv led by Katherine

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Gossip

Freese, theoretical astrophysicist and physics professor at the University of Michigan, concluded that WIMP collisions are "harmless to humans." That's because the amount of radiation the body is exposed to thanks to these collisions is "negligible compared to that from other natural sources, including radon and cosmic rays." In fact, Reese concluded that billions of WIMPs of a certain mass pass through the human body per second and only some of them, roughly ten in a year, hit one of the nuclei in the human body — most likely oxygen and hydrogen nuclei, according to Reese. Of course, both Sidhu and Reese are making some fairly substantial assumptions. Some physicists are even starting to doubt the existence of WIMPs, seeking to dethrone it as the primary candidate for what constitutes dark matter. While plenty of studies have attempted to prove that they exist, most of them have been called into question in recent years. But there is a new candidate on the horizon: the axion, a minuscule particle that's a billion times lighter than an electron. And how exactly axion collisions could effect or alter the human body is still a mystery.

Futurism, 26 July 2019

https://futurism.com

Sony Unveils Wearable Air Conditioner That Sits In A Shirt Pocket

2019-07-31

Tech giant Sony has come up with a futuristic solution to the problem of staying cool: a tiny personal air conditioner that fits in a shirt pocket.

With global temperatures rising at an alarming rate, it's getting harder and harder to avoid melting into a sweaty puddle during the summer months. Now, tech giant Sony has come up with a futuristic solution to the problem of staying cool: a tiny personal air conditioner that fits in a shirt pocket. Sony calls its personal air conditioner the Reon Pocket, and it's worn just below a person's neck in the pocket of a special undershirt. Once the device is in place, the person can control it using a smartphone app. According to Sony, the Reon Pocket can decrease a person's body surface temperature by 13 degrees Celsius (23 degrees Fahrenheit). It can also raise it by 8 degrees Celsius (about 14 degrees Fahrenheit) if you wanted to use the device in the winter months to stay warm. Sony is currently taking orders for its wearable air conditioner on its First Flight crowdfunding platform, with the cost of a single device ranging from 2,760 to 19,030 yen (about $117 to $175). At the time of writing, the device was 57 percent funded with 23 days left. If the project does meet its goal, backers should get their devices around March. Unfortunately for those of us sweltering in

the U.S., however, First Flight products are only available to customers in Sony's home nation of Japan.

Futurism, 26 July 2019

https://futurism.com

'Smart' Fabric Boosts Wearable Device Signals To Save Power

2019-07-31

A new way for wearable devices to connect incorporates conductive textiles into clothing to dynamically connect several devices at once. Over the past decade, a major trend in electronics has been the development of sensors, displays, and smart devices which are seamlessly integrated onto the human body. Most of these wearable devices are singularly connected to a user's smart phone and transmit all data via Bluetooth or Wi-Fi signals. As consumers wear increasing numbers of wearable devices, and as the data they transmit increases in sophistication, however, researchers are seeking more innovative connection methods. The new "wireless body sensor network" allows devices to transmit data with a 1,000 times stronger signal than conventional technologies, meaning the system dramatically improves battery life of all devices. Wireless networks of these wearable devices on a body have future applications in health monitoring, medical interventions, and human-machine interfaces. Currently, almost all body sensors like smart watches connect to smartphones and other wearable electronics via radio-waves like Bluetooth and Wi-Fi. These waves radiate outwards in all directions, meaning that most of the energy is lost to the surrounding area. This method of connectivity drastically reduces the efficiency of the wearable technology as most of its battery life is consumed in attempting the connection. John Ho, an assistant professor from the Institute for Health Innovation & Technology at the National University of Singapore and NUS Engineering, and his team wanted to confine the signals between the sensors closer to the body to improve efficiency. Their solution was to enhance regular clothing with conductive textiles known as metamaterials. Rather than sending waves into surrounding space, these metamaterials are able to create "surface waves" which can glide wirelessly around the body on the clothes. This means that the energy of the signal between devices is held close to the body rather than spread in all directions. The wearable electronics use much less power than normal, and the devices can detect much weaker signals. "This innovation allows for the perfect transmission of data between devices at power levels that are 1,000 times reduced. Or,

A new way for wearable devices to connect incorporates conductive textiles into clothing to dynamically connect several devices at once.

alternatively, these metamaterial textiles could boost the received signal by 1,000 times which could give you dramatically higher data rates for the same power," Ho says. In fact, the signal between devices is so strong that it is possible to wirelessly transmit power from a smartphone to the device itself—opening the door for battery-free wearable devices. Crucially, this signal boost does not require any changes to either the smartphone or the Bluetooth device—the metamaterial works with any existing wireless device in the designed frequency band. This inventive way of networking devices also provides more privacy than conventional methods. Currently, radio-waves transmit signals several meters outwards from the person wearing the device, meaning that personal and sensitive information could be vulnerable to potential eavesdroppers. By confining the wireless communication signal to within 10 centimetres (just under 4 inches) of the body, Ho and his team have created a network which is more secure. The team has a first-year provisional patent on the metamaterial textile design, which consists of a comb-shaped strip of metamaterial on top of the clothing with an unpatterned conductor layer underneath. The researchers can arrange strips on clothing in any pattern necessary to connect all areas of the body. The metamaterial itself is cost-effective, in the range of a few dollars per meter, and can be bought readily in rolls. "We started with a specific metamaterial that was both flat and could support surface waves. We had to redesign the structure so that it could work at the frequencies used for Bluetooth and Wi-Fi, perform well even when close to the human body, and could be mass produced by cutting sheets of conductive textile," Ho explains. The team created their particular design with the aid of a computer model to ensure successful communication in the radio frequency range and to optimise overall efficacy. They then fabricate the smart clothing by laser-cutting the conductive metamaterial and attaching the strips with fabric adhesive. Once made, the "smart" clothes are highly robust. They can fold and bend with minimal loss to the signal strength, and the conductive strips can even be cut or torn without inhibiting the wireless capabilities. The garments can also be washed, dried, and ironed just like normal clothing. The team is talking to potential partners to commercialise this technology, and in the near future Ho is hoping to test the "smart" textiles as specialised athletic clothing and for hospital patients to monitor performances and health. Potential applications could range dramatically—from measuring a patient's vital signs without inhibiting their freedom of motion, to adjusting the volume in an athlete's wireless headphones with a single hand motion. "We envision that endowing athletic wear, medical clothing, and other apparel with such advanced electromagnetic capabilities can enhance our ability

to perceive and interact with the world around us," Ho says. A paper on the research appears in Nature Electronics.

Futurity, 29 July 2019

http://www.futurity.org

A catalyst for sustainable methanol

2019-07-31

The global economy still relies on the fossil carbon sources of petroleum, natural gas and coal, not just to produce fuel, but also as a raw material used by the chemical industry to manufacture plastics and countless other chemical compounds. Although efforts have been made for some time to find ways of manufacturing liquid fuels and chemical products from alternative, sustainable resources, these have not yet progressed beyond niche applications. Scientists at ETH Zurich have now teamed up with the French oil and gas company Total to develop a new technology that efficiently converts CO2 and hydrogen directly into methanol. Methanol is regarded as a commodity or bulk chemical. It is possible to convert it into fuels and a wide variety of chemical products, including those that today are mainly based on fossil resources. Moreover, methanol itself has the potential to be utilised as a propellant, in methanol fuel cells, for example.

Scientists have developed a new catalyst that converts CO2 and hydrogen into methanol. Offering realistic market potential, the technology paves the way for the sustainable production of fuels and chemicals.

Nanotechnology

The core of the new approach is a chemical catalyst based on indium oxide, which was developed by Javier Pérez-Ramírez, Professor of Catalysis Engineering at ETH Zurich, and his team. Just a few years ago, the team successfully demonstrated in experiments that indium oxide was capable of catalysing the necessary chemical reaction. Even at the time, it was encouraging that doing so generated virtually only methanol and almost no by-products other than water. The catalyst also proved to be highly stable. However, indium oxide was not sufficiently active as a catalyst; the large quantities needed prevent it from being a commercially viable option. The team of scientists have now succeeded in boosting the activity of the catalyst significantly, without affecting its selectivity or stability. They achieved this by treating the indium oxide with a small quantity of palladium. "More specifically, we insert some single palladium atoms into the crystal lattice structure of the indium oxide, which anchor further palladium atoms to its surface, generating tiny clusters that are essential for the remarkable performance," explains Cecilia Mondelli, a lecturer in Pérez-Ramírez's group. Pérez-Ramírez points out that, with the aid of advanced analytical and theoretical methods, catalysis may now be

considered nanotechnology, and in fact, the project clearly shows this to be the case.

The closed carbon cycle

"Nowadays, deriving methanol on an industrial scale is done exclusively from fossil fuels, with a correspondingly high carbon footprint," Pérez-Ramírez says. "Our technology uses CO2 to produce methanol." This CO2 may be extracted from the atmosphere or -- more simply and efficiently -- from the exhaust discharged by combustion power plants. Even if fuels are synthesised from the methanol and subsequently combusted, the CO2 is recycled and thus the carbon cycle is closed. Producing the second raw material, hydrogen, requires electricity. However, the scientists point out that if this electricity comes from renewable sources such as wind, solar or hydropower energy, it can be used to make sustainable methanol and thus sustainable chemicals and fuels. Compared to other methods that are currently being applied to produce green fuels, Pérez-Ramírez continues, this technology has the great advantage that it is almost ready for the market. ETH Zurich and Total have jointly filed a patent for the technology. Total now plans to scale up the approach and potentially implement the technology in a demonstration unit over the next few years.

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Extraordinarily thick organic light-emitting diodes solve nagging issues

2019-07-31

By combining thin organic layers with thick layers of hybrid perovskite, researchers at Kyushu University in Japan have developed micrometre-thick organic light-emitting diodes that could improve the affordability and viewing angles of high-performance displays and televisions in the near future. Organic light-emitting diodes (OLEDs) use layers of organic molecules to efficiently convert electricity into light. The molecules, though great emitters, are generally poor electrical conductors, so the name of the game has been thin -- as in 100 nm, or about 1/500 the thickness of a human hair. Only by using such thin layers can electricity easily reach where emission occurs in the middle of devices. While extremely thin layers benefit from needing only a small amount of material, the use of such thin films complicates the reliable fabrication of millions of pixels since extremely small defects can cause device failure.

By combining thin organic layers with thick layers of hybrid perovskite, researchers have developed micrometre-thick organic light-emitting diodes that could improve the affordability and viewing angles of high-performance displays and televisions in the near future.

Gossip

Furthermore, light reflecting between the front and back of the thin layers often results in interactions -- called cavity effects -- that slightly distort the emission colour at large viewing angles. Thus, the challenge has been to make the devices thicker while avoiding the drawbacks of organics. To do this, researchers at Kyushu University turned to an alternative class of materials called perovskites, which are defined by their distinct crystal structure. "Although perovskites have recently attracted a huge amount of attention as light-absorbing layers in solar cells, some perovskites are actually transparent while also being highly conductive," says Toshinori Matsushima, associate professor of the International Institute for Carbon-Neutral Energy Research at Kyushu University and lead researcher on the Nature paper announcing the new results. "In addition, perovskites based on a blend of organic and inorganic components can be processed from low-cost starting materials using the same fabrication processes as for organics, making perovskites and organics a perfect match." In their devices, the researchers sandwiched an emitting layer of molecules typically used in OLEDs between perovskite layers with a total thickness of 2,000 nm. The resulting devices have active layers that are 10-times thicker than typical OLEDs -- though still a fraction of the width of a human hair. The thick devices exhibited efficiencies that were similar to those in reference thin OLEDs while also having the same colour from every viewing angle. On the other hand, OLEDs based on thick organic layers did not emit any light at similar operating voltages. "These results overturn 30 years of thinking that OLEDs are limited to thin films and open new paths for low-cost, reliable, and uniform fabrication of OLED-based displays and lighting," says Prof. Chihaya Adachi, director of Kyushu University's Centre for Organic Photonics and Electronics Research. While researchers have also been attempting to use perovskites directly as light emitters, the lifetimes of the devices have been short so far. By keeping the emission process in the organic materials and using perovskites just for transporting electricity, the Kyushu team achieved similar lifetimes for both thick devices and reference OLEDs. "Based on this work, perovskites will be seen in a new light as versatile, high-performance materials for supporting roles in not only OLEDs but also other organic electronic devices, such as lasers, memory devices, and sensors," predicts Adachi.

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Gossip

Ne theory shows peculiar 'Janus' interface a common mechanism in carbon nanotube growth

2019-07-31

When is a circle less stable than a jagged loop? Apparently when you're talking about carbon nanotubes. Rice University theoretical researchers have discovered that nanotubes with segregated sections of "zigzag" and "armchair" facets growing from a solid catalyst are far more energetically stable than a circular arrangement would be. Under the right circumstances, they reported, the interface between a growing nanotube and its catalyst can reach its lowest-known energy state via the two-faced "Janus" configuration, with a half-circle of zigzags opposite six armchairs. The terms refer to the shape of the nanotube's edge: A zigzag nanotube's end looks like a saw tooth, while an armchair is like a row of seats with armrests. They are the basic edge configurations of the two-dimensional honeycomb of carbon atoms known as graphene (as well as other 2-D materials) and determine many of the materials' properties, especially electrical conductivity. The Brown School of Engineering team of materials theorist Boris Yakobson, researcher and lead author Ksenia Bets and assistant research professor Evgeni Penev reported their results in the American Chemical Society journal ACS Nano. The theory is a continuation of the team's discovery last year that Janus interfaces are likely to form on a catalyst of tungsten and cobalt, leading to a single chirality, called (12,6), that other labs had reported growing in 2014. The Rice team now shows such structures aren't unique to a specific catalyst, but are a general characteristic of a number of rigid catalysts. That's because the atoms attaching themselves to the nanotube edge always seek their lowest energy states, and happen to find it in the Janus configuration they named AZ. "People have assumed in studies that the geometry of the edge is a circle," Penev said. "That's intuitive—it's normal to assume that the shortest edge is the best. But we found for chiral tubes the slightly elongated Janus edge allows it to be in much better contact with solid catalysts. The energy for this edge can be quite low." In the circle configuration, the flat armchair bottoms rest on the substrate, providing the maximum number of contacts between the catalyst and the nanotube, which grows straight up. (Janus edges force them to grow at an angle.) Carbon nanotubes—long, rolled-up tubes of graphene—are difficult enough to see with an electron microscope. As yet there's no way to observe the base of a nanotube as it grows from the bottom up in a chemical vapor deposition furnace. But theoretical calculations of the atom-level energy that passes between the catalyst and the nanotube at the interface can tell researchers a lot about how they grow. That's a path the Rice lab has pursued for more than

Rice University researchers have determined that an odd, two-faced 'Janus' edge is more common than previously thought for carbon nanotubes growing on a rigid catalyst.

a decade, pulling at the thread that reveals how minute adjustments in nanotube growth can change the kinetics, and ultimately how nanotubes can be used in applications. "Generally, the insertion of new atoms at the nanotube edge requires breaking the interface between the nanotube and the substrate," Bets said. "If the interface is tight, it would cost too much energy. That is why the screw dislocation growth theory proposed by Professor Yakobson in 2009 was able to connect the growth rate with the presence of kinks, the sites on the nanotube edge that disrupt the tight carbon nanotube-substrate contact. "Curiously, even though Janus edge configuration allows very tight contact with the substrate it still preserves a single kink that would allow continuous nanotube growth, as we demonstrated last year for the cobalt tungsten catalyst," Bets said. Bets ran extensive computer simulations to model nanotubes growing on three rigid catalysts that showed evidence of Janus growth and one more "fluid" catalyst, tungsten carbide, that did not. "The surface of that catalyst is very mobile, so the atoms can move a lot," Penev said. "For that one, we did not observe a clear segregation." Yakobson compared Janus nanotubes to the Wulff shape of crystals. "It's somewhat surprising that our analysis suggests a restructured, faceted edge is energetically favoured for chiral tubes," he said. "Assuming that the lowest energy edge must be a minimal-length circle is like assuming that a crystal shape must be a minimal-surface sphere but we know well that 3-D shapes have facets and 2-D shapes are polygons, as epitomized by the Wulff construction. "Graphene has by necessity several 'sides,' but a nanotube cylinder has one rim, making the energy analysis different," he said. "This raises fundamentally interesting and practically important questions about the relevant structure of the nanotube edges." The Rice researchers hope their discovery will advance them along the path toward those answers. "The immediate implication of this finding is a paradigm shift in our understanding of growth mechanisms," Yakobson said. "That may become important in how one practically designs the catalyst for efficient growth, especially of controlled nanotube symmetry type, for electronic and optical utility."

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New technique could help engineer polluted water filter, human tissues

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Scientists can turn proteins into never-ending patterns that look like flowers, trees or snowflakes, a technique that could help engineer a

Scientists can turn proteins into never-ending patterns that look like flowers, trees or snowflakes, a technique that could help engineer a filter for tainted water and human tissues.

Gossip

filter for tainted water and human tissues. Their study, led by researchers at Rutgers University–New Brunswick, appears in the journal Nature Chemistry. The study also included scientists at Baylor College of Medicine and the University of Minnesota. "Biomolecular engineers have been working on modifying the building blocks of life—proteins, DNA and lipids—to mimic nature and form interesting and useful shapes and structures," said senior author Sagar D. Khare, an associate professor in the Department of Chemistry and Chemical Biology in the School of Arts and Sciences at Rutgers–New Brunswick. "Our team developed a framework for engineering existing proteins into fractal shapes." In nature, building blocks such as protein molecules are assembled into larger structures for specific purposes. A classic example is collagen, which forms connective tissue in our bodies and is strong and flexible because of how it is organised. Tiny protein molecules assemble to form structures that are scaled up and can be as long as tendons. Assemblies of natural proteins are also dynamic, forming and dissolving in response to stimuli. The research team developed a technique for assembling proteins into fractal, or geometric, shapes that are repeated over and over. Examples include trees, leaves and pineapples. The team used protein engineering software to design proteins that bind to each other, so they form a fractal, tree-like shape in response to a biological stimulus, such as in a cell, tissue or organism. They can also manipulate the dimensions of the shapes, so they resemble flowers, trees or snowflakes, which are visualised using special microscopy techniques. These techniques could lead to new technologies such as a filter for bioremediation, which uses biological molecules to remove herbicides from tainted water, or synthetic matrices to help study human disease or aid tissue engineering to restore, improve or preserve damaged tissues or organs. The next steps are to further develop the technology and expand the range of proteins that form fractal shapes as well as use different stimuli, such as chemicals and light. The scientists also want to study how fractal shapes form in greater detail, so they could gain greater control over the process and the shapes and sizes of designer biomaterials.

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Gossip

Engineers use heat-free tech for flexible electronics; print metal on flowers, gelatin

2019-07-31

Martin Thuo of Iowa State University and the Ames Laboratory clicked through the photo gallery for one of his research projects. How about this one? There was a rose with metal traces printed on a delicate petal. Or this? A curled sheet of paper with a flexible, programmable LED display. Maybe this? A gelatin cylinder with metal traces printed across the top. All those photos showed the latest application of undercooled metal technology developed by Thuo and his research group. The technology features liquid metal (in this case Field's metal, an alloy of bismuth, indium and tin) trapped below its melting point in polished, oxide shells, creating particles about 10 millionths of a metre across. When the shells are broken - with mechanical pressure or chemical dissolving - the metal inside flows and solidifies, creating a heat-free weld or, in this case, printing conductive, metallic lines and traces on all kinds of materials, everything from a concrete wall to a leaf. That could have all kinds of applications, including sensors to measure the structural integrity of a building or the growth of crops. The technology was also tested in paper-based remote controls that read changes in electrical currents when the paper is curved. Engineers also tested the technology by making electrical contacts for solar cells and by screen printing conductive lines on gelatin, a model for soft biological tissues, including the brain. "This work reports heat-free, ambient fabrication of metallic conductive interconnects and traces on all types of substrates," Thuo and a team of researchers wrote in a paper describing the technology recently published online by the journal Advanced Functional Materials. Thuo - an assistant professor of materials science and engineering at Iowa State, an associate of the U.S. Department of Energy's Ames Laboratory and a co-founder of the Ames start-up SAFI-Tech Inc. that's commercializing the liquid-metal particles - is the lead author. Co-authors are Andrew Martin, a former undergraduate in Thuo's lab and now an Iowa State doctoral student in materials science and engineering; Boyce Chang, a postdoctoral fellow at the University of California, Berkeley, who earned his doctoral degree at Iowa State; Zachariah Martin, Dipak Paramanik and Ian Tevis, of SAFI-Tech; Christophe Frankiewicz, a co-founder of Sep-All in Ames and a former Iowa State postdoctoral research associate; and Souvik Kundu, an Iowa State graduate student in electrical and computer engineering. The project was supported by university start-up funds to establish Thuo's research lab at Iowa State, Thuo's Black & Veatch faculty fellowship and a National Science Foundation Small Business Innovation Research grant. Thuo said he

launched the project three years ago as a teaching exercise. "I started this with undergraduate students," he said. "I thought it would be fun to get students to make something like this. It's a really beneficial teaching tool because you don't need to solve 2 million equations to do sophisticated science." And once students learned to use a few metal-processing tools, they started solving some of the technical challenges of flexible, metal electronics. "The students discovered ways of dealing with metal and that blossomed into a million ideas," Thuo said. "And now we can't stop." And so, the researchers have learned how to effectively bond metal traces to everything from water-repelling rose petals to watery gelatin. Based on what they now know, Thuo said it would be easy for them to print metallic traces on ice cubes or biological tissue. All the experiments "highlight the versatility of this approach," the researchers wrote in their paper, "allowing a multitude of conductive products to be fabricated without damaging the base material."

EurekAlert, 29 July 2019

http://www.eurekalert.org

Light may magnetise non-magnetic metals, propose physicists

2019-07-31

Physicists from Nanyang Technological University, Singapore (NTU Singapore) and the Niels Bohr Institute in Copenhagen, Denmark, have devised a method to turn a non-magnetic metal into a magnet using laser light. Magnets and their magnetic field are typically produced by circulating currents, like those found in everyday electromagnetic coils. The 'handedness' of these coils - whether they are wound in clockwise or anticlockwise fashion - determines the direction of the magnetic field produced. The scientists theorise that when non-magnetic metallic disks are illuminated by linearly polarised light - light that does not possess any handedness of its own - circulating electric currents and hence magnetism can spontaneously emerge in the disk. This method could in principle turn non-ferrous metals into magnets "on-demand" using laser light. The new theory by Assistant Professor Justin Song from NTU's School of Physical and Mathematical Sciences and Associate Professor Mark Rudner from Niels Bohr Institute, was published in the scientific journal Nature Physics earlier this month. In formulating their proposal, the scientists developed a new way of thinking about the interaction between light and matter. They used a combination of pencil-and-paper calculations and numerical simulations to devise it. Prof Song said that their scheme is an example

Physicists from Nanyang Technological University, Singapore (NTU Singapore) and the Niels Bohr Institute in Copenhagen, Denmark, have devised a method to turn a non-magnetic metal into a magnet using laser light.

of how novel strong light-matter interactions could be used to create material properties "on-demand". If realised experimentally, this would open up a wide variety of potential applications across a range of high quality plasmonic materials such as graphene.

Harnessing plasmonic fields

The properties of many materials are conventionally thought to be fixed, determined by the arrangement of its atoms at the nanoscale. For example, the configuration of atoms in a material dictates whether it conducts electricity easily or has insulating/non-conductive behaviour. Song and Rudner wanted to explore how plasmons - local oscillations of charge in metals - and the intense oscillating electric fields they create, can be used to alter material properties. Like how light consists of photons, the plasma oscillation consists of plasmons, a type of quasiparticle. Plasmons tend to oscillate and move in the same direction as the field that is driving it (for example, the light field's polarisation direction). However, the scientists found that when the light irradiation is strong enough, the plasmons in a non-magnetic metallic disk can spontaneously rotate in either a left-handed or right-handed fashion, even when driven by linearly polarised light. "This was a signature that the material's intrinsic properties had been altered," said Asst Prof Song. "We found that when a plasmon's strong internal fields modify a material's electronic band structure it would also transform the plasmon as well, setting up a feedback loop enabling the plasmon to spontaneously exhibit a chirality." This chiral motion of the plasmon produced a magnetisation which then made the non-magnetic metallic disk of their scheme, magnetic. The scientists say that the key observation in their theoretical analysis is that intense plasmonic oscillating electric fields can modify the dynamics of the electrons in the metal. Assoc Prof Rudner said: "From the point of view of an electron within a material, an electric field is an electric field: it doesn't matter whether this oscillating field was produced from plasmons within the material itself or by a laser shining on the material." Song and Rudner used this insight to theoretically demonstrate the conditions when feedback from the internal fields of the plasmons could trigger an instability towards spontaneous magnetisation in the system. The team expects that this theoretical approach could be realised in a range of high quality plasmonic materials such as graphene.

Emergent behaviour

The notion of using light to alter a material's properties has gained a lot of scientific attention recently. However, many of the published

examples imbue a material with properties present in the light irradiation (for example, by irradiating a material with circularly polarised light, a material may acquire a chirality or handedness) or quantitatively enhance a property that was already present in the material. Song and Rudner's research, in contrast to these approaches, has gone much further, they say. "We found that the plasmons can acquire a kind of 'separate life' or 'emergence' with new properties that were not present in either the metal that hosts the plasmons or the light field that was driving it," Asst Prof Song added. The behaviour of the plasmon was emergent in the sense that it broke the intrinsic symmetries of both the light field and the metal. Emergent behaviour, where the whole is more than the sum of its parts, arises when many particles interact with each other to act in a collective way. It is responsible for a range of useful phases of matter such as ferromagnets and superconductors that are typically controlled by temperature. The team's research extends this idea to plasmons and puts forward how it can be controlled by light irradiation. "On a deeper level, there are many fundamental questions to explore about the nature of the non-equilibrium spontaneous symmetry breaking ("emergence") that we predicted," said Assoc Prof Rudner. Asst Prof Song agreed, saying "Perhaps the most meaningful take-home message of our work is that it shows that collective modes can exhibit distinct new phases. If plasmonic magnetism is possible, what other phases of collective modes are waiting to be uncovered?"

EurekAlert, 29 July 2019

http://www.eurekalert.org

Curiosities

Research 'paves the way' for early interventions to prevent childhood inflammatory diseases

2019-08-01

A study of newborn infants has identified a compound produced by gut bacteria that appears to predispose certain infants to allergies and asthma later in life. "We have discovered a specific bacterial lipid in the neonatal gut that promotes immune dysfunction associated with allergic asthma and can be used to assess which babies are at risk of developing the disease in childhood" said study senior author Susan Lynch, Ph.D., a professor of medicine at UCSF. "This finding paves the way for early-life gut microbiome interventions to prevent these diseases from developing." Lynch's lab has previously shown that one-month-old infants with unhealthy gut microbial ecosystems—more like a weedy lot than a well-functioning garden—are at increased risk of developing asthma later in childhood. They have also shown that a specific fatty molecule, or lipid, called 12,13-diHOME, found at high concentrations in the faeces of these babies, reduced the number and activity of a key group of immune cells called regulatory T cells (Tregs) that normally suppress allergic inflammation. In their newest study, published 22 July 2019 in Nature Microbiology, research led by MD/PHD candidate Sophia Levan set out to test whether this bacterial molecule might directly drive the risk of asthma and allergy in young infants. First, they showed that injecting 12,13-diHOME into the gut of mice reduced Treg cell numbers in the animals' lungs, and that this molecule alters Treg and other immune cell function at a molecular level. To understand where this pro-inflammatory lipid was coming from, the researchers studied the microbial genes present in stool samples from 41 one-month old infants collected as part of the racially and ethnically diverse WHEALS (Wayne County Health, Environment, Allergy and Asthma Longitudinal Study) cohort in Detroit. They found that the number of copies of three bacterial genes for 12,13 DiHOME or the concentration of the lipid itself in the babies' stool samples predicted which infants went on to develop allergy by age two or asthma by age four. They then replicated this finding in the stool samples of an independent cohort of 50 one-month-olds based in San Francisco. "While these findings need to be replicated in an even larger study group, the fact that these two cohorts collected in demographically different populations in very different cities showed the same results gives us confidence that the association between this bacterial lipid and childhood asthma and allergy risk may generalize to a broader population," Levan said. The researchers emphasise that 12,13-diHOME is likely just one of many microbial-derived products that contribute to

A study of newborn infants has identified a compound produced by gut bacteria that appears to predispose certain infants to allergies and asthma later in life.

early-life immune dysfunction and susceptibility to childhood allergy and asthma. "This is likely just one component of a complex microbiome-immune interaction in young infants that promotes allergy and asthma development in childhood," Lynch said. "But it is a first step towards a more mechanistic understanding of the suite of microbial products that increase susceptibility to allergies and asthma during childhood."

Medical Xpress, 22 July 2019

http://medicalxpress.com

Microdosing Psychedelics May Boost Mood and Focus. But What Are the Drawbacks?

2019-08-01

Microdosing psychedelics is a growing trend that involves ingesting very small sub-hallucinogenic amounts of substances like LSD or dried psilocybin-containing mushrooms. We ran a large-scale, pre-registered global research study asking participants to report what they like and dislike about microdosing. The three most commonly reported benefits were: improved mood, increased focus and enhanced creativity. The three most common challenges were: illegality (by a wide margin), physiological discomfort and "other concerns" such as the unknown risk profile of microdosing and forgetting to take a regular dose.

Microdosers ingest very small sub-hallucinogenic amounts of substances like LSD or dried psilocybin-containing mushrooms.

What does microdosing involve?

When people microdose, they normally consume about a tenth of a recreational dose of a psychedelic substance, although doses vary between people. The dose is sub-hallucinogenic; people who microdose aren't "tripping." Microdosers go about their daily lives, many taking care of children or working in offices, expecting a little boost. Although we don't know what microdosing does (if anything), it is a growing trend. Some Silicon Valley entrepreneurs are becoming microdosing coaches, touting the purported benefits of microdosing. A small scientific community has also started asking pre-defined questions about what microdosing may do, but we figured we'd ask people what they experience, from the ground up. We recruited 909 participants from all over the world using forums like r/microdosing. In one section of our survey, 278 participants told us about the three main benefits of microdosing for them, and the three main challenges they had to cope with.

More confident, motivated and productive

The benefits our participants reported mostly match what people have been reporting anecdotally. They said microdosing helped with mood, focus, creativity, self-efficacy, energy and more. These findings, like creativity, square well with our previous research. Our approach was to take individual reports and classify them into categories. This way we got an idea of how common each of these reports was, helping us guide future research down the most promising avenues. For example, the most commonly reported benefit was improved mood (26.6 per cent of people) making mood the highest-potential area for future research to focus on. Creativity is another obvious area. Perhaps less intuitive is that many people reported microdosing made them more confident, motivated and productive, so this also seems worth researching. In contrast, only 4.2 per cent of people mentioned reduced anxiety and several people reported increased anxiety, so studying microdosing for anxiety reduction seems less promising. These data indicate perceived outcomes and do not indicate confirmed effects.

Headaches, gastrointestinal issues, insomnia

The most common challenge was illegality and this was mentioned in almost a third of reports. In our coding of responses, illegality involved having to deal with the black market, social stigma around using illegal substances and difficulty with dose accuracy and purity. (Microdosers should always test their dose: you never know what you get when you're buying unregulated substances.) This challenge is not due to microdosing itself so much as social policy and norms. As research on psychedelics grows, these substances may eventually be decriminalised or legalised, which could dispel the most common challenge reported in our sample. Next up was physiological discomfort: in 18 per cent of reports, participants described headaches, gastrointestinal issues, insomnia and other unwanted side-effects of microdosing. Research should examine these possible side effects and consider how they compare to the profiles of the many legal substances available, such as anti-depressants, which also cause side effects. Participants also mentioned other concerns, such as not knowing whether there could be harmful interactions between psychedelics and other medications, and lack of research evidence about the long-term effects of microdosing.

What's next for microdosing research?

It is possible that microdosing psychedelics was unrelated to many of the benefits and challenges participants reported. People often feel better or worse even when taking totally inert substances, like sugar pills. This is

commonly known as the placebo effect. Randomised placebo-controlled trials are required to determine what the true outcomes of microdosing are, which is why we're planning to run one soon. Our results suggest that microdosers get a lot out of their use of psychedelics, while negative reports mostly focus on social and physiological concerns. Overall, participants reported less challenges than benefits, and they reported that the benefits were more important than the challenges. There are still more unknowns than knowns when it comes to microdosing: does microdosing cause any of these effects, or is it all placebo? Could there be long-term negative consequences to microdosing? Are certain people more likely to experience specific benefits or challenges? This study creates a road map for researchers to follow. We encourage researchers to test whether these benefits and challenges occur in a lab setting, as we will be doing in the coming months and years. Rotem Petranker, PhD student in Clinical Psychology, York University, Canada and Thomas Anderson, PhD student in Cognitive Neuroscience, University of Toronto

Live Science, 22 July 2019

http://www.livescience.com

Maintaining or starting exercise in middle age tied to longer life

2019-08-01

Even if they were inactive during their younger years, middle aged and older adults who get at least the minimum recommended amount of exercise each week may live longer than their sedentary counterparts, suggests a large UK study. Physical activity has long been linked to a lower risk of cardiovascular disease and certain cancers. But most research has looked at exercise habits at a single point in time rather than activity patterns across the years, researchers note in The BMJ. For the current study, researchers assessed activity levels several times over eight years for 14,599 men and women who were between 40 and 80 years old at the outset. After the first eight years, researchers started tracking mortality for another 12.5 years, on average. During that period, there were 3,148 deaths, including 950 from cardiovascular disease and 1,091 from cancer. The researchers measured both work and leisure-time physical activity in terms of energy expended per kilogram of body weight. Activity increases over time that were equivalent to going from sedentary to meeting the World Health Organization's recommendation of at least 150 minutes a week of moderate physical activity were associated with a 24% lower risk of death from any cause, a 29% lower risk of cardiovascular death

Even if they were inactive during their younger years, middle aged and older adults who get at least the minimum recommended amount of exercise each week may live longer than their sedentary counterparts, suggests a large UK study.

and an 11% lower risk of cancer death compared to those who remained inactive. "This sends a strong message to all of us, irrespective of what our current life circumstances may be, since it is never too late to build physical activity into your daily routine in order to enjoy a longer healthier life," said Soren Brage, senior author of the study and a researcher at the University of Cambridge in the UK. "Everybody benefitted from becoming more active," Brage said by email. "This was also true for the subgroup of people who already had a serious chronic condition such as heart disease and cancer at baseline." The reduced risk of death linked to increasing activity was present regardless of past activity levels and improvements or even worsening of other risk factors such as diet, body weight, medical history, blood pressure and cholesterol levels over the years. Compared to consistently inactive people, adults who shifted from being inactive to "low" activity levels were 24% less likely to die of any causes during the study, while people who reached "medium" activity levels were 38% less likely to die and adults who achieved "high" activity levels were 42% less likely to die. At the population level, the researchers calculated, getting at least 150 minutes a week of moderate intensity physical activity would potentially prevent 46% of deaths associated with physical inactivity. The study wasn't designed to prove whether or how exercise, or changes in activity over time, might directly prevent disease or help people live longer. Even so, it adds to evidence suggesting that changing exercise habits late in life can still make a difference, said Dr. I-Min Lee, a researcher at the Harvard T.H. Chan School of Public Health and Brigham and Women's Hospital in Boston who wasn't involved in the study. Other studies that randomly assigned inactive people to start exercising or maintain their current lifestyle have found, among other things, that starting to exercise can improve blood pressure, blood sugar, cholesterol levels, and inflammation and reduce belly fat, Lee said by email. "Becoming physically active in mid-life can extend longevity," Lee said.

Reuters Health, 18 July 2019

http://www.reuters.com/news/health

Several people in a county in West Virginia recently overdosed from wasp spray, which they used as an alternative to methamphetamine, according to news reports.

People Are Overdosing on Wasp Spray in West Virginia

2019-08-01

Several people in a county in West Virginia recently overdosed from wasp spray, which they used as an alternative to methamphetamine, according to news reports. Police in Boone County say they've seen a rise in residents abusing wasp spray to achieve a meth-like high, according to local news outlet WCHS. The practice is believed to have played a role in three

overdoses in the county last week, WCHS reported. "People are making a synthetic type [of] methamphetamine out of wasp spray," Sgt. Charles Sutphin, of the West Virginia State Police, told WCHS. The practice is known as "wasping," and it has emerged as a concerning drug trend in recent years, according to a 2018 report from ABC News. Users either combine the wasp spray with meth, or use the spray by itself as a meth substitute. People can crystallise the spray liquid on hot metal sheets, which allows the substance to be inhaled or injected, ABC News reported. Bug sprays contain active ingredients called pyrethroids, which stun and kill insects; but in humans, the chemicals can interfere with nerve signalling, which can lead to abnormal sensations, and in some cases, seizures or paralysis, ABC News reported. The chemicals can also lead to increased heart rate, difficulty breathing, headache, nausea, problems with coordination, and swelling and burning sensations. Police in Boone County are working with medical centres to determine the best treatment for those who abuse the spray, WCHS reported.

Live Science, 17 July 2019

http://www.livescience.com

Heart disease biomarker linked to paleo diet

2019-08-01

People who follow the paleo diet have twice the amount of a key blood biomarker linked closely to heart disease, the world's first major study examining the impact of the diet on gut bacteria has found. Researchers from Edith Cowan University (ECU) compared 44 people on the diet with 47 following a traditional Australian diet. The research, published in the European Journal of Nutrition, measured the amount of trimethylamine-n-oxide (TMAO) in participants' blood. High levels of TMAO, an organic compound produced in the gut, are associated with an increased risk of heart disease, which kills one Australian every 12 minutes.

People who follow the paleo diet have twice the amount of a key blood biomarker linked closely to heart disease, the world's first major study examining the impact of the diet on gut bacteria has found.

Impact on gut health

The controversial Paleo (or 'caveman') diet advocates eating meat, vegetables, nuts and limited fruit, and excludes grains, legumes, dairy, salt, refined sugar and processed oils. Lead researcher Dr. Angela Genoni said that with the diet's growing popularity, it was important to understand the impact it could have on overall health. "Many Paleo diet proponents claim the diet is beneficial to gut health, but this research suggests that when it comes to the production of TMAO in the gut, the Paleo diet could be having an adverse impact in terms of heart health," she said. "We also

found that populations of beneficial bacterial species were lower in the Paleolithic groups, associated with the reduced carbohydrate intake, which may have consequences for other chronic diseases over the long term."

Reduced intake of whole grains to blame

She said the reason TMAO was so elevated in people on the Paleo diet appeared to be the lack of whole grains in their diet. "We found the lack of whole grains were associated with TMAO levels, which may provide a link between the reduced risks of cardiovascular disease we see in populations with high intakes of whole grains," she said. The researchers also found higher concentrations of the bacteria that produces TMAO in the Paleo group. "The Paleo diet excludes all grains and we know that whole grains are a fantastic source of resistant starch and many other fermentable fibres that are vital to the health of your gut microbiome," Dr. Genoni said. "Because TMAO is produced in the gut, a lack of whole grains might change the populations of bacteria enough to enable higher production of this compound. "Additionally, the Paleo diet includes greater servings per day of red meat, which provides the precursor compounds to produce TMAO, and Paleo followers consumed twice the recommended level of saturated fats, which is cause for concern. Dr. Angela Genoni initially presented her findings at the Nutrition Society of Australia Conference last year. This is the first time the findings have been published in a peer-reviewed journal.

Medical Xpress, 22 July 2019

http://medicalxpress.com

A new study examines the potential role plastic exposure, akin to exposure in a medical setting, has on heart rhythm disruptions.

Phthalate MEHP and cardiac arrhythmias

2019-08-01

Calling an ambulance during an emergency, emailing a breaking news or journal article before a 5 p.m. deadline and maintaining conditions during the fifth week of a 6-week lab study, without altering the light or temperature, requires electricity and translates into time, money and lives. During critical moments, we appreciate the tiny particles and ions in electric currents that power our phones, computers or laboratory equipment. We seldom think about the speed of these connections or potential disruptors when conditions are stable. The same applies to the electric currents, or electrophysiology, of our heart. Arrhythmias, irregular heart rhythms, affect millions of Americans but can be controlled with routine screenings and preventive care. In critical settings, such as an ICU,

doctors monitor arrhythmias, which range from a patient's heart beating too slow to too fast. Helping a patient maintain a steady heart rate, especially if they are at risk for cardiac complications, may support a faster recovery, shorter hospital stays, reduced health care costs and improved health outcomes, such as avoiding complications from heart failure or stroke. A preclinical study, entitled " Interaction With the Heart," appears in the July issue of Circulation: Arrhythmia and Electrophysiology and examines the role plastic exposure, akin to exposure in a medical setting, has on heart rhythm disruptions and arrhythmias. The research team, led by researchers at Children's National Health System, discovered increased risks for irregular heart rhythms after exposing intact, in vitro heart models to 30 minutes of mono-2-ethylhexyl phthalate (MEHP), a metabolite from Di-2-ethylexyl phthalate (DEHP). DEHP is a chemical commonly used to make plastics pliable in FDA-approved medical devices. This phthalate accounts for 40% of the weight of blood storage bags and up to 80% of the weight of tubes used in an intensive care setting, such as for assisted feeding or breathing, and for catheters used in diagnostics or to conduct minimally invasive cardiac procedures. The team chose to study the heart's reaction to 60 µM of MEHP, a level comparable to stored blood levels of MEHP observed in paediatric patients and in neonatal exchange transfusion procedures. They found 30-minute exposure to MEHP slowed atrioventricular conduction and increased the atrioventricular node effective refractory period. MEHP prolonged action potential duration time, enhanced action potential triangulation, increased the ventricular effective refractory period and slowed epicardial conduction velocity, which may be due to the inhibition of Nav 1.5, or sodium current. "We chose to study the impact of MEHP exposure on cardiac electrophysiology at concentrations that are observed in an intensive care setting, since plastic medical products are known to leach these chemicals into a patient's bloodstream," says Nikki Gillum Posnack, Ph.D., a principal investigator with the Sheikh Zayed Institute for Paediatric Surgical Innovation at Children's National and an assistant professor of paediatrics at the George Washington University School of Medicine and Health Sciences. "In critical conditions, a patient may have a blood transfusion, require extracorporeal membrane oxygenation, undergo cardiopulmonary bypass or require dialysis or intravenous fluid administration. All of these scenarios can lead to plastic chemical exposure. Our research team wants to investigate how these plastic chemicals can impact cardiac health."
In this review, Dr. Posnack's team mentions one reason for the observed changes in the preclinical heart models may be due to the structure of phthalates, which resemble hormones and can interfere with a variety of biological processes. Due to their low molecular weight, these chemicals

can interact directly with ion channels, nuclear receptors and other cellular targets. Existing epidemiological research shows associations between exposure to phthalates and adverse health outcomes, including metabolic disturbances, reproductive disorders, inflammatory conditions, neurological disorders and cardiovascular disease. This is the first study to examine the link between cardiac electrophysiology in intact hearts and exposure to MEHP, comparable to levels observed in an ICU. Dr. Posnack's team previously found DEHP reduced cellular electrical coupling in cardiomyocyte cell models, which slowed conduction velocity and produced an arrhythmogenic phenotype. A microarray analysis found heart cells treated with DEHP led to mRNA changes in genes responsible for contracting and calcium handling. Another preclinical study showed DEHP altered nervous system regulation of the cardiovascular system. Future studies to expand on this research may include the use of larger preclinical models or human assessments. For the latter, stem cell-derived cardiomyocytes can be used to compare the safety profile of plastic chemicals with potential alternatives. An accompanying editorial, entitled "Shocking Aspects of Nonconductive Plastics," authored by cardiology researchers at the University of Wisconsin-Madison, puts this novel research into perspective. Like Dr. Posnack, the team notes that while the clinical impact s have on heart health still needs to be determined, the work contributes to compelling data among multiple researchers and shows DEHP and MEHP are not inert substances. "Toxic s in children's toys and baby products hit public headlines 20 years ago, but exposure to these compounds is up to 25x higher in patients undergoing complex medical procedures," write the University of Wisconsin-Madison researchers. "We readily (and unknowingly) administer these compounds, and at times in high quantity, to some of our most vulnerable patients. This work highlights the need for further investigation into short and long-term exposure on cardiac electrophysiology." The Agency for Toxic Substances and Disease Registry (ATSDR), part of the Centres for Disease Control and Prevention (CDC), released a public health statement about DEHP in 2002, noting more research in humans is needed to issue formal warnings against this phthalate. ATSDR states there is no conclusive evidence about the adverse health effects of children exposed to DEHP in a medical setting, such as procedures that require the use of flexible tubing to administer intravenous fluids or medication. However, the CDC statement includes limits of DEHP exposure, based on preclinical models, used to guide upper DEHP limits in consumer products, including food packaging, drinking water, and air quality in the workplace. "It's important to note that this was a preliminary study performed on an ex vivo model that is largely resilient to arrhythmias," says Rafael Jaimes III, Ph.D., the first

author of the study and a senior scientist at Children's National. "Due to the nature of the design, it was somewhat alarming that we found such significant effects. I predict that electrophysiological disturbances will be more pronounced in models that more closely resemble humans. These types of models should absolutely be studied." "And, importantly, our results may incentivise the development and use of new products that are manufactured without phthalates," Dr. Posnack adds. These questions are powering Dr. Posnack and her team through a decade-long, multi-institution research investigation to understand how plastic chemicals and medical device biomaterials can impact cardiac health.

Science Daily, 22 July 2019

http://www.sciencedaily.com

Before you go back-to-school shopping, read this report on toxic fashion

2019-08-01

A new report says that brands like J.Crew, Urban Outfitters, Forever21, and Carter's fail to disclose important information about their chemical practices.

Green America, a non-profit committed to social and environmental justice, just studied the chemical practices of 14 American apparel brands. In a report, Green America said four companies—J.Crew, Urban Outfitters, Forever21, and Carter's—came in last because they all failed to disclose the chemicals they use in their manufacturing. "These companies had no publicly-available policies about their use of toxic chemicals, and that lack of transparency is a problem," says Caroline Chen, Green America's social justice campaigns manager. "Toxic chemicals in textile manufacturing is bad for the planet and workers. And sometimes they remain in the fabric when they are sold, so they could be harming the end consumer as well." A spokesperson for J.Crew said that the brand preferred not to comment. A spokesperson for Urban Outfitters said the brand did have a number of sustainability programs in place. "Unfortunately, those and other programs were not publicly disclosed and so were not included in Green America's report," the spokesperson said. "We are re-evaluating the way in which we disclose the work we are doing around sustainability." We will update this story with any further responses. It's important to note that this study did not actually test garments to find traces of toxins. It was concerned with whether companies had robust, publicly-disclosed chemical management policies in place and were working to eradicate toxic chemicals from their supply chain. Carter's, for instance, told Green America that it keeps an internal list of restricted chemicals—but it has not made that list public. "So, we have no way of knowing what chemicals are present in the Carter's clothing worn by infants and children," Green America said in

its announcement. Another caveat to the report: Green America did not audit the practices of brands that did disclose them. Companies that don't report accurately risk getting called out by industry watchdogs, like the Fair Labor Association, which examines how companies address worker's safety, including whether they are exposed to toxic chemicals, but it is still worth taking any company's self-reported data with a grain of salt. In other words, Green America's research deals with how much information these companies do publicly disclose—rather than whether that information is accurate or how sustainable a particular brand's practices are. "Disclosing their policies is just a start," says Chen. "It's far from enough, but as you can see, many companies don't even do this." Apparel manufacturing is a dirty business. More than 8,000 chemicals are used throughout the textile-making process, from pesticides in growing cotton and other fibres, to bleaching and dying yarns, to washing fabrics, to printing patterns. This amounts to an estimated 43 million tons of chemicals every year. The Swedish Chemicals Agency tested 2,400 chemicals commonly used in textile manufacturing and found that a third of them were toxic. Among them are polyfluorinated chemicals, commonly used in waterproofing clothing, which have been shown to affect liver health and disrupt hormonal functions; heavy metals used in dying, which can be carcinogenic and damaging to your nervous system; and azo dyes, the most frequently used dyes, which can release carcinogenic chemicals into the air during the dying process. If not properly managed, these chemicals can end up in rivers and the ocean, harming marine ecosystems and migrating to drinking water. About 20% of overall industrial water pollution can be attributed to textile manufacturing. To take just one example, synthetic indigo is often used to dye denim jeans blue, but the chemical cocktail used often includes formaldehyde, which is toxic to the environment and people. In China, where many jeans are made, an estimated 70% of the rivers and lakes are contaminated by 2.5 billion gallons of wastewater from the textile and dye industry, according to the watchdog group China Water Risk. Workers (and their communities) can be harmed by many chemicals used in textile manufacturing, since many have been shown to cause cancer, reproductive health problems, and other diseases. And once clothes make their way to our homes, residual chemicals on garments can affect us, as wearers. Chen says that Green America reached out to all 14 companies to ask for details about their chemical and waste management, among other manufacturing practices, including factory safety. The organisation also scoured each company's corporate social responsibility and financial reports. Then, each company was scored and ranked. Among the companies that had the best marks were Target, The North Face, Nike, and Gap Inc. (which includes Old

Navy and Banana Republic). These companies offered detailed policies about their chemical management and actively shared their benchmarks and progress. In other words, these companies were aware of their environmental footprint and were actively working to capture and dispose of their toxic chemicals. Many companies had some transparency and waste-management strategies in place but had some room for improvement. Some had a policy regarding toxic chemicals but did not have clear enough details about how it measured progress. This includes Ann Taylor, Ralph Lauren, Walmart, Abercrombie & Fitch, and American Eagle. The best policies were the ones that listed every single supplier factory, provided a comprehensive list of all the restricted chemicals used at each site, and gave detailed plans to dispose of these chemicals safely and restrict their use in the future. One disturbing finding was that many children's clothing companies had low marks. Both The Children's Place and Carter's (which also owns Osh Kosh and Hop Skip) did not fare well. Babies and children are more sensitive to chemical irritants, and toxins can be more damaging to them as they are growing. Earlier this year, Green America publicly called on Carter's to do better. "We are calling on Carter's to adopt a strong publicly-available chemical management policy to help protect its workers and its consumers— the tiniest humans who wear its clothes—starting by disclosing what chemicals it is using in its supply chain," the company said in an announcement. Chen says that Green America is committed to lobbying companies to clean up their acts when it comes to their supply chains. But the first step is getting them to track—and report—the chemicals they are using in the first place. And even at that basic level, many American apparel companies are failing. "We have a long way to go when it comes to eradicating toxic chemicals from the fashion industry," says Chen. "But having a strong chemical-management policy in place—and being transparent about it—is part of how we get there."

Fast Company, 25 July 2019

http://www.fastcompany.com/

Blueberries linked to major blood pressure, memory and aging benefits

Blueberries linked to major blood pressure, memory and aging benefits

2019-08-01

Several recently published studies highlight various health benefits associated with blueberries, the small blue and purple berries readily available in most grocery stores. Compared to other popular fruits, blueberries have the highest quantities of antioxidants, as well as other

phytochemicals that may lower blood pressure, improve memory, and make aging a healthier process. A total of five studies on blueberries were recently published in The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences. The research looks at different possible health effects associated with eating berries, including changes in inflammation, memory, and avoiding age-related diseases as we age. According to one study, eating around one cup of blueberries every day may decrease systolic blood pressure, which is the top number in a blood pressure reading that indicates the amount of pressure on one's arteries when the heart muscle contracts. As well, eating that amount of blueberries was also found to improve blood vessel function, benefits that were linked to phytochemicals called anthocyanins. In addition, the studies found a link between eating blueberries and improved cognitive function and memory in older adults. One study cites the polyphenols found in blueberries and grapes as the catalyst for improved episodic memory in elderly individuals who had poor memory performance, but who were otherwise healthy. Though it may seem too good to be true, the benefits continue from there. Another study found an association between eating blueberries and other health benefits, including a reduction in inflammation, potentially helping an individual age without developing the diseases that typically manifest in one's older years. Past research has found similar health benefits linked with blueberries, a so-called 'super fruit.' In addition to being sold as fresh and frozen produce in a number of stories, blueberries are also commonly available as an herbal tea. A number of other berries also contain high levels of phenols and other beneficial compounds, as well.

Slash Gear, 29 July 2019

https://www.slashgear.com

"The big problem is we aren't testing for these cutting agents, and chronic health problems [they cause] by their nature only appear years later," said an expert.

Weird New Kinds Of Cocaine Could Start A "Hidden Epidemic" Of Health Threats

2019-08-01

A hidden epidemic of chronic disease — organ failure, leaky blood vessels, and "flesh eating" infections — might threaten cocaine and meth users in coming years because of increasing signs of dangerous adulterants in illicit drugs, analysts warn. That's worrisome because cocaine use is up 47% since its low point in 2011, with 2.2% of people over the age of 12 reporting they have snorted or smoked it in the last year. US cocaine and methamphetamine overdose deaths have also roughly tripled in the last five years, according to the CDC. (Methamphetamine overdoses

killed 12,987 people last year, and cocaine overdoses killed another 15,699.) The increases in deaths from these stimulant drugs have been obscured by an even larger number of deaths from opioids: mostly painkiller pills, heroin, or illicit fentanyl. More than 40,000 people died of opioid overdoses in 2018, a slight decline from the previous year, which remarkably led to the first decline in total US overdose deaths in 28 years. "While the declining trend of overdose deaths is an encouraging sign, by no means have we declared victory against the epidemic or addiction," Health and Human Services Secretary Alex Azar said in a statement addressing the drop of 5%, which still left a total of 67,774 people dead. "We also face other emerging threats, like concerning trends in cocaine and methamphetamine overdoses." Cocaine mixed with fentanyl, a potent opioid, is thought to be the major driver of the rise in stimulant deaths. The United Nations Office on Drugs and Crime blames record coca crops in Colombia and cheaper cocaine for a resultant stimulant-drug boom worldwide. But the other emerging contributor is a hidden wave of toxic lab-made adulterants that are infiltrating the illicit drugs, suggest some experts in international narcotics. "The danger is that we may not see a hidden epidemic starting up until it is too late," Thom Browne of the Colombo Plan Secretariat, an intergovernmental Asia-Pacific organization, told BuzzFeed News. "We aren't testing for these cutting agents, and chronic health problems [they cause] by their nature only appear years later." Browne's claim, presented with new testing data at an April overdose meeting in Atlanta, challenges conventional wisdom about fentanyl's outsize role in deaths from stimulant drugs. He suggests instead that toxic adulterants may be silently responsible for many more deaths than medical examiners realise, and may contribute to as many deaths as fentanyl overall. Browne and colleagues point to adulterant-driven health crises among street drug users in South Africa and South America, which show up as outbreaks of organ failure and AIDS-like immune system collapses. They suggest that cutting agents in illicit drugs have turned markedly toxic, and are suggesting that many of the stimulant deaths in the US, too, could have those origins. Experts such as Michael Lynch, medical director of the Pittsburgh Poison Centre, told BuzzFeed News that better monitoring of adulterants was worthwhile, but said that fentanyl taken with stimulant drugs overall seemed a better explanation for mortality increases, similar to a CDC report released in May. In Atlanta, Browne presented lab findings to show how toxic cutting agents are turning up in bewildering varieties and larger numbers than seen previously in illicit drugs. Samples of cocaine and heroin tested from three US states — Kentucky, Nevada, and Vermont — in 2016 and 2017 turned up with traces of numerous additives linked to erratic heartbeats, reduced

immune system response, and organ failures, Browne and drug testing consultant David Martin of JMJ Technologies reported. The group also found signs of multiple toxic adulterants in North Carolina, Pennsylvania, and Texas, Browne told BuzzFeed News in July. Warning signs about these adulterants have been around for a decade: The US Drug Enforcement Administration and public health researchers have been worrying about cocaine laced with levamisole, a veterinary drug for parasitic worms linked to severe infections, and phenacetin, a banned painkiller linked to cancer and kidney failure, since 2009. The DEA has suggested as far back as 2012 that levamisole is present in about 80% of the cocaine samples it tested, in concentrations as high as 10%. Severe infection from levamisole in cocaine wipes out immune system defences.

The dangers of the adulterant are well-known. Levamisole in crack cocaine triggered headlines about "flesh eating" bacteria infections in the UK in 2016. The drug kills white blood cells, key parts of the immune system, leading to severe infections. Unlike older cutting agents, such as powdered milk added for bulk, or laxatives, these toxic additives generally boost or extend the high associated with drugs and are added to both stretch the supply of a drug and make it more sought after by people chasing a high. What's different now, suggested Browne, is that the chemistry knowledge of criminal cartels worldwide has increased just as trade globalization has delivered fentanyl, synthetic cannabinoids, and industrial methamphetamine to the US. This same trend also threatens to push adulterant concentrations to higher, more dangerous levels. Of the recent cocaine and heroin samples from Kentucky and Vermont, for example, 54% had nine or more toxic adulterants. Some of the chemical know-how among traffickers has led to weird illicit drugs: Some "pink" cocaine made in Colombia is actually synthetic mescaline, a hallucinogen, while other pink cocaine is a mixture of cocaine, Ecstasy, and ketamine, an anaesthetic used as a club drug. A translucent kind of "fish scales" cocaine sold in South America is actually a mixture of cocaine and phenacetin. "You have to see the whole drug market moving toward synthetics," he said. This is occurring as more people in the illicit drug market are using more drugs, so-called "polydrug" or multidrug use, in which they indiscriminately mix depressants — opioids like heroin — with stimulants like meth or cocaine, all of them adulterated in new ways, with unknown effects. "Your dealer doesn't really know what is in there," Browne said. "Without more forensic drug testing, neither will we." Of course, there is always something new on the drug market, whether heroin sold as "grey death" or mescaline sold as pink cocaine, Lynch told BuzzFeed News, cautioning against overreacting. "Fentanyl is such an overriding concern right now, due to

overdose deaths," that looking for the long-term signs of adulterants in cocaine that cause chronic illnesses will inevitably not loom as large a concern for understaffed and underbudgeted public health officials, Lynch said. Warnings about adulterants also need to reach actual drug users to matter, epidemiologist Traci Green of the Boston Medical Centre Injury Prevention Centre told BuzzFeed News, not just law enforcement or public health types present at the April conference where Browne and Martin presented their results. "Just 'remove the labs! eradicate the cutting!' isn't useful in the long run," she added. Until the long-term health risks and ways to limit their exposure are understood on the street, the illicit drug market will just keep serving up more and more toxic adulterated drugs. Browne agreed that fentanyl is a necessary priority for public health officials because of the epidemic of overdose deaths. However, contrary to suggestions by other observers that fentanyl explains most of the increase in stimulant deaths, his data suggests that adulterants may be an equally pervasive killer and, so, also warrant attention. "The other half of overdose deaths could be due to highly adulterated drugs," he said. Meanwhile, chronic health problems caused by multiple adulterants might suddenly impose a burden on public health care systems in coming years. From a global perspective, Browne said, not testing for toxic adulterants in the US looks short-sighted because they are known to have caused tremendous problems elsewhere in the world. "We have seen these health problems, primarily due to adulterated and impure cocaine, play out in South America over the last decade," he said, with drug users suddenly turning up with severe infections or kidney and liver failure.

A 2017 Archives of Toxicology review, for example, found 233 case reports of severe infections tied to immune system collapse in chronic cocaine users, seen everywhere from Argentina to the US from 2010 to 2016. Separately, there have been more than 100 case reports of weakened blood vessels, another side effect of the adulterant, including at least one death in 2017 in North Carolina. "The more ominous threat is the unknown interaction or synergistic effects of multiple toxic adulterants," Browne added. Fentanyl demonstrates how synthetic drugs can go from obscure to tremendously dangerous in only a few years when they infiltrate illicit drug supplies, he pointed out. "Cutting with multiple adulterants is a fairly new phenomenon in the United States." The threat might be ignored because most US labs do not test for toxic adulterants. Crime labs look for illegal drugs like heroin or cocaine, not cattle dewormers, in order to enable criminal prosecutions. Hospitals, public health clinics, and coroners don't, either, instead testing for the drugs that are primarily driving chemical dependencies — including heroin, cocaine, and meth — that

lead to addiction. So, Browne and Lynch agree, some of the money now coming into treating addiction and addressing the US overdose crisis should fill the gap where neither crime labs nor public health clinics test illicit drugs for adulterants. "Police departments have this tremendous resource, seized drugs, that they can't afford to test, and the samples are just sitting on lab shelves," said Browne. "Tests are expensive, but we know these things are dangerous. Shouldn't we at least have some idea what is out there?

Buzz Feed News, 29 July 2019

http://www.buzzfeed.com/

Air Pollution Big Health Concern for the US

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Air quality in the US may be linked with increased mortality and reduced life expectancy according to new research. The study, published in the journal PLOS Medicine and led by Imperial College London and the Centre for Air, Climate and Energy Solutions at Carnegie Mellon University, analysed concentrations of fine particles in the air, called PM2.5, across all counties in the contiguous USA (excluding Alaska and Hawaii) between 1999 and 2015. These particles are mainly emitted from automobiles, power plants and industry, and known to be hazardous to health. The tiny particles, around 30 times smaller than the width of a human hair, can be inhaled deep into the lungs, and have been associated with increased risk of a range of conditions including heart attack and various forms of lung disease. The amount of this fine particle pollution in the US has declined since 1999. The current US annual PM2.5 standard is set at 12 microgram per cubic meter of air (ug/m3). The highest concentration of PM2.5 during the study period was 22.1ug/m3, in 1999, Fresno County, California. In 2015 the highest concentration was in Tulare County, California (13.2ug/m3), with the lowest amount recorded in Apache County, Arizona (2.8ug/m3). However, the new research shows that at levels between 2.8ug/m3 and 13.2ug/m3, which is mostly below the current standard, air pollution was associated with an estimated 15,612 deaths in females, and 14,757 deaths in men. The deaths were from cardiorespiratory conditions, which refers to heart and lung disorders (such as heart attack and various lung diseases including asthma).

Air quality in the US may be linked with increased mortality and reduced life expectancy according to new research.

Poorer areas linked to higher death tolls

These deaths would lower national life expectancy by 0.15 years for women, and 0.13 years for men. The life expectancy loss due to PM2.5 was

largest around Los Angeles and in some southern states, such as Arkansas, Oklahoma and Alabama. At any PM2.5 concentration, life expectancy loss was, on average, larger in counties with lower income than in wealthier counties. Professor Majid Ezzati, lead author of the research from Imperial's School of Public Health said: "We've known for some time that these particles can be deadly. This study suggests even at seemingly low concentrations – mostly below current limits – they still cause tens of thousands of deaths. Lowering the PM2.5 standard below the current level is likely to improve the health of the US nation, and reduce health inequality." He added: "US PM2.5 concentrations are generally lower than those in many Europe cities –– which suggests there may also be substantial number of deaths in Europe associated with air pollution." In the study, the research team – all part of the Centre for Air, Climate and Energy Solutions - assessed data from over 750 air quality monitoring stations from across the US, and combined this with other sources of air pollution data, such as satellite images.

Pollution causes heart and lung disorders

The team then combined this with death counts from the National Centre for Health Statistics. There were a total of 41.9 million deaths between 1999 to 2015 in the USA, with 18.4 million of these deaths from cardiorespiratory diseases, for which there is strong evidence of an association with air pollution. Using a series of statistical models (the computer code for which is publicly available), the team combined all this data and estimated the increase in death rate per 1ug/m3 of PM2.5, and hence the additional deaths above the lowest recorded PM2.5 concentration of 2.8ug/m3. The team factored in various factors that could affect the results, such as age, education, poverty and smoking rates. They could only indirectly account for other factors such as healthcare access and diet, that affect deaths in different counties.

Technology Networks, 29 July 2019

https://www.technologynetworks.com

Cases of necrotizing fasciitis, commonly known as flesh-eating bacteria, are rising slightly.

Why Is Flesh-Eating Bacteria On The Rise? Some Point To Climate Change

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If it seems like you're seeing more reports about flesh-eating bacteria, you actually are. The number of cases is up, though only slightly. And scientists have begun pointing to an increasingly familiar cause: climate change. The

trend will likely continue because of steadily warming temperatures in the Gulf of Mexico, which provide a "breeding ground" for the bacteria, said Dr. Sally Alrabaa, an infectious disease specialist with USF Health and Tampa General Hospital. "It's by no means an epidemic but we are seeing more cases this year," she said. "As the water is getting warmer by a few degrees the bacteria are flourishing for longer periods." Necrotising fasciitis, the infection's formal name, isn't caused by the same bacteria found in the blue-green algae or red tide blooms that Florida has seen recently. "But the two are closely related," Alrabaa said. "The bacteria that affects us has had a lot of food to 'eat' thanks to red tide, which has killed fish and marine animals. That's a lot of organic material for it to feast on." Explaining it doesn't make the situation any less concerning. Several recent reports from Tampa Bay and other parts of Florida have rattled a population that regularly comes into contact with the water. Among the cases: A 77-year-old Ellenton woman who scraped her leg in the waters off Anna Maria Island, got the infection and died; an Ohio man who spent 11 days in the hospital and nearly lost a foot after being infected near Weedon Island; another man who hooked his hand and caught the infection while fishing in the gulf off the Pinellas County coast around Easter. Necrotising fasciitis is caused by bacteria that stops blood circulation, prompting tissue to die and skin to decay. It is somewhat rare, but it's called "flesh-eating" because the infection is so rapidly progressing, doctors say. Even with treatment, one in three patients die from necrotising fasciitis, according to the U.S. Centres for Disease Control and Prevention. Since 2010, the agency says, between 700 and 1,200 people a year have contracted the infection in the United States. But cases have gone up in the last year in Florida. Most healthy adults will be able to fight off a necrotising fasciitis infection without hospital care. It's the elderly, children and people with compromised immune systems or issues like liver disease who are more susceptible to the infection. The easiest way to avoid it is to wash your hands regularly. There are two known strains of bacteria that cause necrotising fasciitis: Group A Streptococcus and Vibrio Vulnificus. Group A Streptococcus is the same bacteria that causes strep throat, and is generally considered the most common cause of necrotising fasciitis, according to the CDC. It's not found in water. Vibrio Vulnificus, on the other hand, lives and breeds in warm and brackish water, and can infect someone by entering the body through a cut or scrape. People can also contract it by eating raw seafood, like oysters or sushi, infected with the bacteria. "The gulf is its natural habitat," said Valarie Harwood, professor of water quality microbiology and microbial ecology at the University of South Florida. "In Tampa Bay, swimmers are exposed to hundreds of thousands of microorganisms. When the water temperature is over 75

degrees, we'll see more of them. The warmer it is, like 85 to 90 degrees, the better it is for bacteria. They're loving it." That's why summer tends to be when the most flesh-eating bacteria cases are reported, she said. "There's more Vibrio Vulnificus bacteria in brackish water, like an estuary, than the open Gulf of Mexico," Harwood said. " They tend to like areas where there is less salt in the water." But it's the warmer temperatures that bring Vibrio Vulnificus out in greater numbers. A study published last month in the Annals of Internal Medicine examined a rise in the number of Vibrio Vulnificus cases reported in Delaware Bay over a 10-year period. From 2008 to 2016, researchers found there was just one reported case in the region, where in general, the water is too cold to support the bacteria. But there were five cases reported in just one year, from 2017 to 2018. Researchers linked the rise to warming waters from climate change. "It's there no matter what," Harwood said of the bacteria in Florida. "So, people should use common sense before getting in the water, especially if they have a cut or an abrasion, or are immune-compromised." Once infected, swelling usually occurs right away and blisters can form over the wound site. Those blisters will turn black and blue over time as tissue and skin begins to die. Those who have the infection will feel flu-like symptoms of fever, dizziness and cold sweats right away. Severe complications are common, like sepsis, shock and organ failure. Recovering from necrotising fasciitis depends on how fast the infection is caught and treated by medical professionals. Multiple surgeries are fairly common to remove infected tissue, as are long courses of potent antibiotics. "People are dying from global warming, it's just not in ways they often expect," Alrabaa said. "It's not dramatic, but it's happening. As the water continues to warm over time, we're going to see more infections like these."

WLRN, 26 July 2019

https://www.wlrn.org

The US body that regulates sunscreen has declared that 12 of the 16 popular active ingredients might not actually be safe.

Safety of many sunscreen ingredients is in doubt – should we worry?

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After recent developments, some may hesitate to put sunscreen on, wondering if it is totally safe. In the past five months, the US body that regulates sunscreen has declared that 12 active ingredients used in sunscreens might not actually be safe. And in a study published in May, the organisation found that four of these ingredients enter the bloodstream through the skin. The revelations have come from the US at least partly because sunscreens there are, unusually, regulated as over-

the-counter drugs. But similar products are sold around the world. And sunscreens may be only the tip of the iceberg, with general cosmetics starting to come under scrutiny too. There is no need to drastically change your behaviour just yet as none of the commonly used ingredients have been decidedly declared unsafe, but questions remain. Why are these concerns only coming now? And how worried should we be about the stuff we put on our skin? In most countries, sunscreens are classified as cosmetic products. In the European Union, they are subject to rules on which ingredients can be used, and must pass tests for skin and eye irritation, for example. In the US, however, sunscreens, including cosmetics marketed with a sun protection factor, are regulated like drugs because they make specific health claims: to reduce the chances of sunburn, skin ageing and skin cancers. The US Food and Drug Administration (FDA) issues rules for industry to follow and new drugs must undergo rigorous clinical trials in people, but because sunscreens were already marketed before these rules took effect, their safety has been reviewed after the fact. Although the first sunscreens came onto the market in the 1920s, it took the FDA 50 years to issue any regulations. In 1978, it finally issued a tentative set of rules and updated them in 1999, listing 16 active ingredients as safe. However, these ingredients are now coming under scrutiny. "Only two of the original 16 'safe' ingredients can actually be considered safe and effective". Take oxybenzone, for example, which is widely used in sunscreens. In 2008, the US Centres for Disease Control and Prevention found traces of it in the urine of 97 per cent of the 2500 people it tested. Other studies have found the chemical in breast milk. "There is some evidence that oxybenzone may be a hormone disruptor, and act as a very weak oestrogen," says Kim Harley at the University of California, Berkeley. Some cancers have an oestrogen component. "The issue is that there's so much we don't know," she says. Similar questions have been raised about the other ingredients. The FDA issued new proposed rules in February this year, saying that only two of the original 16 "safe" ingredients can actually be considered safe and effective: zinc oxide and titanium dioxide. Of the remaining ingredients, two will be banned, while the rest, including oxybenzone, have big question marks over them. Then, in May, the FDA published a study looking at four of these ingredients, again including oxybenzone. Researchers including Theresa Michele, who directs the organisation's Division of Non-prescription Drugs, applied one of four sunscreen products to 24 volunteers, following the products' instructions for maximal use, four times a day for four days. They then looked for traces of the chemicals in the volunteers' blood. Not only did all four chemicals turn up in the blood, they did so at levels that demand further research to make sure they aren't causing cancer, says Michele.

Curiosities

Dermatologist Kanade Shinkai, based at the University of California San Francisco Medical Centre, says she thought sunscreen would pass through the skin. But what was a surprise was that it was absorbed after the first application and that it persists for days, she says. So, is it time to throw out your sun protection? Not so fast. "I think sunscreen is important because we know the sun causes cancer," says Harley. "But these compounds are getting into our bodies, and what's concerning is that there's a real lack of information on what the consequences could be." Manufacturers can point to the fact that all these ingredients were deemed safe by the FDA and we have been using sunscreen for decades without seeing detrimental effects. "Back in the 70s, we thought that anything you put on the skin just stayed there," says Michele. "We never thought that things could be absorbed by the skin." Similar concerns are now being raised about the chemicals in cosmetics too. They face little regulation in the US and have had the same level of scrutiny as sunscreen in the EU. This means that few studies have been done about which chemicals in cosmetics can enter the bloodstream and what their effects may be. Part of the problem comes from complaints falling through the cracks. If someone in the US complains of an adverse drug effect to its manufacturer, then the company has to report it to the FDA. But this isn't the case for cosmetics, meaning issues can go unnoticed. Take the case of hair product WEN by Chaz Dean Cleansing Conditioners. In 2014, the FDA began investigating the product after it received 127 complaints directly from consumers. It later discovered that, by this point, the company had already received 21,000 complaints of hair loss and scalp irritation. The FDA hasn't yet announced an end to its investigation, but its options are limited. The product is still on sale. In the European Union, people are expected to report issues to their national authorities. Problems persist with other cosmetic products too. Despite this, Steve Xu at Northwestern University in Chicago and his colleagues found that, between 2004 and 2016, only 5144 adverse events were submitted to the FDA.

Cosmetic issues

"What we saw was very low," says Xu, who, as a dermatologist, says he sees patients with skin irritation resulting from personal care products on a daily basis. "That tells me people are not going to the FDA, they're going to the manufacturer, and the manufacturer is a black hole." There have been attempts to tighten regulation of cosmetics in the US, but without much success. In the meantime, researchers aren't saying that cosmetics are unsafe. Just that their full effects are unknown. As for sunscreen, while the recent FDA rules are due to be finalised by November, it is unlikely we will

have the final word on the 12 ingredients still under investigation then. Michele says the industry has asked for eight of the ingredients to be left off the list to allow for extra data to be collected. "This is a proposed rule, so it's not final yet," she says. "We're currently reviewing comments." In the meantime, if you are worried about sunscreens, one option is to stick to products that use zinc oxide or titanium dioxide as an active ingredient. These are "generally recognised as safe and effective" by the FDA. And taking other sun protection measures, such as covering up and seeking shade in peak hours, is also vital.

New Scientist, 24 July 2019

http://www.newscientist.com/

BPA substitutes linked to obesity in children and teens

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Two chemicals used as substitutes for bisphenol A (BPA) may contribute to childhood weight gain and obesity, according to a study published in the Journal of the Endocrine Society. The study adds to mounting evidence that bisphenol chemicals are associated with an increased body mass index in children and teens. It will continue to be an issue "given that human exposure to these compounds is likely to continue to increase in the future," said the study's authors. Bisphenol S (BPS) and bisphenol F (BPF) are chemicals similar to BPA, which has been used for decades in plastic and metal food packaging, receipts, and electronics. While BPA use in products has declined due to increased awareness about its role as an endocrine disrupting chemical, BPS and BPF are increasingly used as replacements but, as structurally similar chemicals to BPA, they seem to have similar health effects — a phenomenon researchers refer to as "regrettable substitutions.". Bisphenol chemicals mimic the hormone estrogen and can affect the endocrine system. The main way they enter the body is through leaching out of containers that hold food and beverages; however, they can also be absorbed through the skin. The new study was led by Melanie Jacobson, a research scientist at NYU School of Medicine. It examined data from the US National Health and Nutrition Examination Surveys (NHANES), which measured urinary BPA, BPS, and BPF levels in 1,831 children and adolescents between 2013-2016. Nearly all study subjects, 97.5 percent, had detectable concentrations of BPA in urine, while BPS and BPF were found in 87.8 percent and 55.2 percent of urine samples, respectively. The researchers found a correlation between BPS concentrations in urine and being overweight in childhood. As BPS concentration in urine increased, the more likely it was for a child to be

"Replacing BPA with similar chemicals does nothing to mitigate the harms chemical exposure has on our health"

obese. BPF detection in urine, meanwhile, was not significantly associated with general obesity – but it was significantly associated with being overweight, and with abdominal obesity specifically. Abdominal obesity, also called central obesity, is the presence of excess fat surrounding the stomach and abdomen. People who have abdominal obesity are more likely to develop insulin resistance, which can lead to type 2 diabetes and cardiovascular disease. "Although diet and exercise are still understood to the main drivers of obesity, this research suggests that common chemical exposures may also play a role, specifically among children," said Jacobson in a press release. The study didn't determine bisphenol exposure as the cause of the children's weight gain, but researchers say it's plausible. Previous studies similar to this one has found associations between bisphenols and obesity, and toxicological studies in mice have suggested that these chemicals play a role by making fat cells bigger and decreasing adiponectin, a hormone that helps regulate blood sugar levels. One thing that complicates the results is that people who eat more are not only more likely to be obese, but also more likely to be exposed to more food packaging that contains bisphenol chemicals. However, when the researchers controlled for caloric intake, they did not have substantial differences in their findings. Many products are now labelled BPA-free, but not as many are labelled as BPS- or BPF-free, and it can be hard for consumers to tell if a product contains these chemicals. Some researchers recommend precautionary measures such as avoiding touching receipts, but since bisphenol chemicals are in so many everyday products, exposure can be hard to avoid. Since bisphenol chemicals are so commonly used, their health effects need to continue to be researched and monitored, said the study's authors. "Replacing BPA with similar chemicals does nothing to mitigate the harms chemical exposure has on our health," Jacobson said.

Environmental Health News, 26 July 2019

http://www.environmentalhealthnews.org/

Finally, Science Has Weighed in on The Correct Way to Pat a Cat

2019-08-01

Many of us will have experienced that super friendly cat who seems to love being stroked one minute, only to bite or swipe at us the next. It might be easy at this point to blame it on the cat, but what's likely happening here is that we're just not stroking them right. To understand why this might be, we first need to know a bit more about kitty's ancestry. It's likely that the domestic cat's ancestors (the African wildcat) were

regarded as mere pest control, but modern-day cats are often treated as our valued companions or even "fur babies". This social shift in the human-cat relationship is thought to have occurred around 4,000 years ago – a little later than "man's best friend" – the domestic dog. Although this might seem like a sufficient amount of time for a species to fully adjust to increased social demands, this is unlikely to be the case for your feline friend. Domestic cats also display relatively modest genetic divergence from their ancestors, meaning their brains are probably still wired to think like a wildcat's. Wildcats live solitary lives and invest considerable time and effort communicating indirectly – via visual and chemical messages – just to avoid having to see each other. So, it's unlikely that domestic cats inherited many complex social skills from their relatives. Humans on the other hand, are an inherently social species – favouring proximity and touch during displays of affection. We are also drawn to infantile looking features – large eyes and forehead, a small nose and round face – this is why most of us find the faces of cats so cute. It's not surprising, then, that our initial reaction when we see a cat or kitten is to want to stroke, cuddle and smush all over them. Though it should also come as no surprise that many cats can find this type of interaction a little overwhelming.

Cat affections

Although a lot of cats do like being stroked, and in certain contexts will choose us over food, human interaction is something they have to learn to enjoy during their comparatively short sensitive period – between two and seven weeks old. When it comes to human-cat interactions, the characteristics of humans are also important. Our personalities and gender, the regions of the cat's body we touch and how we generally handle cats, may all play an important role in how the cat responds to our affections. And while some cats may react aggressively to unwanted physical attention, others may merely tolerate our social advances in exchange for the good stuff (food and lodgings). That said, a tolerant cat is not necessarily a happy cat. Higher stress levels are reported in cats that are described by their owners as tolerating rather than actively disliking petting.

How to stroke a cat

The key to success is to focus on providing the cat with as much choice and control during interactions as possible. For example, the choice to indicate whether they want to be petted or not, and control over where we touch them, and how long for. Due to our tactile nature and love of cute things, this approach may not come instinctively to many of us. And it

will likely require a little self-restraint. But it could well pay off, as research shows interactions with cats are likely to last longer when the cat, rather than the human, initiates them. It's also really important to pay close attention to the cat's behaviour and posture during interactions, to ensure they are comfortable. When it comes to touch, less is often more. This is not only true during veterinary handling, but also during more relaxed encounters with people. As a general guide, most friendly cats will enjoy being touched around the regions where their facial glands are located, including the base of their ears, under their chin, and around their cheeks. These places are usually preferred over areas such as their tummy, back and base of their tail.

Signs of cat enjoyment:

• Tail held upright and choosing to initiate contact.

• Purring and kneading you with their front paws.

• Gently waving their tail from side to side while held in the air.

• A relaxed posture and facial expression, ears pricked and pointed forwards.

• Giving you a gentle nudge if you pause while you're stroking them.

Signs of dislike or tension:

• Shifting, moving or turning their head away from you.

• Remaining passive (no purring or rubbing)

• Exaggerated blinking, shaking their head or body or licking their nose

• Rapid, short bursts of grooming.

• Rippling or twitching skin, usually along their back.

• Swishing, thrashing or thumping tail.

• Ears flattening to the sides or rotating backwards.

• A sharp sudden turn of their head to face you or your hand.

• Biting, swiping or batting your hand away with their paw.

Whether cats make good "fur babies", then, is very debatable. Lots of cats do like being touched, but lots probably don't – and many tolerate it at best. Ultimately though, when it comes to cats, it's important to respect

their boundaries – and the wildcat within – even if that means admiring their cuteness from afar.

Science Alert, 30 July 2019

http://www.sciencealert.com.au

Technical Notes

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