VOL.2/ ISSUE 6/ June 2019
ISSN 2515-9534 (Print)
ISSN 2515-9542 (Online)

Scientific European®

MONTHLY POPULAR SCIENCE MAGAZINE

Sleep Traits and Cancer: New Evidences of Breast Cancer Risk

ISSN 2515-9542
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Published by UK Education Consultancy Services Ltd., (Company Number 10459935 Registered in England);
Country of publication: United Kingdom

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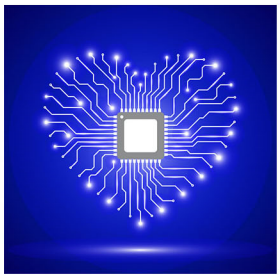
VOL. 2/ISSUE 06/ June 2019



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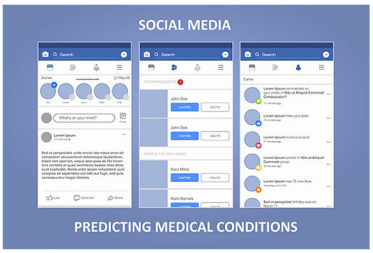

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NOTE FROM EDITOR-IN-CHIEF

We are thrilled to bring to you nine articles which showcase latest advances in science including device to monitor blood pressure, a novel meditation app, new treatment for Parkinson's, food sensor to test freshness and many more..

Hope you find these intellectually stimulating!

Umesh Prasad

Publisher's statement: Scientific European® is both online and print science magazine published by UK Education Consultancy Services Ltd, (Company Number 10459935 Registered in England); City: Alton, Hampshire; Country of publication: United Kingdom, ISSN 2515-9534 (Print), ISSN 2515-9542 (Online)

Food Wastage Due to Premature Discarding: A Low-cost Sensor to Test Freshness

Scientists have developed an inexpensive sensor using PEGS technology which can test food freshness and can help reduce wastage due to discarding food prematurely (throwing away of food solely because it is close to (or passed) the use-by date, regardless of its actual freshness). The sensors can be integrated into food packaging or tags.

Almost 30 percent of food which is safe for human consumption is discarded or simply thrown away every year. A major contribution towards this massive food wastage is through the discarding done by the consumer or supermarkets especially in developed countries. Food wastage is becoming a global issue and it has huge implications on economy and environment.

All packaged food sold in stores and supermarkets has a label of 'use by date' which indicates the date till when the food is safe and edible to consume. However, experts say that this date which is usually printed by the manufacturer is just an approximation and not an accurate indicator of actual freshness as other factors example the conditions in which the food is stored are also important. Discarding food prematurely on the basis of 'use by date' regardless of its actual freshness is contributing to huge amounts of food wastage every year.

Usage of sensors is a promising alternative to

the manufacturer's 'use by date' as these sensors can track the condition of perishable packaged foods and convery it to the user in real time. Many types of sensor technologies have been designed; however, they have not yet been integrated into mainstream food packaging due to several reasons like commercial unviability, high-costs, complex fabrication process and difficulty of use. Also, these technologies have been incompatibile with digital platforms so the data cannot be comprehended easily by the user.

A new study published in *ACS Sensors* describes a sensitive, eco-friendly, low-cost and flexible prototype of PEGS (paper-based electrical gas sensor) which can detect spoilage gases like ammonia and trimethylamine which can dissolve in water. The sensor has been formulated by printing carbon electrodes onto easily available cellulose paper using a simple ballpoint pen and an automated cutter plotter. The cellulose paper, though looks dry, consists of highly hygroscopic cellulose fibers containing moisture which gets adsorbed to their surface from external environment. Thus, wet chemical methods can be used for sensing water-soluble gases due to this hygroscopic property and without addition of water to the substrate. The conductance of the paper can be measured by using two carbon (graphite) electrodes which are printed onto the surface of paper. Thus, thin film of water's electrical properties can be easily probed via conductance. When any water-soluble gas is present in direct surrounding, this leads to increase in ionic conductance of the paper mainly due to disassociation of water-soluble gas(s) in the thin film of water on the surface of the paper.

Researchers tested the PEGS technology on packaged foods (meat products – particularly fish and chicken) in the laboratory to quantitively monitor freshness. Results showed that PEGS sensor exhibited high sensitivity to water-soluble gases as it was able to swiftly and accurately detect trace amounts of spoilage gases in comparison to existing sensors. The gases tested were carbon monoxide, carbon dioxide, sulphur dioxide, trimethylamine and ammonia with highest sensitivity to ammonia due it being highly soluble in water. PEGS showed enhanced performance, better response time and higher sensitivity. Also, no additional heating or complex manufacturing was required. These results were validated using established microbiological testing that uses bacterial cultures. Therefore, PEGS is suitable as an indicator of variation in food freshness due to microbial contamination in packaged meat. Further, the sensor's design has been combined with a series of microchips called NFC (near field communication) tags to enable to take readings on mobile devices nearby wirelessly.

The unique sensor described in the current study is the first ever commercially-viable, non-toxic, eco-friendly sensor which can be used to test freshness of food items by tapping their sensitivity to gases involved in food decay. Importantly, it is inexpensive, at just a fraction of the cost of existing sensors. PEGS works well at room temperature and even at 100 percent humid conditions while consuming very little energy. According to the authors PEGS could be available to be integrated into commercial food packaging by manufactures and supermarkets in the next 3 years. Their use could also be extended to other chemical and medical, farming and environmental applications.

Source(s)

Barandun G. et al. 2019. Cellulose fibers enable near zero-cost electrical sensing of water-soluble gases. ACS Sensors.
DOI: 10.1021/acssensors.9b00555 ■

Polar Bear Inspired, Energy-efficient Building Insulation

Scientists have designed a nature-inspired carbon tube aerogel thermal insulating material based upon the microstructure of polar bear hair. This lightweight, highly-elastic and more efficient heat insulator opens

Polar bear hair helps the animal to prevent heat loss in cold and humid climatic conditions in the frigid Arctic circle. Polar bear hair is naturally hollow unlike human hair or other mammals. Each hair strand has a long, cylindrical core running through its center. It is this shape and spacing of the cavities which gives polar bear hair the distinct white coat. These cavities have multitude of properties like exceptional heat-holding, water resistance, elasticity etc. which makes them a very good thermal insulator material. The hollow centers restrict movement of heat while design-wise making every strand extremely lightweight. Also, the non-wettable nature of polar bear hair keeps the animal warm when they are swimming in sub-zero temperatures and also under humid conditions. Polar bear hair is thus a very good model for designing synthetic materials which can provide efficient insulation from heat just like polar bear hair does it naturally.

In a new study published in *Chem,* scientists have

developed a novel insulator taking inspiration from and mimicking the microstructure of individual polar bear hairs and hence acquiring all of its unique properties. They fabricated millions of super-elastic, lightweight hollowed-out carbon tubes, each the size of a single hair strand and wound these into an aerogel block. The design process first started with making cable hydrogel from tellurium (Te) nanowires as a template which was coated with a carbon shell. Then they fabricated a carbon tube aerogel (CTA) from this hydrogel by first drying it and next calcinating it in an argon inert atmosphere at 900 °C to remove Te nanowires. This unique design makes CTA an excellent thermal insulator and also super-elastic in nature as it rebound at the speed of 1434 mm/s. This is the fastest ever compared to all conventional elastic materials. Authors point out that it is even more elastic than polar bear hair.

Due to the hollow structure of carbon tubes, the material exhibits excellent thermal conductivity which is lower than that of dry air owing to the material's inner diameter being less than of free path of air. The material showed longevity by maintaining its thermal conductivity after being stored for 3 months at room temperature with 56% relative humidity. The CTA is lightweight with density of 8 kg/m3; lighter than majority of available thermal insulator materials. It doesn't get affected by water as it is non-wettable. Also, the mechanical structure of the CTA is maintained even after numerous compress-release cycles at different strains.

The current study describes a new carbon tube aerogel - inspired from polar-bear hair's hollow tube design - which acts as an excellent thermal insulator. Compared to other aerogel insulation materials available, this polar-bear inspired hollow-tube design is light in weight, more resistant to heat flow, water proof and doesn't degrade over its lifetime.

Improved and more efficient thermal insulation systems hold promise for conserving primary energy consumption. Energy is now in short supply while energy costs are escalating. One of the ways to conserve energy is to improve thermal insulation of buildings. Aerogels are already showing great promise for wide variety of such applications. This study opens up avenues to design high performance material which is light weight, super-elastic and thermally insulating for applications in buildings, aerospace industry especially in extreme environments. Because of its extreme stretch ability, its appeal is enhanced for various applications.

Source(s)

Zhan, H. et al. 2019. Biomimetic Carbon Tube Aerogel Enables Super-Elasticity and Thermal Insulation. Chem. DOI: 10.1016/j.chempr.2019.04.025 ■

MediTrain: A New Meditation Practice Software to Improve Attention Span

Study has developed a novel digital meditation practice software which can help healthy young adults to improve and sustain their attention span

In today's fast paced life where swiftness and multitasking are becoming a norm, adults especially young adults are facing enormous challenges including poor attention span, decreased academic/work performance, reduced contentment amidst huge distractions. Attention or focus towards a task or an event is a fundamental cognitive process which is critical for our higher-order cognition like memory, decision making, emotional well-being and daily activities. Some studies backed by moderate evidences have shown the potential of the act of meditation in reducing anxiety, depression and agony or pain by inducing changes in the brain.

In a study published on in *Nature Human Behaviour*, researchers describe a novel stand-alone personalized digital meditation training program called 'MediTrain' which lays emphasis on 'focused-attention' meditation with an aim to improve it for the users. The goal of the program is to achieve focused internal attention to one's breath and while tackling distractions successfully returning one's focus on

breath. The main idea behind this program was to see if it can have a positive impact on concentration and attention span. Unlike other meditation apps available, MediTrain was designed, developed and tested as a meditation-inspired software program which integrates central aspects of traditional meditation with a neuroplasticity- based closed-loop algorithm for cognitive advancement - an approach which has been successful as part of other non-digital tinterventions. The MediTrain program was tested in a randomized controlled trial with 59 healthy adult participants between 18 and 35 years of age who were split into two groups. 22 participants took part in the trial and used the program on an Apple iPad Mini2 and 18 participants were in the control group which used unrelated other meditation apps. The program starts by first instructing participants via a recording on how

to focus their attention on their breath with their eyes closed, example by sensation of air in their nostrils or movement of their chest. Subsequently, they were instructed to be aware of their mind's wandering(by certain distractions for example) and once wandering is detected then try to shift back their attention to their breath. The program required a cumulative practice of 20-30 minutes every day consisting of very short meditation periods. At the start of use of the program, participants had to focus on their breath only for 10-15 seconds at one time. These durations were slowly increased as the participant learned how to maintain focus. Gradually over 6 weeks of using the program, participants were encouraged to increase the total amount of time in which they could maintain their focus. The participants regularly checked their daily progress and were asked if they were able to maintain focus in a simple yes/no. Based upon participant's introspection and self-reporting after every meditation segment, closed loop algorithm of the program used an adaptivestaircase algorithm to be able to adjust the difficulty at the next step i.e. gradually increase the duration of focus or decrease duration when focus wavers. So, this regular feedback taken by the program not only provides encouragement and allows introspection

by participants, it is used by MediTrain to personalize lengths of the meditation sessions depending upon the abilities of each participant. This tailored method makes sure that participants do not get discouraged by their initial attempts. The data was sent directly from the app to the researchers.

Key points

- A novel stand-alone personalized digital med- itation training program called 'MediTrain' has been designed, dev- eloped and tested.
- This meditation-inspired software program integrates central aspects of traditional meditation with a neuroplasticity-based closed-loop algorithm for cognitive advancement.
- After using 'MediTrain', attention span of participants was improved by an average of six minutes while their self-reported wandering of mind went down at the end of six weeks.

Results showed that the attention span of participants was improved by an average of six minutes (after a start time of 20 seconds) while their self-reported wandering of mind went down at the end of six weeks. Also, response time across trials (RTVar) rates decreased significantly for participants of the program – lower rates are associated with better concentration. The improvements were also reflected in their brain activity in terms of positive changes in important neural signatures of attentional control as measured by electroencephalogram (EEG). The results of using MediTrain daily for 20-30 minutes were similar to what normally adults achieve after months of intensive meditation training. The participants had an improved ability to focus on their breathing, improved attention span and enhanced working memory. They were able to perform more consistently on specialized tests carried out after the 6-week period when compared to the control group.

MediTrain is a novel personalized meditation practice software which can be delivered using a digital technology – a mobile phone or a tablet. It is becoming increasingly important in the current digital era to be able to improve and sustain one's attention span and working memory which has become challenging especially for the younger generation due to heavy use of media, visuals and technology.

Source(s)

1. Ziegler DA. 2019. Closed-loop digital meditation improves sustained attention in young adults. Nature Human Behaviour.
DOI: 10.1038/s41562-019-0611-9

2. University of San Francisco, USA. MediTrain. https://neuroscape.ucsf .edu/technology/#meditrain ■

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Parkinson's Disease: Treatment by Injecting amNA-ASO into the Brain

Experiments in mice show that injecting amino-bridged nucleic acid-modified antisense oligonucleotides (amNA-ASO) into the brain is a potent and efficient approach to target SNCA protein for treatment of Parkinson's disease

More than 10 million people worldwide suffer from Parkinson's disease - a neurodegenerative disorder in which patients exhibit loss of dopaminergic neurons in the brain. The symptoms of this disease include tremors, muscle rigidity, slowed movement and loss of posture. The exact cause of Parkinson's is not clear and both genetics and environmental triggers are believed to have important implications. There is no treatment to control the onset and progression of this disease. The treatments available for Parkinson's' disease only help in management of symptoms.

A key characteristic feature of Parkinson's disease is the presence of Lewy bodies – clumps of substances inside brain cells. In patients with Parkinson's, increased levels of a natural and common protein called alpha-synuclein (SNCA) get accumulated in these Lewy bodies in clump form which

cannot be broken down. It is well established that increased levels of SNCA increase risk of Parkinson's disease as it causes dysfunction and toxicity. SNCA is a promising therapeutic for Parkinson's.

In a study published in *Scientific Reports*, scientists aimed to target alpha-synuclein for a new possible treatment of Parkinson's by utilizing gene therapy in vivo experiments. Preventing the expression of this crucial protein could delay the onset or likely modify the course of the disease. The antisense oligonucleotide (ASO) is a potential gene therapy for targeting the SNCA gene. In the current work, researchers set out to improve the efficacy of ASOs for in *vivo* experiments. After designing short fragments of DNA which are mirror images of sections of alpha-synuclein gene product, researchers stablished the genetic fragments by adding amino-bridging via employing amino radicals to connect molecules. The fragments now called amino-bridged nucleic acid-modified antisense oligonucleotides (amNA-ASO) have more stability, lesser toxicity and more potency for targeting SNCA. They chose a 15-nucleotide sequence (after screening around 50 variants) which successfully decreases αlpha-synuclein mRNA levels by 81%. The amNA-ASO was able to bind to their matching mRNA sequence and prevent the genetic information from getting translated into protein alpha-synuclein.

They tested this 15-nucleotide amNA-ASO in a

mouse model of Parkinson's where it successfully got delivered to the brain directly via intracerebroventricular injection without needing assistance from chemical carriers. It also decreased production of αlpha-synuclein in mice thereby reducing the severity of the disease symptoms after around 27 days of administration. A single injection was able to do the task. Similar results were seen in human cultured cells in the laboratory.

The current study shows that gene therapy using alpha-synuclein targeting amNA-ASOs is a promising therapeutic strategy for treatment of Parkinson's disease and some other forms of dementia. This is the first study to show intracerebroventricular administration of ASO (by use of amNA-ASO) without needing a carrier or conjugation to successfully knockout the levels of SNCA and improve motor function in animal model of Parkinson's disease.

Source(s)

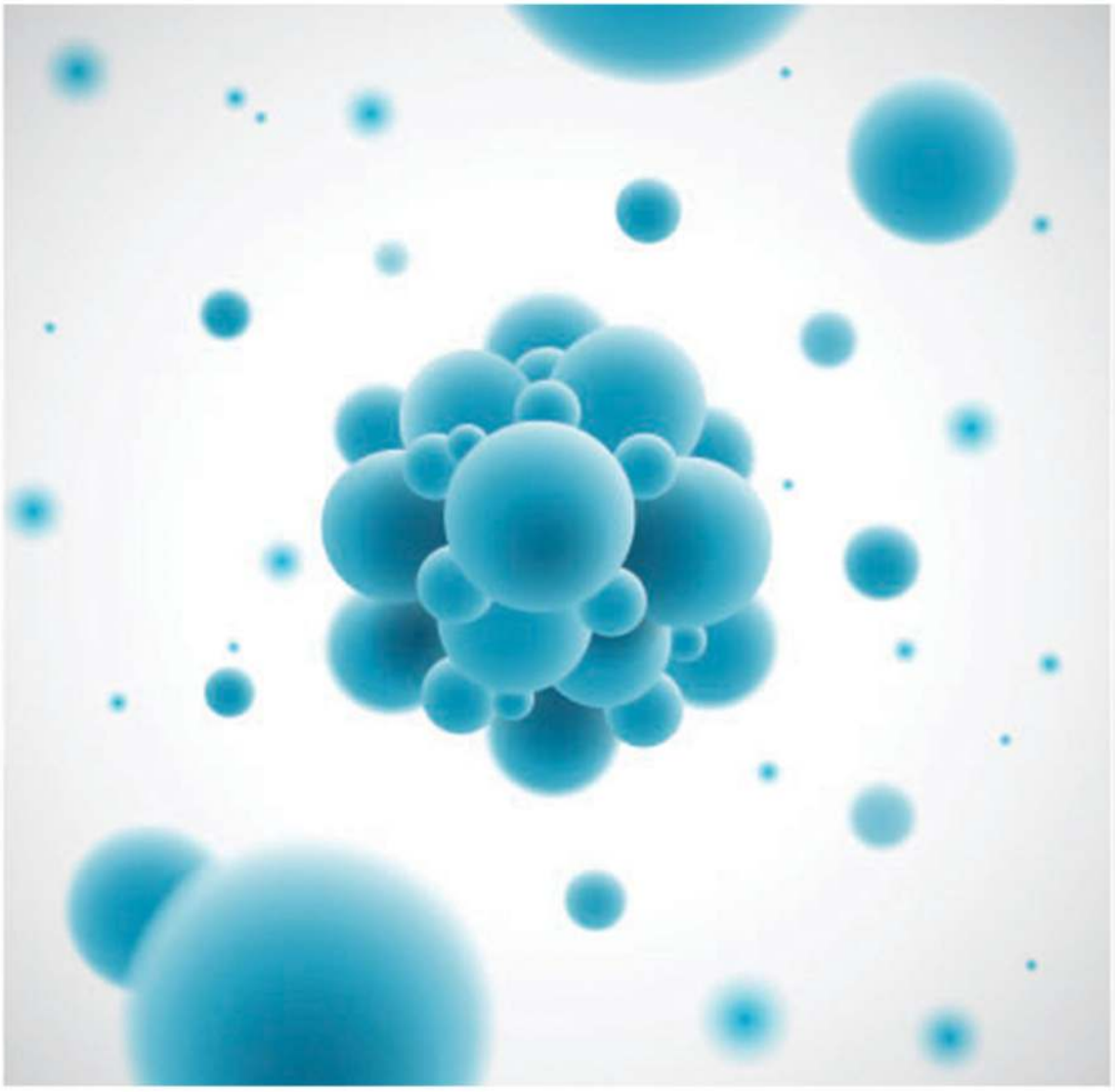
Uehara T. et al. 2019. Amido-bridged nucleic acid (AmNA)-modified antisense oligonucleotides targeting α-synuclein as a novel therapy for Parkinson's disease. Scientific Reports. 9 (1).
DOI: 10.1038/s41598-019-43772-9 ■

Tissue Engineering: A Novel Tissue-specific Bioactive Hydrogel

Scientists have for the first time created an injectable hydrogel which beforehand incorporates tissue-specific bioactive molecules via novel crosslinkers. The hydrogel described has strong potential for usage in tissue engineering

Tissue engineering is the development of tissue and organ substitutes – three-dimensional cellular constructs - having properties similar to natural tissues. Tissue engineering aims at restoring, preserving or enhancing tissue functions by use of these biologically active scaffolds. Synthetic hydrogel polymers have been hailed as promising candidates to provide such mechanical scaffolds owing to their unique composition and structural similarities with natural extracellular matrix. Hydrogels mimic tissue environments and the crosslinkers in hydrogels help the material to maintain its structure even when it has absorbed huge amounts of water. However, currently available hydrogels are biologically inert and thus cannot act standalone to drive an appropriate biological function. They require addition of compatible biomolecules (example growth factors, adhesive ligands) making them an imperative part of hydrogels.

In a study published in *Science Advances*, scientists have developed a new modular injectable hydrogel which uses a crosslinker called PdBT – a biodegradable compound – for crosslinking of the hydrogel polymer to create a swollen, bioactive hydrogel. The PdBT incorporates bioactive molecules by anchoring them in the chemical crosslinkers in the hydrogel. The specific



biomolecules can be simply mixed with PdBT at room temperature and by doing so bioactive molecules become an integrated part of the hydrogel. Such a system, developed for the first time, has the ability to bind to tissue-specific biomolecules at room temperature to become functionalized without requiring any secondary injection or system later.

The added biomolecules remain anchored to the hydrogel and can be presented directly to the target tissue. This prevents diffusion to area outside the target area avoiding undesired consequences like inactivation or redundant tissue growth. Experiments were conducted on bone and cartilage using specific PdBT monomers by adding functionality through incorporating cartilage-associated hydrophobic N-cadherin peptide and a hydrophilic bone morphogenetic protein peptide, and a cartilage-derived glycosaminoglycan, chondroitin sulfate. This hydrogel mixture can be directly injected into the target tissue. Biomolecules incorporated in the hydrogel come in contact with body's mesenchymal stem cells of the host tissue and "lure" them so they get added to the target area to 'seed' or initiate new growth. Once the new tissue grows, the hydrogel degrades and disappears.

The new hydrogel described in the current study can be prepared at room temperature for immediate use and can be customized accordingly for

different tissues. The straightforward preparation process prevents thermal degradation of biomolecules which has been an issue with previous hydrogels as this affects their biological activity. Bioactive hydrogels can help to regenerate bone, cartilage, skin and other tissues. This novel technique which uses an injectable bioactive hydrogel having favourable properties has a strong potential for use in tissue engineering.

Source(s)

Guo JL et al. 2019. Modular, tissue-specific, and biodegradable hydrogel cross-linkers for tissue engineering. Science Advances. 5 (6).
DOI: 10.1126/sciadv.aaw7396 ■

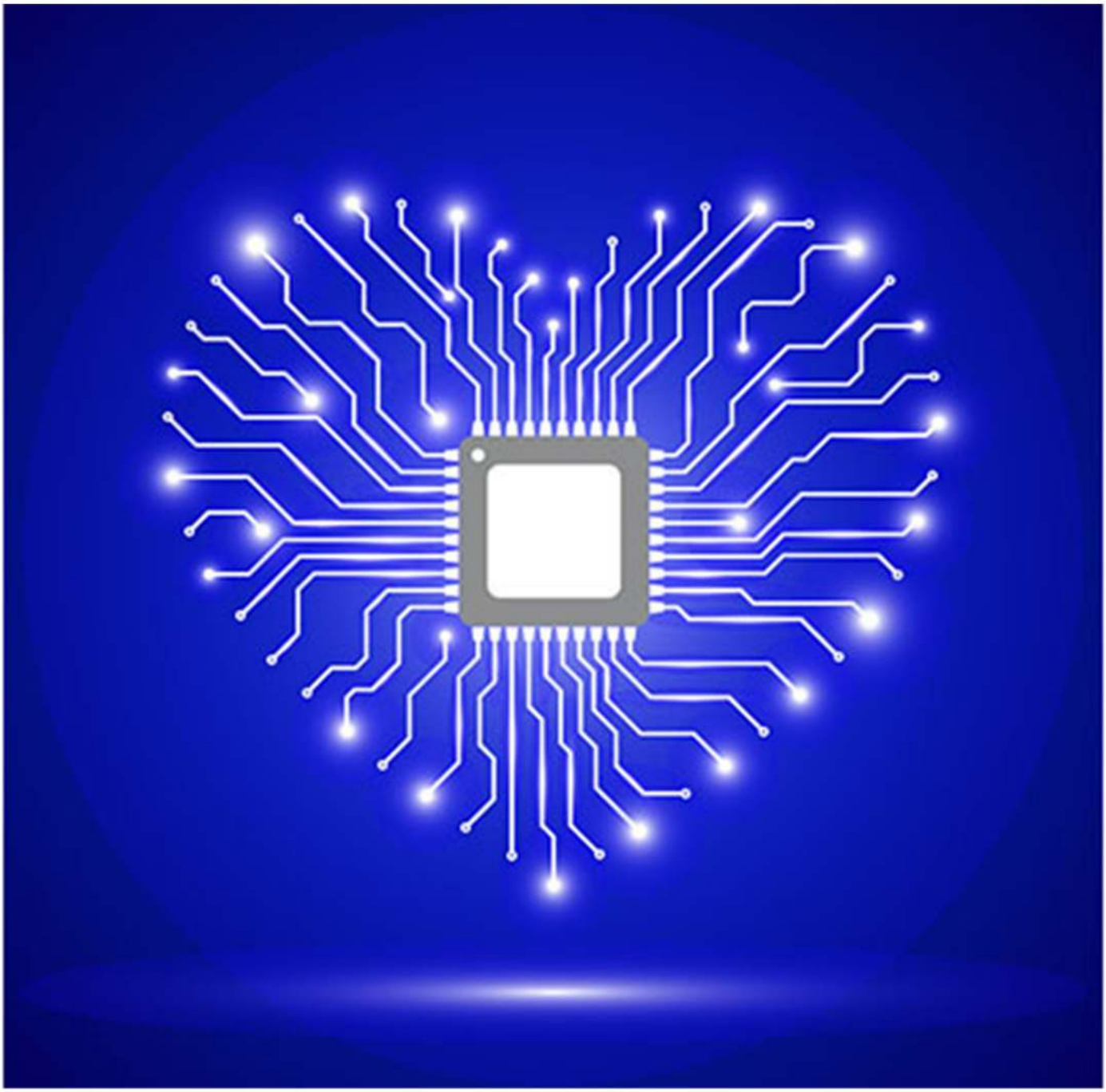
E-Tattoo to Monitor Blood Pressure Continuously

Scientists have designed a new chest-laminated, ultrathin, 100 percent stretchable cardiac sensing electronic device (e-tattoo) to monitor heart functions. The device can measure ECG, SCG (seismocardiogram) and cardiac time intervals accurately and continuously for longer duration to monitor blood pressure.

Cardiovascular disease(s) is the leading cause of deaths worldwide. Monitoring function of our heart can to an extent help in preventing heart diseases. The ECG (electrocardiogram) test measures electrical activity of our heart by measuring heart rate and rhythm to tell us whether our heart is functioning normally. Another test called SCG (seismocardiography) is an accelerometer sensor-based method which is being used to record cardiac mechanical vibrations by measuring chest vibrations caused by the heartbeats. SCG is gaining importance in the clinic as an additional measure along with ECG to monitor and ascertain cardiac abnormalities with improved accuracy and reliability.

Wearable devices like fitness and health trackers are now a promising and popular alternative to monitor our health. For monitoring heart functions, few soft devices are available which measure ECG. However, SCG sensors available today are based upon rigid accelerometers or non-stretchable membranes making them bulky, impractical and uncomfortable to wear.

In a new study published in *Advanced Science*, researchers describe a new device which can be laminated on one's chest (hence called as an e-tattoo) and monitor heart functions by measuring



ECG, SCG and cardiac time intervals. This unique device is ultrathin, lightweight, stretchable and it can be placed over one's heart without need of a tape for long durations without causing pain or discomfort. The device is made of a serpentine mesh of commercially available sheets of piezoelectric polymer called polyvinylidene fluoride by using a simple, cost -effective fabrication method. This polymer has a unique property of generating electric charge in response to a mechanical stress.

To guide this device, a 3D image correlation method maps motion of the chest derived from respiration and cardiac movement. This helps to find the optimal sensing spot for chest vibrations to mount the device. The soft SCG sensor is integrated with stretchable gold electrodes onto a single device itself creating a dual mode device which can synchronously measure ECG and SCG

by using electro- and acoustic cardiovascular sensing (EMAC). ECG is routinely used to monitor one's heart, but when combined with SCG signal recordings, its accuracy gets enhanced. Using this EMAC sensor and performing synchronous measurements, different cardiac time intervals can be successfully extracted including systolic time interval. And, it was seen that systolic time interval has a robust negative correlation with blood pressures, thus beat-to-beat blood pressure could be estimated using this device. Strong correlations were seen between systolic time interval and the systolic-diastolic blood pressures. A smartphone remotely powers this device.

Key points

- Monitoring functions of our heart can to an extent help in preventing heart diseases.
- A new ultrathin, ultralight, soft, 100 percent stretchable device has been designed which can be laminated on one's chest and it can monitor heart functions by measuring ECG, SCG and cardiac time intervals.
- By measuring systolic time interval, beat-to-beat blood pressure could be estimated using this novel device.

The innovative chest-mounted device described in the current study provides a simple mechanism to monitor blood pressure continuously and non-invasively. This device is an ultrathin, ultralight, soft, 100 percent stretchable mechano-acoustic sensor which has high sensitivity and can be easily manufactured. Such wearables which can be worn to monitor heart functions without needing to visit the doctor could be promising for preventing heart diseases.

Source(s)

Ha T. et al. 2019. A Chest-Laminated Ultrathin and Stretchable E-Tattoo for the Measurement of Electrocardiogram, Seismocardiogram, and Cardiac Time Intervals. Advanced Science.
DOI: 10.1002/advs.201900290 ■

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ISSN 2613-3227 (Online)

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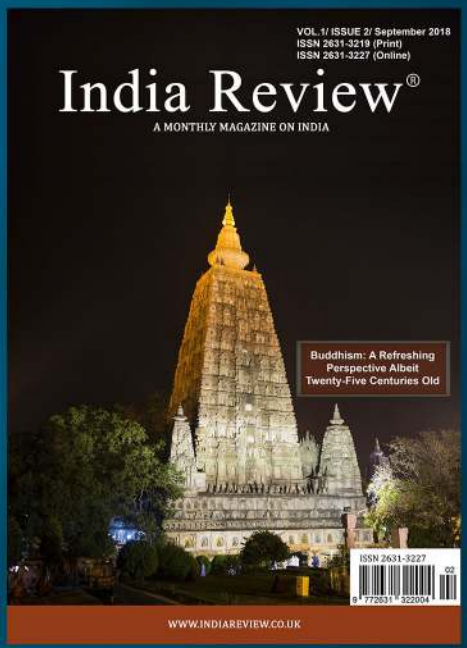

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Circular Solar Halo

By Neelam Prasad, Hampshire England

Circular Solar Halo is an optical phenomenon seen in the sky when sunlight interacts with ice crystals suspended in the atmosphere. These pictures of solar halo were observed on 09 June 2019 in Hampshire England.

On Sunday morning of 09 th June 2019, I was sitting in the backyard. It was partly cloudy sky. I was enjoying the sun when I noticed some beautiful things in the sky around cloud-sun area. I took out my phone and quickly took pictures.

Do you know what they are ? I did not.

I searched google and literature - this is Halo, an optical phenomenon seen in the partly cloudy sky.

These are images of circular solar halo observed in Alton, Hampshire on 09 June 2019.

The Halo is produced as a result of diffraction when sunlight interacts with ice crystals suspended in the atmosphere. (Rainbows are formed when light interacts with water droplets).

Orientation and the size of the ice crystals is important in formation of circular halo. These are not formed by randomly oriented ice crystals. For a sharp diffraction pattern the ice crystals should be in transition between randomness and high orientation and have diameters between about 12 and 40 μm (Fraser 1979).

Source(s)

Fraser Alistair B.1979. What size of ice crystals causes the halos?. Journal of the Optical Society of America. 69(8).
DOI: 10.1364/JOSA.69.001112 ■

Social Media and Medicine: How Posts Can Help Predict Medical Conditions

Medical scientists from University of Pennsylvania have found that medical conditions could be predicted from contents of social media posts

Social media is now an integral part of our lives. In 2019, at least 2.7 billion people regularly use online social media platforms like Facebook, Twitter and Instagram. This means that more than a billion individuals share information on a daily basis about their lives on these public platforms. People freely share their thoughts, likes and dislikes, sentiments and personalities. Scientists are exploring whether this information, generated outside the clinical healthcare system, could reveal possible disease predictors in daily lives of patients which otherwise may be hidden to healthcare personnel and researchers. Earlier studies have shown how Twitter can predict heart disease mortality rate or monitor public sentiment on medical-related issues like insurance. However, social media information has so far not been used for predicting medical conditions at an individual level.

A new study published in *PLOS ONE* has for the first time shown the linking of electronic

medical records of patients (who have given their consent) with their social media profiles. Researchers aimed to investigate – first, whether medical conditions of an individual can be predicted from the language posted on the user's social media account(s) and second, if specific disease markers can be identified.

Researchers used an automated data collection technique to analyse full Facebook history of 999 patients. This meant analysing a humungous 20 million words in around 949,000 Facebook status updates with posts containing at least 500 words. Researchers developed three models to make predictions for each patient. The first model analysed the language of Facebook posts by identifying keywords. The second model analysed patient's demographics information like their age and gender. The third model combined these two datasets. A total of 21 medical conditions were looked into including diabetes, anxiety, depression, hypertension, alcohol abuse, obesity, psychoses.

Analysis showed that all 21 medical conditions were predictable from Facebook posts alone. And, 10 conditions were predicted better by Facebook posts than even demographics. The prominent keywords were, for example, 'drink', 'drunk' and 'bottle' which were predictive of alcohol abuse and words like 'God' or 'pray' or 'family' were used 15 times more likely by people with diabetes.

Words like 'dumb' served as indicators for drug abuse and psychosis and words like 'pain', 'crying' and 'tears' were linked to emotional distress. Facebook language used by individuals was very effective in making predictions - particularly about diabetes and mental health conditions including anxiety, depression and psychosis.

The current study suggests that an opt-in system for patients could be developed where patients allowed analysis of their social media posts by providing access to this information to clinicians. This approach could be most valuable for people who routinely use social media. Since social media reflects people's thoughts, personality, mental state and health behaviours, this data could be used to predict onset or worsening of a disease. Where social media is concerned, privacy, informed consent and data ownership is going to be crucial. Condensing and summarizing social media content and making interpretations is the primary goal.

The current study can lead way to develop new artificial intelligence applications for predicting medical conditions. Social media data is quantifiable and provides new avenues to assess behavioural and environmental risk factors of a disease. Social media data of an individual is being referred to as 'social mediome' (similar to genome - complete set of genes).

Source(s)

Merchant RM. et al. 2019. Evaluating the predictability of medical conditions from social media posts. PLOS ONE. 14 (6).
DOI: 10.1371/journal.pone.0215476 ■

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Sleep Traits and Cancer: New Evidences of Breast Cancer Risk

Synchronizing sleep-wake pattern to night-day cycle is critical for good health. WHO classifies body clock disruption as probably carcinogenic in nature. A new study in The BMJ has investigated direct effects of sleep traits (morning or evening preference, sleep duration and insomnia) on risk of developing breast cancer and found that women with preference to getting up early in the morning had lower risk, also if the sleep duration is more than 7-8 hours it increases breast cancer risk.

The World Health Organization's International Agency for Research on Cancer classifies shift work involving circadian disruption as probably carcinogenic to humans. Evidences point towards a positive connection between disruption in body clock and increased cancer risk.

Studies have shown that women workers who work night shift have higher breast cancer risk due to disruption of internal body clock caused by erratic and disturbed sleep patterns, exposure to light in twilight hours and associated lifestyle changes. However, not many studies have focused on investigating associations between one's sleep traits (a) one's chronotype i.e. the time of the sleep and regular activities (sleep-wake pattern) (b) sleep duration and (c) insomnia with breast cancer risk. Self-reporting by women in observational studies is prone to error or unmeasured confounding and thus making a direct inference about relationship between these sleep traits and risk of breast cancer is very challenging.

A new study published in *The BMJ* aimed to investigate the causal effects of sleep traits on risk of developing breast cancer using a combination of methods. Researchers utilized two large

high-quality epidemiological resources – UK Biobank and BCAC study (Breast Cancer Association Consortium). UK Biobank study had 180,216 women participants of European descent of whom 7784 had breast cancer diagnosis. 228,951 women participants, also of European descent, in BCAC study of which 122977 were breast cancer cases and 105974 controls. These resources provided breast cancer status, confounding (unmeasured) factors and genetic variables.

Participants completed questionnaire which included sociodemographic information, lifestyles, family history, medical history, physiological factors. Alongside, participants self-reported their (a) chronotype i.e. morning or evening preference (b) average sleep duration and (c) insomnia symptoms. Researchers analyzed the genetic variants associated with these three particular sleep traits (recently identified in large genome-association studies) by using a method called Mendelian Randomization (MR). MR is an analytic research method used to investigate causal relationships between modifiable risk factors and health outcomes by using genetic variants as natural experiments. This method is less likely to be affected by confounding factors compared to traditional observational studies. Several factors which were considered as confounders

Key points

- Multiple evidences point towards a positive connection between disruption in body clock and increased cancer risk.
- The study integrates multiple approaches to make an assessment about the causal effect of sleep traits on risk of breast cancer.
- Analysis showed that women with preference to getting up early in the morning had lower risk, also if the sleep duration is more than 7-8 hours it increases breast cancer risk.

of the association between sleep traits and risk of breast cancer were age, family history of breast cancer, education, BMI, alcohol habits, physical activity etc.

Mendelian analysis of UK Biobank data showed that 'morning preference' (a person who wakes up early in the morning and goes to bed early in the evening) was associated with lower risk of breast cancer (1 less woman in 100) compared to 'evening preference'. Very little evidence showed possible risk association with sleep duration and insomnia. Mendelian analysis of BCAC data also supported morning preference and further showed that longer sleep duration i.e. more than 7-8 hours increases risk of breast cancer. The evidences of insomnia were inconclusive. Since MR method gives reliable results so if an association is found, it is suggestive of a direct relationship. The evidences were seen to be consistent for both these causal associations.

The current study integrates multiple approaches to be able to make an assessment about the causal effect of sleep traits on risk of breast cancer by first, including data from two high quality resources – UK Biobank and BCAC and second, use data derived from self-reporting and objectively assessed measures of sleep. Further, MR analysis used highest number of SNPs identified in genome-wide association studies till date. The findings reported have strong implications for persuading good sleep habits in the general population (especially younger) in order to improve one's health. The findings could help to develop new personalized strategies for reducing risk of cancer associated with disruption of our circadian system.

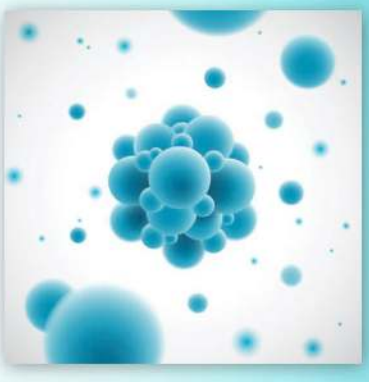
Source(s)

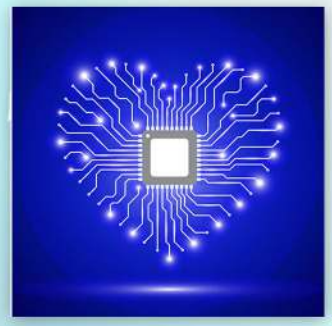
1. Richmond RC et al. 2019. Investigating causal relations between sleep traits and risk of breast cancer in women: mendelian randomisation study. BMJ. DOI: 10.1136/bmj.l2327

2. UK Biobank. www.ukbiobank.ac.uk

3. Breast Cancer Association Consortium. www.bcac.ccge.medschl.cam.ac.uk ■


SOCIAL MEDIA
PREDICTING MEDICAL CONDITIONS



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