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Zinc eaten at levels found in biofortified crops reduces 'wear and tear' on DNA

Research results present a new strategy for measuring the impact of zinc on health

Oakland, CA - A new study by researchers from the UCSF Benioff Children's Hospital Research Institute (CHORI) shows that a modest 4 milligrams of extra zinc a day in the diet can have a profound, positive impact on cellular health that helps fight infections and diseases. This amount of zinc is equivalent to what biofortified crops like zinc rice and zinc wheat can add to the diet of vulnerable, nutrient deficient populations.

The study, published in the American Journal of Clinical Nutrition, was led by CHORI Senior Scientist Janet King, PhD. King and her team are the first to show that a modest increase in dietary zinc reduces oxidative stress and damage to DNA.

"We were pleasantly surprised to see that just a small increase in dietary zinc can have such a significant impact on how metabolism is carried out throughout the body," says King. "These results present a new strategy for measuring the impact of zinc on health and reinforce the evidence that food-based interventions can improve micronutrient deficiencies worldwide."

Zinc is ubiquitous in our body and facilitates many functions that are essential for preserving life. It plays a vital role in maintaining optimal childhood growth, and in ensuring a healthy immune system. Zinc also helps limit inflammation and oxidative stress in our body, which are associated with the onset of chronic cardiovascular diseases and cancers.

Around much of the world, many households eat polished white rice or highly refined wheat or maize flours, which provide energy but do not provide enough essential micronutrients such as zinc. Zinc is an essential part of nearly 3,000 different proteins, and it impacts how these proteins regulate every cell in our body. In the absence of sufficient zinc, our ability to repair everyday wear and tear on our DNA is compromised.

In the randomized, controlled, six-week study the scientists measured the impact of zinc on human metabolism by counting DNA strand breaks. They used the parameter of DNA damage to examine the influence of a moderate amount of zinc on healthy living. This was a novel approach, different from the commonly used method of looking at zinc in the blood or using stunting and morbidity for assessing zinc status.

According to King, these results are relevant to the planning and evaluation of food-based solutions for mitigating the impact of hidden hunger and malnutrition. King believes that biofortification can be a sustainable, long-term solution to zinc deficiency.

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Genes affecting our communication skills relate to genes for psychiatric disorder

Genetic links depend on stages in a child's development

The researchers studied the genetic overlap between the risk of having these psychiatric disorders and measures of social communicative competence - the ability to socially engage with other people successfully - during middle childhood to adolescence. They showed that genes influencing social communication problems during childhood overlap with genes conferring risk for autism, but that this relationship wanes during adolescence. In contrast, genes influencing risk for schizophrenia were most strongly interrelated with genes affecting social competence during later adolescence, in line with the natural history of the disorder. The findings were published in Molecular Psychiatry on 3 January 2017.

Timing makes the difference

"The findings suggest that the risk of developing these contrasting psychiatric conditions is strongly related to distinct sets of genes, both of which influence social communication skills, but which exert their maximum influence during different periods of development",

explained Beate St Pourcain, senior investigator at the MPI and lead author of the study.

People with autism and with schizophrenia both have problems interacting and communicating with other people, because they cannot easily initiate social interactions or give appropriate responses in return. On the other hand, the disorders of autism and schizophrenia develop in very different ways. The first signs of ASD typically occur during infancy or early childhood, whereas the symptoms of schizophrenia usually do not appear until early adulthood.

Features of autism or schizophrenia are found in many of us

People with autism have serious difficulties in engaging socially with others and understanding social cues, as well as being rigid, concrete thinkers with obsessive interests. In contrast, schizophrenia is characterised by hallucinations, delusions, and seriously disturbed thought processes. Yet recent research has shown that many of these characteristics and experiences can be found, to a mild degree, in typically developing children and adults. In other words, there is an underlying continuum between normal and abnormal behaviour.

Recent advances in genome-wide analyses have helped drawing a more precise picture of the genetic architecture underlying psychiatric disorders and their related symptoms in unaffected people. A large proportion of risk to disorder, but also variation in milder symptoms, stems from combined small effects of many thousands of genetic differences across the genome, known as polygenic effects. For social communication behaviour, these genetic factors are not constant, but change during childhood and adolescence. This is because genes exert their effects consistent with their biological programming.

Disentangling psychiatric disorders

"A developmentally sensitive analysis of genetic relationships between traits and disorders may help to disentangle apparent behavioural overlap between psychiatric conditions", St Pourcain commented.

George Davey Smith, Professor of Clinical Epidemiology at the University of Bristol and senior author of the study, said, "The emergence of associations between genetic predictors for different psychiatric conditions and social communication differences, around the ages the particular conditions reveal themselves, provides a window into the specific causes of these conditions".

David Skuse, Professor of Behavioural and Brain Sciences at University College London added, "This study has shown convincingly how the measurement of social communicative competence in childhood is a sensitive indicator of genetic risk. Our greatest challenge now is to identify how genetic variation influences the development of the social brain".

The data on unaffected individuals for this study came from a general population cohort, the Avon Longitudinal Study of Parents and Children, hosted by the University of Bristol. ASD and schizophrenia collections included several large, international autism genetic studies: the Psychiatric Genomics Consortium Autism group, the Psychiatric Genomics Consortium Schizophrenia group and the iPSYCH autism project in Denmark.

http://bit.ly/2j0e0rq

This Brainless Blob Learns — and Teaches, Too

You don't need a brain to learn and teach. New research finds that slime molds, goopy and rather uncharismatic organisms that lack a nervous system, can adapt to a repulsive stimulus and then pass on that adaptation by fusing with one another.

By Stephanie Pappas, Live Science Contributor

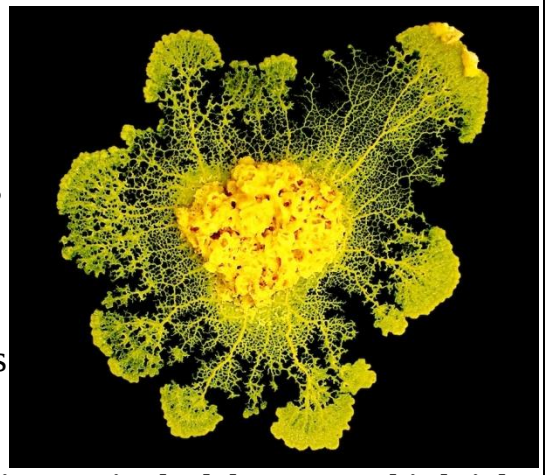
The research suggests that learning may predate the evolution of the nervous system, Toulouse University researchers David Vogel and Audrey Dussutour wrote Dec. 21 in the journal Proceedings of the Royal Society B.

Slime molds are truly bizarre. They're part of the taxonomic group Amoebozoa, which they share with their famous cousins, amoebas. Slime molds can exist as independent cells, but they can also fuse into giant, single-celled organisms with multiple nuclei. The variety studied by Vogel and Dussutour, Physarum polycephalum, is bright yellow and can fuse to form a giant cell that covers hundreds of square

centimeters in area. In the wild, P. polycephalum favors habitats like rotting leaves and the moist undersides of logs.

Slime that learns

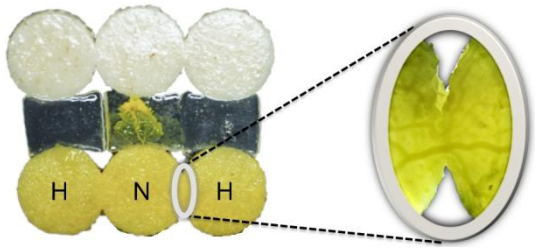
Previous studies of slime mold have found that they have a primitive form of memory based on information stored in their trails of goo. Despite being entirely brainless, slime molds can find the fastest route through a maze or between points. P. polycephalum is capable of creeping along at 1.5 inches (4 centimeters) an hour.



Physarum polycephalum grows in agar in the laboratory. This bright-yellow slime mold can form a giant cell as big as a square meter in area, each with thousands of nuclei. **Audrey Dussutour (CNRS)**

Vogel and Dussutour reported in April 2016 that P. polycephalum can learn. They cultured the slime mold in dishes filled with a mix of agar cell and Quaker Oats and then put the molds next to a patch of food, accessible only by an agar bridge. Half of the time, the researchers coated the bridges with bitter-but-harmless quinine or caffeine. They found that the slime molds were initially reluctant to cross these bitter bridges, and took twice as long as the slime molds that got to cross bridges free of repellent. Over the course of a few days, though, the slime molds "learned" that the quinine and caffeine were harmless, and sped their passage across the bridges. This demonstrated habituation, or a diminished response to a repeated stimulus.

For the current study, the researchers repeated this experiment with another harmless deterrent, sodium chloride — table salt. After confirming that the slime molds responded to salted bridges first with aversion and then with habituation, Vogel and Dussutour added a twist. After habituation, they exposed slime molds that had experienced the salted bridges to slime molds that had crossed only plain bridges, and allowed those molds to fuse. In the process of fusion, the individual molds keep their nuclei but lose their cell membranes to become one blob-like cell.



Habituated slime molds, labeled H, fuse with naïve individuals, labeled N. The habituated slime molds are used to crossing aversive salted areas to reach food, a trick they pass on to their naïve counterparts during fusion. **David Vogel**

Pass it on

After fusion, the researchers timed all of the slime molds as they crossed salted bridges. They found that as long as a single salt-habituated slime mold was in the mix, the new fused molds crossed the salty bridges just as fast as molds that were used to the salt. No matter how many slime molds were fused, the researchers found, just one was enough to habituate the whole gang.

The researchers also found evidence that the habituation was the result of some sort of internal transfer of knowledge, not just a dilute mixing of habituated cells with unhabituated cells. For one thing, the tubular extension (called a pseudopod) that first reached the food patch was frequently from the unhabituated portion of the newly fused mega-cell. For another, there was no linear relationship between the amount of habituated mold and the speed of bridge-crossing: One habituated slime mold mixed with three unhabituated slime molds was just as fast as three habituated slime molds mixed with an unhabituated one.

Most strikingly, the lessons persisted after fusion ended. The researchers separated unhabituated and habituated slime molds after one hour and after three hours of union. After one hour, the unhabituated slime molds went back to hating salt. But when the researchers waited three hours to separate the slimes, the unhabituated slime molds behaved just like habituated slime molds, slithering merrily across the salted bridges. Without brains or even nerve cells, they had "learned" from their habituated brethren.

The research should prompt study into the transfer of adaptive behavioral responses in other types of cells, the researchers concluded.

http://bit.ly/2hLu7bu

Chemically modified insulin is available more quickly

Replacing a hydrogen atom by an iodine atom in insulin, the hormone retains its efficacy but is available more rapidly to the organism.

Researchers at the University of Basel were able to predict this effect based on computer simulations and then confirm it with experiments. The results have been published in the Journal of Biological Chemistry.

Insulin is formed in the pancreas and regulates the blood glucose level. In the body, it is stored as a zinc-bound complex of six identical molecules, called a hexamer. However, the physiologically active form is a single insulin monomer. Only when the body requires insulin the hexamer divides into monomers available for blood sugar regulation.

Researchers attempt to control this disassembly process by developing artificial insulin preparations, in order to optimize clinical treatment of diabetes mellitus. By means of chemical modifications, the release and availability of insulin can be improved. One possible approach is to strategically replace individual atoms in a targeted manner. This results in what is known as an insulin analog, which differs from natural insulin in both structure and properties.

Artificial insulin is released more rapidly

The team led by Professor Markus Meuwly from the Department of Chemistry at the University of Basel has investigated this process in collaboration with researchers from the USA and Australia. The researchers exchanged a single hydrogen atom by an iodine atom which modulates intermolecular interactions that resulted in more rapid insulin disassembly and release.

Introducing the iodine atom improved the insulins' availability, while the affinity for the insulin receptor and the biological function remained unchanged when compared to the natural hormone. These advantageous properties were first predicted by a combination of quantum chemistry and molecular dynamics simulations. In a next step, the stability changes of the chemically modified insulin were directly probed by using crystallographic and nuclear magnetic resonance experiments which confirmed the computations.

Clinical application possible

The use of halogen atoms is a promising approach for compound optimization in medicinal chemistry. The results obtained for iodinated insulin demonstrate that the concept of chemical modification has also great potential in the field of protein engineering. A future clinical application of the insulin analog, which differs from natural insulin by only a single atom, is quite conceivable.

Research links fatty liver disease to type 2 diabetes

More information: Krystel El Hage et al. Extending Halogen-based Medicinal Chemistry to Proteins, Journal of Biological Chemistry (2016). DOI: 10.1074/jbc.M116.761015

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SpaceX finds failure cause, announces January 8 as target for flight resumption

Plans for rapid resumption of flights as soon as Sunday complex carrying a payload of 10 advanced mobile relay satellites

January 3, 2017 by Ken Kremer, Universe Today

After an intensive four month investigation into why a SpaceX Falcon 9 rocket exploded without warning on the launch pad last September, the company today announced the failures likely cause as well as plans of a rapid resumption of flights as soon as next Sunday, Jan. 8, from their California launch complex – carrying a lucrative commercial payload of 10 advanced mobile relay satellites to orbit for Iridium Communications.

"Targeting return to flight from Vandenberg with the @IridiumComm NEXT launch on January 8," SpaceX announced on their website today, Monday, Jan. 2., 2017. "Our date is now public. Next Sunday morning, Jan 8 at 10:28:07 pst. Iridium NEXT launch #1 flies!"

Iridium Communications CEO Matt Desch quickly confirmed by tweet today, Jan 2.

SpaceX has been dealing with the far reaching and world famous fallout from the catastrophic launch pad explosion that eviscerated a Falcon 9 and its expensive $200 million Israeli Amos-6 commercial payload in Florida without warning, during a routine preflight fueling test on Sept. 1, 2016, at pad 40 on Cape Canaveral Air Force Station.

After the Sept. 1 accident at pad 40, SpaceX initiated a joint investigation to determine the root cause with the FAA, NASA, the US Air Force and industry experts who have been "working methodically through an extensive fault tree to investigate all plausible causes." "We have been working closely with NASA, and the FAA [Federal Aviation Administration] and our commercial customers to understand it," said SpaceX CEO Elon Musk.

Via the "fault tree analysis" the Sept. 1 anomaly has been traced to a failure in one of three helium storage tanks located inside the second stage liquid oxygen (LOX) tank of the Falcon 9 rocket, according to a statement released by SpaceX today which provided some but not many technical details.

The failure apparently originated at a point where the helium tank "buckles" and accumulates oxygen – "leading to ignition" of the highly flammable liquid oxygen propellant in the second stage.

The helium tanks – also known as composite overwrapped pressure vessels (COPVs) – are used in both stages of the Falcon 9 to store cold helium which is used to maintain tank pressure.

"The accident investigation team worked systematically through an extensive fault tree analysis and concluded that one of the three composite overwrapped pressure vessels (COPVs) inside the second stage liquid oxygen (LOX) tank failed." "Each COPV consists of an aluminum inner liner with a carbon overwrap."

"Specifically, the investigation team concluded the failure was likely due to the accumulation of oxygen between the COPV liner and overwrap in a void or a buckle in the liner, leading to ignition and the subsequent failure of the COPV."

SpaceX says investigators identified "an accumulation of super chilled LOX or SOX in buckles under the overwrap" as "credible causes for the COPV failure." Apparently the super chilled LOX or SOX can pool in the buckles and react with carbon fibers in the overwrap – which act as an ignition source.

"Investigators concluded that super chilled LOX can pool in these buckles under the overwrap. When pressurized, oxygen pooled in this buckle can become trapped; in turn, breaking fibers or friction can ignite the oxygen in the overwrap, causing the COPV to fail."

Very concerning is the fact that the helium loading conditions are confirmed to be so low that they can actually freeze the liquid oxygen into solid form. Thus it cannot flow freely and significantly increases the chances of a "friction ignition."

This same Falcon 9 rocket will be used to launch our astronauts to the ISS in 2018 – seated inside a Crew Dragon atop the helium tank bathed in super chilled LOX. "Investigators determined that the loading temperature of the helium was cold enough to create solid oxygen (SOX), which exacerbates the possibility of oxygen becoming trapped as well as the likelihood of friction ignition."

SpaceX says they will address the causes of the mishap through a mix of both short term and long term "corrective actions."

"The corrective actions address all credible causes and focus on changes which avoid the conditions that led to these credible causes."

The short term fixes involve simpler changes to the COPV configuration and modifying the helium loading conditions.

"In the short term, this entails changing the COPV configuration to allow warmer temperature helium to be loaded, as well as returning helium loading operations to a prior flight proven configuration based on operations used in over 700 successful COPV loads."

The long term fixes involve changing the COPV hardware itself and will take longer to implement. They are also likely to be more

effective – but only time will tell. "In the long term, SpaceX will implement design changes to the COPVs to prevent buckles altogether, which will allow for faster loading operations."

Liftoff of the SpaceX Falcon 9 with the payload of 10 identical next generation IridiumNEXT communications satellites will take place from Space Launch Complex 4E on Vandenberg Air Force Base in California – assuming the required approval is first granted by the Federal Aviation Administration (FAA).

No Falcon 9 launch will occur until the FAA gives the 'GO.'

Furthermore, in anticipation of announcing the targeted 'Return to Flight' launch date, technicians have already processed the Falcon 9 rocket for the 'Return to Flight' blastoff with the vanguard of a fleet of IridiumNEXT mobile voice and data relay satellites for Iridium Communications – as I reported last week in my story here – and subsequently tweeted by Iridium CEO Matt Desch saying "Nice recap."

Last week, the first ten IridiumNEXT mobile voice and data relay satellites were fueled, stacked and tucked inside the nose cone of the Falcon 9 rocket designated as SpaceX's 'Return to Flight' launcher in order to enable a blastoff as soon as possible after an approval is received from the FAA. "Iridium is pleased with SpaceX's announcement on the results of the September 1 anomaly as identified by their accident investigation team, and their plans to target a return to flight on January 8 with the first Iridium NEXT launch" Iridium Communications said on their website today, Jan. 2.

The Iridium 1 mission is the first of seven planned Falcon 9 launches – totaling 70 satellites. "Iridium is replacing its existing constellation by sending 70 Iridium NEXT satellites into space on a SpaceX Falcon 9 rocket over 7 different launches," says Iridium. The goal of this privately contracted mission is to deliver the first 10 Iridium NEXT satellites into low-earth orbit to inaugurate what will be a new constellation of satellites dedicated to mobile voice and data communications.

Iridium eventually plans to launch a constellation of 81 Iridium NEXT satellites into low-earth orbit. "At least 70 of which will be launched by SpaceX," per Iridium's contract with SpaceX.

http://bit.ly/2iL4itC

Forget the Shovel, Ancient Finds Now Made From Space

Archaeology now has much better tools than lucky amateurs with shovels.

BY CHRISTINA TYNAN-WOOD

Badgers discovered the burial site of 12th century Slavic warriors and a Stonehenge cremation burial. The Lascaux cave paintings were discovered by four schoolchildren and a dog. The 5,000-year-old corpse of Ötzi was discovered when hikers happened upon in the Alps. The Rosetta Stone was discovered by French soldiers expanding their fort.

Many discoveries in archaeology have happened this way, by accident. But archaeology now has much better tools than badgers and lucky amateurs with shovels. Take, for example, the search for the ancient lost city of Itjtawy in Egypt.

"Finding it randomly would be the equivalent of locating a needle in a haystack, blindfolded, wearing baseball mitts," explained Sarah Parcak, a space archaeologist and founder of the Laboratory for Global Observation at the University of Alabama at Birmingham, in her TED Talk.

So Parcak developed a way to process satellite images with infrared in order to identify chemical changes in the soil caused by the activity of ancient civilizations. She quickly found patterns where there were previously none. With this technique, she located the long-ago path of the Nile and the probable location of this important city, which was the capitol of Egypt for 400 years during its important middle kingdom.

Looking for ancient sites this way has proved to be a boon for the study of ancient human civilizations. Back in 2011, Parcak discovered

more than a dozen lost pyramids and over 1,000 tombs and 3,100 ancient settlements in Egypt alone using this technique.

Last year, NASA archaeologist Tom Sever, archaeologist William Saturno of the University of New Hampshire in Durham, and researcher Daniel Irwin of NASA's Marshall Space Flight Center in Huntsville, Alabama used satellite images to locate several Mayan settlements that had been cloaked in deep jungle.

In June of 2016, Parcak and archaeologist Christopher Tuttle, executive director of the Council of American Overseas Research Centers, used satellite imagery and drone photography to locate an enormous hidden monument in the well-known — and much visited — historical site Petra in Southern Jordan.

Last week, the Afghanistan Ministry of Information and Culture (MoIC), announced that it has used satellites to identify 5,000 ancient sites in that country over the past year. It's creating a map of the sites and hopes to use the information to protect the sites from looters.

But that doesn't mean that happy accidents are no longer needed in the quest to uncover the knowledge about prehistoric humans. In fact, Parcak is hoping to solicit the help of interested amateurs to speed up this important work. (Badgers, though, might be out of work in this field.)

Parcak received a TED Prize for her work using processed satellite imagery for archaeology last year and is using it to start a global movement, housed online at GlobaXplorer, to solicit the time and skill of interested amateurs to help archaeologists locate and identify ancient sites as quickly as possible before they are destroyed by war or looters.

"By building an online citizen science platform and training a 21st century army of global explorers," she said at GlobaXplorer, "We'll find and protect the world's hidden heritage, which contains clues to humankind's collective resilience and creativity."

Instead of stumbling upon ancient remains when doing construction or playing in caves, she is hoping we will go online and help her sift through massive numbers of satellite images, looking for patterns that look like ancient civilizations or buildings. In fact, she asks rather urgently for help since construction, war, and looting do much more to destroy ancient sites than lucky accidents do to preserve them.

"Archaeologists have explored less than 10 percent of the Earth's surface," she said at GlobalXplorer.org. "In the next 10 years, we can explore the remaining 90 percent."

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Veggies with Vision: Do Plants See the World around Them?

The concept of a "seeing plant" fell by the wayside in the early 20th century—only to reemerge in the past few years

By Marta Zaraska | Scientific American January 2017 Issue

Don't look now, but that tree may be watching you. Several lines of recent research suggest that plants are capable of vision—and may even possess something akin to an eye, albeit a very simple one.

The idea that plants may have "eyes" is, in a way, nothing new. In 1907 Francis Darwin, Charles's son, hypothesized that leaves have organs that are a combination of lens-like cells and light-sensitive cells. Experiments in the early 20th century seemed to confirm that such structures, now called ocelli, exist, but the concept of a "seeing plant" fell by the wayside—only to reemerge in the past few years.

In a recent issue of Trends in Plant Science, František Baluška, a plant cell biologist at the University of Bonn in Germany, and Stefano Mancuso, a plant physiologist at the University of Florence in Italy, lay out new evidence for visually aware vegetation. To make their case, the researchers first point to the 2016 discovery that Synechocystis cyanobacteria, single-celled organisms capable of photosynthesis, act like ocelli. "These cyanobacteria use the entire cell body as a lens to focus an image of the light source at the cell membrane, as in the retina of an animal eye," says University of London microbiologist Conrad Mullineaux, who helped to make the discovery. Although researchers are not sure what the purpose of this

mechanism is, its existence suggests that a similar one could have evolved in higher plants. “If something like this is already present at the lower level of evolution, it is most likely kept,” Baluška says.

Recent work also shows that some plants, such as the cabbage and mustard relative Arabidopsis, make proteins that are involved in the development and functioning of eyespots—the ultrabasic eyes found in some single-celled organisms such as green algae. These proteins specifically show up in structures called plastoglobuli, which are famed for giving autumn leaves their red and orange hues. “This discovery suggests that plastoglobuli in plants may act as eyespots,” Baluška says.

Other observational research reveals plants have visual capabilities we just do not understand yet. For instance, as reported in 2014 in Current Biology, the climbing wood vine Boquila trifoliolata can modify its leaves to mimic the colors and shapes of its host plant.

Although the evidence for eyelike structures in higher plants remains limited, it is growing. “I had never heard about plant vision, and I would have dismissed it as unlikely until my own discovery of cyanobacteria acting as a camera eye,” says biotechnologist Nils Schuergers, co-author of the 2016 study on Synechocystis. The next challenge is to confirm the early 20th-century experiments showing that plant cells themselves can act like lenses—and researchers still need to figure out all the ends to which plants put their rudimentary sight.

http://bit.ly/2hQGxUk

Stuttering linked to reduced blood flow in area of brain associated with language

Reduced cerebral blood flow in the Broca's area in persons who stutter.

A study led by researchers at Children's Hospital Los Angeles demonstrates what lead investigator Bradley Peterson, MD, calls "a critical mass of evidence" of a common underlying lifelong vulnerability in both children and adults who stutter. They discovered that regional cerebral blood flow is reduced in the Broca's area - the region in the frontal lobe of the brain linked to speech production - in persons who stutter. More severe stuttering is associated with even greater reductions in blood flow to this region.

In addition, a greater abnormality of cerebral blood flow in the posterior language loop, associated with processing words that we hear, correlates with more severe stuttering. This finding suggests that a common pathophysiology throughout the neural "language" loop that connects the frontal and posterior temporal lobe likely contributes to stuttering severity.

Peterson, who is director of the Institute for the Developing Mind at CHLA and a professor of the Keck School of Medicine at the University of Southern California, says that such a study of resting blood flow, or perfusion, has never before been conducted in persons who stutter. His team also recently published a study using proton magnetic resonance spectroscopy to look at brain regions in both adults and children who stutter. Those findings demonstrated links between stuttering and changes in the brain circuits that control speech production, as well as those supporting attention and emotion. The present blood flow study adds significantly to the findings from that prior study and furthermore suggests that disturbances in the speech processing areas of the brain are likely of central importance as a cause of stuttering.

According to Peterson, the new study - published on December 30 in the journal Human Brain Mapping - provides scientists with a completely different window into the brain. The researchers were able to zero in on the Broca's area as well as related brain circuitry specifically linked to speech, using regional cerebral blood flow as a measure of brain activity, since blood flow is typically coupled with neural activity.

"When other portions of the brain circuit related to speech were also affected according to our blood flow measurements, we saw more severe stuttering in both children and adults," said first author Jay

Desai, MD, a clinical neurologist at CHLA. "Blood flow was inversely correlated to the degree of stuttering - the more severe the stuttering, the less blood flow to this part of the brain," said Desai, adding that the study results were "quite striking."

Additional contributors to the study include Ravi Bansal, Children's Hospital Los Angeles and the Keck School of Medicine of USC; Yuankai Huo and Zhishun Wang, Columbia University; Steven C. R. Williams, David Lythgoe and Fernando O. Zelaya, King's College, London, UK. This work was supported in part by Children's Hospital Los Angeles, the National Institute of Mental Health grant K0274677, the Milhiser family fund and the Murphy endowment at Columbia University.

http://bit.ly/2hRJIJR

Zinc: A surprise target in regenerating the optic nerve after injury

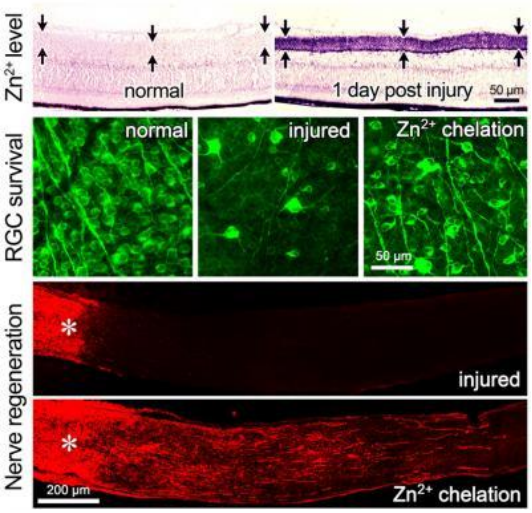
Chelators to remove zinc improve survival of neurons in the retina and stimulate repair of damaged nerve fibers

For more than two decades, researchers have tried to regenerate the injured optic nerve using different growth factors and/or agents that overcome natural growth inhibition. But at best, these approaches get only about 1 percent of the injured nerve fibers to regenerate and reconnect to the brain; most of the cells eventually die. Researchers at Boston Children's Hospital now show that a completely new approach -- chelating zinc that is released as a result of the injury -- gets cells to live longer, perhaps indefinitely, with dramatic levels of axon regeneration in a mouse model.

If proven to work similarly well in humans, such treatment could greatly benefit patients with optic nerve injury, glaucoma, and perhaps other types of nerve fiber (axon) injury within the central nervous system, such as spinal cord injury. Zinc chelators already exist and could potentially be given either systemically or through injection into the eye, the researchers say. Their findings were published online by the Proceedings of the National Academy of Sciences during the week of January 2.

The optic nerve, which carries visual information from the eye to brain, is made up of axons projecting from neurons known as retinal ganglion cells. Normally, when the optic nerve is damaged, these cells die, but what actually kills them hasn't been known.

"At least 200 studies, including some done here, have tried to understand what makes these cells die," says Larry Benowitz, PhD, of the F.M. Kirby Neurobiology Center and Department of Neurosurgery at Boston Children's Hospital, co-senior author on the paper. "And even if the cells survive, they usually cannot regrow their connections."



Top row: Cross-sections through the mouse retina show very little free zinc (Zn2+) in normal mice (purple staining, left panel), but high levels after the optic nerve is injured (right panel). Within an hour after nerve injury, zinc begins to accumulate in the layer of the retina where interneurons known as amacrine cells connect with the retinal ganglion cells (RGCs). Over the next two days, the zinc transfers to the RGCs themselves, causing these neurons to die and preventing them from regenerating the axons (nerve fibers) that were damaged by the injury.

Second row: Blocking the accumulation of zinc (Zn2+) with chelating compounds enables many damaged retinal ganglion cells (RGCs) to survive for months after the optic nerve is injured. The panels show healthy RGCs in the normal retina (left), in an injured, untreated retina two weeks after optic nerve injury (center) and in a treated retina two weeks after injury (right).

Bottom two panels show the optic nerve two weeks after injury at the sites denoted by the asterisks. Without treatment (upper panel), no axons regenerate beyond the injury site; treatment with a zinc chelator (bottom panel) leads to extensive axon regeneration. **Boston Children's Hospital**

Paul Rosenberg, MD, PhD, co-senior author and of the Kirby Center and Department of Neurology, had been studying the role of zinc in cell death. He suggested investigating zinc in the retina, the part of the eye where visual signals are received, processed and sent to the brain.

His lab and the Benowitz lab began collaborating in 2010, an effort led by Yiqing Li, MD, PhD, the paper's first author.

A spike in zinc

Zinc is essential for many cell functions. In many neurons, zinc is packaged in the synapses in tiny vesicles, together with the neurotransmitters that these cells use to communicate with other cells. Zinc release is normally tightly controlled, because high levels are toxic to cells.

In mouse experiments, the researchers saw a dramatic elevation of zinc after injury to the optic nerve -- surprisingly, not in the damaged retinal ganglion cells themselves but in cells that communicate with them, interneurons known as amacrine cells. This spike in zinc occurred within an hour after the injury. Two or three days later, the zinc transferred to the retinal ganglion cells -- and only then did the cells begin to die.

Promoting survival and regeneration

While zinc has previously been linked to cell death, this is the first study to demonstrate that targeting zinc can protect damaged neurons in the eye and help regenerate axons through the optic nerve and among the first to show the effects of targeting zinc in a live animal model.

"When we used agents that bind zinc -- chelators -- we enabled about 40 percent of the injured cells to survive for months and possibly indefinitely," says Benowitz. "Growth factors and survival factors only have a transient effect; they don't really stop the cell death process. If you hit the right dosage and deliver zinc chelators continuously, you might have half of the retinal ganglion cells surviving."

The researchers also saw substantial regeneration of the cells' axons. Hundreds of axons extended well past the site of nerve injury, compared to just a handful in the untreated mice. Regeneration was further enhanced when chelators were combined with deletion of the pten gene to decrease natural growth inhibition.

For these studies, the authors used multiple agents to visualize the increase in free zinc within cells of the retina and to chelate zinc, including some newly developed compounds Stephen Lippard, PhD in the Department of Chemistry at MIT, a coauthor on the paper.

In addition to chelation, Benowitz, Rosenberg and Li tested several other genetic and pharmacologic ways of preventing zinc from getting into the retinal ganglion cells. These methods also increased cell survival. "All you have to do is prevent zinc from getting across the synapse into the ganglion cells," says Li.

Therapeutic possibilities

The researchers note that the delay before zinc floods into the retinal ganglion cells means that chelation can be effective even if not delivered immediately after injury. They observed robust cell survival and axon regeneration even if treatment was delayed for five days.

"Although various groups have found ways to induce regeneration, generally this involves altering gene expression before or just after the injury," says Rosenberg. "Understanding that zinc is the block to nerve regeneration has allowed us to devise approaches that could be used after the injury."

They hope to get further funding to develop a slow-release formulation that would chelate zinc over a period of time, potentially allowing patients to receive just a single injection in the eye.

Benowitz, Rosenberg and Li are also interested in exploring how zinc causes cell death and blocks regeneration.

"The next step is to find those mechanisms," says Rosenberg. "We think more ideas for new therapeutic approaches could come out of these investigations."

Zinc: The new calcium?

This is the first study to demonstrate the role of zinc in optic nerve injury, but zinc has also been shown to have a role in stroke injury, and has been implicated in Alzheimer's disease and amyotrophic lateral sclerosis. In fact, neurons in the rest of the brain contain higher levels of reactive zinc than are found in the normal retina.

"Very little is known about the role of zinc in the healthy nervous system or its role in brain injury, although through the work of many groups around the world we are beginning to appreciate its significance," says Rosenberg. "Everyone has thought of calcium as the master regulator in health and disease. We think zinc will come to share that role in the 21st century."

Supporters of the study include the National Eye Institute (1 RO1 EY024481), the National Institute of Neurological Diseases and Stroke (R01NS066019), the National Institute of Mental Health (R21MH104318), the U.S. Department of Defense (CDMRP DM102446), the Dr. Miriam and Sheldon G. Adelson Medical Research Foundation, the National Institute of General Medical Sciences (GM065519) and the China Scholarship Council.

http://bit.ly/2hPYj5h

Researchers uncover mechanism for cancer-killing properties of pepper plant

Chemical process behind anti-cancer properties uncovered in a spicy Indian pepper plant called the long pepper

*ヒハツ（畢撥 **Piper longum**）*

DALLAS - UT Southwestern Medical Center scientists have uncovered the chemical process behind anti-cancer properties of a spicy Indian pepper plant called the long pepper, whose suspected medicinal properties date back thousands of years. The secret lies in a chemical called Piperlongumine (PL), which has shown activity against many cancers including prostate, breast, lung, colon, lymphoma, leukemia, primary brain tumors, and gastric cancer.

Using x-ray crystallography, researchers were able to create molecular structures that show how the chemical is transformed after being ingested. PL converts to hPL, an active drug that silences a gene called GSTP1. The GSTP1 gene produces a detoxification enzyme that is often overly abundant in tumors.

"We are hopeful that our structure will enable additional drug development efforts to improve the potency of PL for use in a wide range of cancer therapies," said Dr. Kenneth Westover, Assistant Professor of Biochemistry and Radiation Oncology. "This research is a spectacular demonstration of the power of x-ray crystallography."

The long pepper, a plant native to India, is found in southern India and southeast Asia. Although rare in European fare, it is commonly found in Indian stores and used as a spice or seasoning in stews and other dishes. It dates back thousands of years in the Indian subcontinent tied to Ayurveda, one of the world's oldest medical systems, and was referred to by Hippocrates, the ancient Greek physician known as the father of medicine.

"This study illustrates the importance of examining and re-examining our theories. In this case we learned something fundamentally new about a 3,000-year-old medical claim using modern science," said Dr. Westover."

Dr. Westover, a member of the Harold C. Simmons Comprehensive Cancer Center, used cutting edge technologies in UT Southwestern's Structural Biology Core (SBC) - the University's world-renowned facility for X-ray crystallography, to better understand the anticancer properties of PL. X-ray crystallography allows scientists to determine molecular structures that reveal how molecules interact with targets - in this case how PL interacts with GSTP1. Viewing the structures helps in developing drugs for those targets.

The study is published in the Journal of Biological Chemistry.

This work is supported by the V Foundation for Cancer Research, founded by ESPN and legendary basketball coach Jim Valvano, The Welch Foundation, and the Cancer Prevention and Research Institute of Texas.

Additional UT Southwestern researchers who contributed to the study include alumni of the Westover lab: Dr. Wayne Harshbarger, Dr. John Hunter and Dr. Durga Udayakumar. Current UT Southwestern scientists in the Departments of Radiation Oncology and Biochemistry include Dr. Deepak Gurbani, Dr. William Singer, Dr. Yan Liu, Dr. Lianbo Li and Dr. Sudershan Gondi.

http://bit.ly/2hQ2JsU

Common antioxidant may guard against liver disease, says CU Anschutz researcher

PQQ is found in kiwi fruit, soy and celery

AURORA, Colo. - A common antioxidant found in human breast milk and foods like kiwi fruit can protect against nonalcoholic fatty liver disease (NAFLD) in the offspring of obese mice, according to researchers at the University of Colorado Anschutz Medical Campus.

"Pyrroloquinoline quinone, or PQQ, is a natural antioxidant found in soil and many foods and enriched in human breast milk," said the study's lead author Karen Jonscher, PhD, an associate professor of anesthesiology and a physicist at CU Anschutz. "When given to obese mouse mothers during pregnancy and lactation, we found it protected their offspring from developing symptoms of liver fat and damage that leads to NAFLD in early adulthood."

The study, published online last week in the Journal of the Federation of American Societies for Experimental Biology, is the first to demonstrate that PQQ can protect offspring of obese mothers from acceleration of obesity-induced liver disease.

NAFLD is the most common liver disease in the world, affecting 20-30 percent of all adults in the U.S. and over 60 percent of those who are obese. It heightens the risk of cardiovascular disease, type 2 diabetes and liver cancer.

Scientists have found that mice fed a high fat, Western-style diet give birth to offspring with a higher chance of getting the disease.

"We know that infants born to mothers with obesity have a greater chance of developing NAFLD over their lifetime, and in fact one-third of obese children under 18 may have undiagnosed fatty liver disease that, when discovered, is more likely to be advanced at the time of diagnosis," Jonscher said. "The goal of our study, which we carried out using a mouse model of obese pregnancy, was to determine whether a novel antioxidant given to mothers during pregnancy and breastfeeding could prevent the development of NAFLD in the offspring."

Jonscher and her colleagues fed adult mice healthy diets or Western-style diets heavy on fat, sugar and cholesterol. They gave a subset of both groups PQQ in their drinking water. Their offspring were kept on the diets for 20 weeks. Those fed a Western diet gained more weight than those on a healthy diet. PQQ did not change the weight gain but it did reduce the fat in the livers even before the mice were born.

The antioxidant also reduced inflammation in the livers of mice fed the Western diet. The researchers found that PQQ protected adult mice from fatty liver, even when it was stopped after three weeks when the mice quit breastfeeding. Jonscher believes the antioxidant may work by impacting pathways critical to the early onset of diseases associated with maternal obesity, high fat diets and inflammation.

PQQ is found in human breast milk, soy, parsley, celery, kiwi and papaya. It's also found in soil and interstellar dust. Jonscher said it could possibly be used as a prenatal or lactation supplement to protect children of obese mothers from developing liver and cardiovascular disease in adulthood, but cautioned that pregnant women should always consult their doctor before taking any supplement.

"Perhaps supplementing the diet of obese pregnant mothers with PQQ, which has proven safe in several human studies, will be a therapeutic target worthy of more study in the battle to reduce the risk of NAFLD in babies," Jonscher said.

http://bbc.in/2j8T3ik

Terrorism 'first-aid training needed'

People need to learn lifesaving skills in case they are caught up in a terror attack in the UK, a team of senior military and civilian medics has said.

By Smitha Mundasad Health reporter

They say people need to know how to help each other because it could take some time before it is deemed safe for paramedics to arrive on the scene. Their app, called CitizenAID, offers step-by-step advice.

The idea is supported by counter-terrorism police. Security services say a UK terror attack is highly likely.

'Run, hide, tell'

Although an individual's chance of being caught up in an incident is small, Brig Tim Hodgetts and Prof Sir Keith Porter, co-developers of CitizenAID, say it is a good idea for people to have a plan and the knowledge and skills to help each other. Their app, pocket book and website suggest how best to deal with injuries in the immediate aftermath of a mass shooting or bombing incident.

The system includes instructions on how to treat severe bleeding - one of the major causes of death in these scenarios.

It guides people through packing, putting pressure on and elevating a wound, and how to use a tourniquet safely, for example.

The programme also explains how to prioritise those who need treatment first and what to tell the emergency services once they arrive. CitizenAID builds on national advice from national counter-terrorism police to:

Run away in the event of an incident if you can
Hide if you can't run
Tell the emergency services.

Battlefield lessons

The CitizenAID system says people should follow these steps and then go one step further. It suggests once people are safe, they should start treating casualties.

Ch Insp Richard Harding, head of the National Counter Terrorism Security Office, told the BBC: "One of the challenges we have is that when a serious incident, particularly a terrorist incident occurs, the first responders from a police perspective to a terrorist incident will inevitably be trying to deal with the people causing the threat.

"They won't have time to deal with the people who are injured and that gap is vital to saving people's lives. "So we are really interested in the concept of CitizenAID. It allows the public and people involved in very rare incidents like this to help themselves and help others and their loved ones survive the situation."

According to its founders, CitizenAID builds on lessons learnt on the battlefield.

Sir Keith Porter, professor of clinical traumatology at the Queen Elizabeth Hospital in Birmingham, told the BBC: "I have treated hundreds of soldiers whose lives have been saved by simply the applications of tourniquets when they have been shot or blown up. Teaching individual soldiers these skills has saved lives.

"And I think it is essential we train the public in those skills and that is exactly what CitizenAID does."

'Right decisions'

Brig Tim Hodgetts, medical director of the Defence Medical Services, told the BBC; "We don't know when the next incident will be that will involve blasts or gunshots so we need a critical mass of the general public to learn these first aid skills.

"They are the people who are always going to be at the scene. They are the ones who are going to make a difference." He added: "I think we are doing the opposite of scaring the public, we are empowering the public. "By giving them a step-by-step system we take away the anxiety because the decisions are already made and the right decisions in the right order can save lives."

The app is free to download and the pocketbook costs £1.99 to order.

Sue Killen, of St John Ambulance, added "First aid can be the difference between life and death. Knowing basic first aid in a terror attack or in an everyday emergency at home or in the community, will give you more confidence to deal with a crisis.

"First aid is easy to learn and our first aid techniques cover a wide range of injuries that could occur in a terrorist incident including severe bleeding, crush injuries and shock.

"We encourage anyone who would like to learn first aid to go to our website to view our first aid videos, download our app or attend a first aid course."

http://bit.ly/2hYqNR5

Scientists develop new antibiotic for gonorrhea

Carbon monoxide-releasing molecule effects adopted to develop a new antibiotic which could be used to treat gonorrhoea

Scientists at the University of York have harnessed the therapeutic effects of carbon monoxide-releasing molecules to develop a new antibiotic which could be used to treat the sexually transmitted infection gonorrhoea.

The infection, which is caused by the bacteria Neisseria gonorrhoeae, has developed a highly drug-resistant strain in recent years with new cases reported in the north of England and Japan. There are concerns that gonorrhoea, which is the second most common sexually transmitted infection in England, is becoming untreatable.

Almost 35,000 cases were reported in England during 2014, with most cases affecting young men and women under the age of 25. The interdisciplinary team, from the University of York's Departments of Biology and Chemistry, targeted the "engine room" of the bacteria using carbon monoxide-releasing molecules (CO-RMs).

CO is produced naturally in the body, but there is increasing evidence that carbon monoxide enhances antibiotic action with huge potential for treating bacterial infections.

The scientists found that Neisseria gonorrhoeae is more sensitive to CO-based toxicity than other model bacterial pathogens, and may serve as a viable candidate for antimicrobial therapy using CO-RMs.

The CO molecule works by binding to the bacteria, preventing them from producing energy.

Scientists believe the breakthrough, published in the journal MedChemComm, could pave the way for new treatments.

Professor Ian Fairlamb, from the University's Department of Chemistry, said: "The carbon monoxide molecule targets the engine room, stopping the bacteria from respiring. Gonorrhoea only has one enzyme that needs inhibiting and then it can't respire oxygen and it dies.

"People will be well aware that CO is a toxic molecule but that is at high concentrations. Here we are using very low concentrations which we know the bacteria are sensitive to.

"We are looking at a molecule that can be released in a safe and controlled way to where it is needed."

The team say the next stage is to develop a drug, either in the form of a pill or cream, so that the fundamental research findings can be translated on to future clinical trials.

Professor Fairlamb added: "We think our study is an important breakthrough. It isn't the final drug yet but it is pretty close to it."

"People might perceive gonorrhoea as a trivial bacterial infection, but the disease is becoming more dangerous and resistant to antibiotics."

The team worked with Professor James Moir from the University's Department of Biology. He added: "Antimicrobial resistance is a massive global problem which isn't going away. We need to use many different approaches, and the development of new drugs using bioinorganic chemistry is one crucial way we can tackle this problem, to control important bacterial pathogens before the current therapies stop working."

The study was funded by the Biotechnology and Biological Sciences Research Council (BBSRC). Full research paper:
http://pubs.rsc.org/en/content/articlelanding/2017/md/c6md00603e#!divAbstract

http://bit.ly/2hYpPNW

Promising new drug stops spread of melanoma by 90 percent

Michigan State University researchers have discovered that a chemical compound, and potential new drug, reduces the spread of melanoma cells by up to 90 percent.

EAST LANSING, Mich. - The man-made, small-molecule drug compound goes after a gene's ability to produce RNA molecules and certain proteins in melanoma tumors. This gene activity, or transcription process, causes the disease to spread but the compound can shut it down. Up until now, few other compounds of this kind have been able to accomplish this.

"It's been a challenge developing small-molecule drugs that can block this gene activity that works as a signaling mechanism known to be important in melanoma progression," said Richard Neubig, a pharmacology professor and co-author of the study. "Our chemical compound is actually the same one that we've been working on to potentially treat the disease scleroderma, which now we've found works effectively on this type of cancer."

Scleroderma is a rare and often fatal autoimmune disease that causes the hardening of skin tissue, as well as organs such as the lungs, heart and kidneys. The same mechanisms that produce fibrosis, or skin thickening, in scleroderma also contribute to the spread of cancer.

Small-molecule drugs make up over 90 percent of the drugs on the market today and Neubig's co-author Kate Appleton, a postdoctoral student, said the findings are an early discovery that could be highly effective in battling the deadly skin cancer. It's estimated about 10,000 people die each year from the disease. Their findings are published in the January issue of Molecular Cancer Therapeutics.

"Melanoma is the most dangerous form of skin cancer with around 76,000 new cases a year in the United States," Appleton said. "One reason the disease is so fatal is that it can spread throughout the body very quickly and attack distant organs such as the brain and lungs."

Through their research, Neubig and Appleton, along with their collaborators, found that the compounds were able to stop proteins, known as Myocardin-related transcription factors, or MRTFs, from initiating the gene transcription process in melanoma cells. These triggering proteins are initially turned on by another protein called RhoC, or Ras homology C, which is found in a signaling pathway that can cause the disease to aggressively spread in the body.

The compound reduced the migration of melanoma cells by 85 to 90 percent. The team also discovered that the potential drug greatly reduced tumors specifically in the lungs of mice that had been injected with human melanoma cells.

"We used intact melanoma cells to screen for our chemical inhibitors," Neubig said. "This allowed us to find compounds that could block anywhere along this RhoC pathway."

Being able to block along this entire path allowed the researchers to find the MRTF signaling protein as a new target.

Appleton said figuring out which patients have this pathway turned on is an important next step in the development of their compound because it would help them determine which patients would benefit the most.

"The effect of our compounds on turning off this melanoma cell growth and progression is much stronger when the pathway is activated," she said. "We could look for the activation of the MRTF proteins as a biomarker to determine risk, especially for those in early-stage melanoma."

According to Neubig, if the disease is caught early, chance of death is only 2 percent. If caught late, that figure rises to 84 percent.

"The majority of people die from melanoma because of the disease spreading," he said. "Our compounds can block cancer migration and potentially increase patient survival."

The National Institutes of Health and MSU's annual Gran Fondo cycling event, which raises money for skin cancer research, funded the study. Additional researchers from MSU and the University of Michigan contributed to the project.

http://bit.ly/2jbC4I6

Global warming hiatus disproved -- again

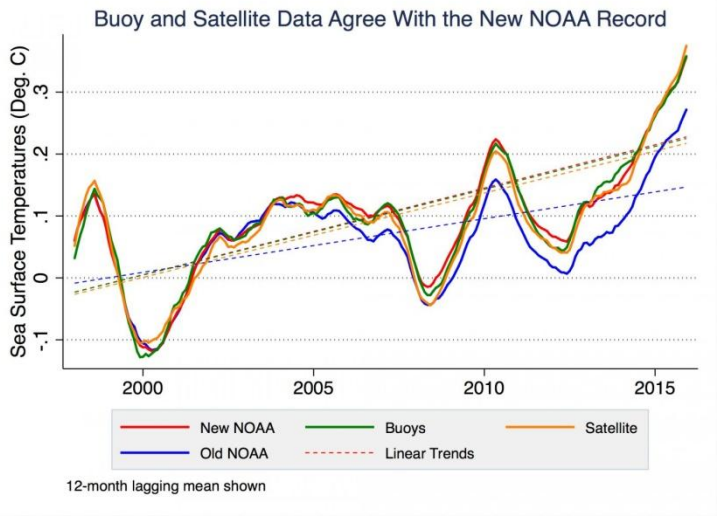
Study confirms steady warming of oceans for past 45 years

A controversial paper published two years ago that concluded there was no detectable slowdown in ocean warming over the previous 15 years - widely known as the "global warming hiatus" - has now been confirmed using independent data in research led by researchers from the University of California, Berkeley, and Berkeley Earth, a non-profit research institute focused on climate change.

The 2015 analysis showed that the modern buoys now used to measure ocean temperatures tend to report slightly cooler temperatures than older ship-based systems, even when measuring the

same part of the ocean at the same time. As buoy measurements have replaced ship measurements, this had hidden some of the real-world warming.

After correcting for this "cold bias," researchers with the National Oceanic and Atmospheric Administration concluded in the journal Science that the oceans have actually warmed 0.12 degrees Celsius (0.22 degrees Fahrenheit) per decade since 2000, nearly twice as fast as earlier estimates of 0.07 degrees Celsius per decade. This brought the rate of ocean temperature rise in line with estimates for the previous 30 years, between 1970 and 1999.



A new UC Berkeley analysis of ocean buoy (green) and satellite data (orange) show that ocean temperatures have increased steadily since 1999, as NOAA concluded in 2015 (red) after adjusting for a cold bias in buoy temperature measurements. NOAA's earlier assessment (blue) underestimated sea surface temperature changes, falsely suggesting a hiatus in global warming. The lines show the general upward trend in ocean temperatures. **Zeke Hausfather, UC Berkeley**

This eliminated much of the global warming hiatus, an apparent slowdown in rising surface temperatures between 1998 and 2012. Many scientists, including the International Panel on Climate Change, acknowledged the puzzling hiatus, while those dubious about global warming pointed to it as evidence that climate change is a hoax.

Climate change skeptics attacked the NOAA researchers and a House of Representatives committee subpoenaed the scientists' emails. NOAA agreed to provide data and respond to any scientific questions but refused to comply with the subpoena, a decision supported by scientists who feared the "chilling effect" of political inquisitions.

The new study, which uses independent data from satellites and robotic floats as well as buoys, concludes that the NOAA results were correct. The paper will be published Jan. 4 in the online, open-access journal Science Advances.

"Our results mean that essentially NOAA got it right, that they were not cooking the books," said lead author Zeke Hausfather, a graduate student in UC Berkeley's Energy and Resources Group.

Long-term climate records

Hausfather said that years ago, mariners measured the ocean temperature by scooping up a bucket of water from the ocean and sticking a thermometer in it. In the 1950s, however, ships began to automatically measure water piped through the engine room, which typically is warm. Nowadays, buoys cover much of the ocean and that data is beginning to supplant ship data. But the buoys report slightly cooler temperatures because they measure water directly from the ocean instead of after a trip through a warm engine room.

NOAA is one of three organizations that keep historical records of ocean temperatures - some going back to the 1850s - widely used by climate modelers. The agency's paper was an attempt to accurately combine the old ship measurements and the newer buoy data.

Hausfather and colleague Kevin Cowtan of the University of York in the UK extended that study to include the newer satellite and Argo float data in addition to the buoy data.

"Only a small fraction of the ocean measurement data is being used by climate monitoring groups, and they are trying to smush together data from different instruments, which leads to a lot of judgment calls about how you weight one versus the other, and how you adjust for the transition from one to another," Hausfather said. "So we said, 'What if we create a temperature record just from the buoys, or just

from the satellites, or just from the Argo floats, so there is no mixing and matching of instruments?'"

In each case, using data from only one instrument type - either satellites, buoys or Argo floats - the results matched those of the NOAA group, supporting the case that the oceans warmed 0.12 degrees Celsius per decade over the past two decades, nearly twice the previous estimate. In other words, the upward trend seen in the last half of the 20th century continued through the first 15 years of the 21st: there was no hiatus.

"In the grand scheme of things, the main implication of our study is on the hiatus, which many people have focused on, claiming that global warming has slowed greatly or even stopped," Hausfather said. "Based on our analysis, a good portion of that apparent slowdown in warming was due to biases in the ship records."

Correcting other biases in ship records

In the same publication last year, NOAA scientists also accounted for changing shipping routes and measurement techniques. Their correction - giving greater weight to buoy measurements than to ship measurements in warming calculations - is also valid, Hausfather said, and a good way to correct for this second bias, short of throwing out the ship data altogether and relying only on buoys.

Another repository of ocean temperature data, the Hadley Climatic Research Unit in the United Kingdom, corrected their data for the switch from ships to buoys, but not for this second factor, which means that the Hadley data produce a slightly lower rate of warming than do the NOAA data or the new UC Berkeley study.

"In the last seven years or so, you have buoys warming faster than ships are, independently of the ship offset, which produces a significant cool bias in the Hadley record," Hausfather said. The new study, he said, argues that the Hadley center should introduce another correction to its data.

"People don't get much credit for doing studies that replicate or independently validate other people's work. But, particularly when things become so political, we feel it is really important to show that, if you look at all these other records, it seems these researchers did a good job with their corrections," Hausfather said.

Co-author Mark Richardson of NASA's Jet Propulsion Laboratory and the California Institute of Technology in Pasadena added, "Satellites and automated floats are completely independent witnesses of recent ocean warming, and their testimony matches the NOAA results. It looks like the NOAA researchers were right all along."

Other co-authors of the paper are David C. Clarke, an independent researcher from Montreal, Canada, Peter Jacobs of George Mason University in Fairfax, Virginia, and Robert Rohde of Berkeley Earth. The research was funded by Berkeley Earth.

http://bbc.in/2iYmUGI

GM malaria vaccine 'milestone'

A malaria vaccine that uses a weakened form of the parasite has passed a "critical milestone" in human safety trials, say researchers.

By James Gallagher Health and science reporter, BBC News website

Doctors used a genetically modified form of malaria that was unable to cause a full infection in people.

Trials, published in the journal Science Translational Medicine, suggested it was safe and generated a good immune response.

Tropical disease experts described the findings as "promising".

The malaria parasite goes through multiple stages both in mosquitoes and inside the human body.

The team at the Centre for Infectious Disease Research, in Seattle, deleted three genes from the parasite so it could not infect liver cells.

The idea is that "infecting" people with the weakened parasite will expose the immune system to malaria, but the parasite will not be able to complete its lifecycle to cause disease.

Ten people took part in the safety trials. No-one went on to develop the disease and there were no severe side-effects to the treatment.

The patients' antibodies were then given to mice, which showed greater immunity when they were deliberately infected with malaria.

Dr Sebastian Mikolajczak, one of the researchers, said: "The clinical study now shows that the vaccine is completely attenuated in humans and also shows that even after only a single administration, it elicits a robust immune response against the malaria parasite.

"Together these findings are critical milestones for malaria vaccine development."

There are two similar approaches to "attenuating" the malaria parasite - one involves weakening it by exposing it to radiation and the other gives the patient anti-malarial drugs at the same time as infecting them.

But the most advanced malaria vaccine is years ahead. RTS,S uses some components from the parasite to generate an immune response and the vaccine is now going through large field trials.

However, an approach that uses the whole parasite may ultimately prove more effective.

Sir Brian Greenwood, from the London School of Hygiene and Tropical Medicine, told the BBC News website: "It is encouraging, but this is a first step toward developing a vaccine.

"It is really promising and the evidence presented here is enough for challenge studies [in which people are immunised and then infected with malaria to see if it works]."

However, he cautioned that the latest approach is "not practical in the field" as it requires nearly 200 bites by infected mosquitoes.

Ultimately it would have to be just an injection.

Dr Robert Seder, from the Vaccine Research Centre at the National Institutes of Health, said: "This report is a major advance in malaria vaccine development by providing the first evidence that genetically attenuated Plasmodium falciparum parasites are safe and immunogenic in humans.

"Future studies demonstrating protective efficacy will be the next critical milestone for continued development of this promising vaccine approach".

http://bit.ly/2iJpHFU

Living near major traffic linked to higher risk of dementia

Those who live close to high-traffic roadways face a higher risk of developing dementia

People who live close to high-traffic roadways face a higher risk of developing dementia than those who live further away, new research from Public Health Ontario (PHO) and the Institute for Clinical Evaluative Sciences (ICES) has found.

Led by PHO and ICES scientists, the study found that people who lived within 50 metres of high-traffic roads had a seven per cent higher likelihood of developing dementia compared to those who lived more than 300 meters away from busy roads.

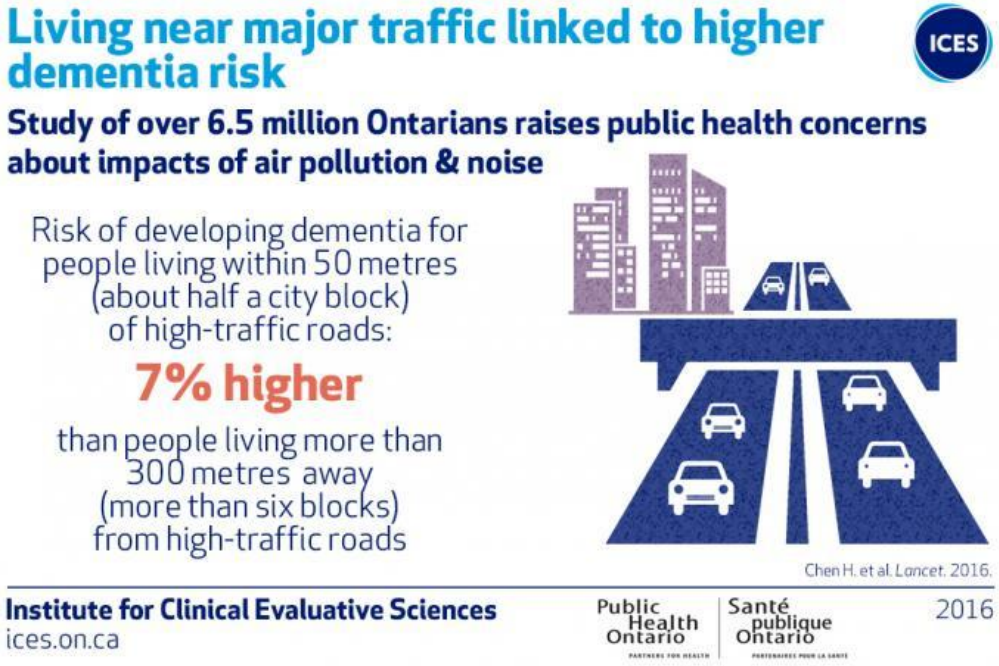
Published in The Lancet, the researchers examined records of more than 6.5 million Ontario residents aged 20-85 to investigate the correlation between living close to major roads and dementia, Parkinson's disease and multiple sclerosis.

Scientists identified 243,611 cases of dementia, 31,577 cases of Parkinson's disease, and 9,247 cases of multiple sclerosis in Ontario between 2001 and 2012. In addition, they mapped individuals' proximity to major roadways using the postal code of their residence.

The findings indicate that living close to major roads increased the risk of developing dementia, but not Parkinson's disease or multiple sclerosis, two other major neurological disorders.

"Little is known in current research about how to reduce the risk of dementia. Our findings show the closer you live to roads with heavy day-to-day traffic, the greater the risk of developing dementia. With our widespread exposure to traffic and the greater tendency for people to live in cities these days, this has serious public health implications," says Dr. Hong Chen, environmental and occupational health scientist at PHO and an adjunct scientist at ICES. Dr. Chen is lead author on the paper titled Living Near Major Roads and the Incidence of

Dementia, Parkinson's Disease, and Multiple Sclerosis: A Population-based Cohort Study (embargoed link).



A study of over 6.5 million Ontario residents raises public health concerns about the impact of air pollution and noise. **Public Health Ontario and the Institute for Clinical Evaluative Sciences**

"Our study is the first in Canada to suggest that pollutants from heavy, day-to-day traffic are linked to dementia. We know from previous research that air pollutants can get into the blood stream and lead to inflammation, which is linked with cardiovascular disease and possibly other conditions such as diabetes. This study suggests air pollutants that can get into the brain via the blood stream can lead to neurological problems," says Dr. Ray Copes, chief of environmental and occupational health at PHO and an author on the paper.

As urban centres become more densely populated and more congested with vehicles on major roads, Dr. Copes suggests the findings of this paper could be used to help inform municipal land use decisions as well as building design to take into account air pollution factors and the impact on residents.

This research was conducted in collaboration with scientists from the University of Toronto, Carleton University, Dalhousie University, Oregon State University, and Health Canada. The study was funded by Health Canada.

Key findings:

Using data held at ICES, the researchers examined records of more than 6.5 million Ontario residents, aged 20-85, and mapped them according to residential postal codes five years before the study started.

Between 2001 and 2012, 243,611 cases of dementia, 31,577 cases of Parkinson's disease, and 9,247 cases of multiple sclerosis were identified in Ontario.

People who lived within 50 metres of high-traffic roads had a seven per cent higher likelihood of dementia than those who lived more 300 meters away from busy roads.

The increase in the risk of developing dementia went down to four per cent if people lived 50-100 metres from major traffic, and to two per cent if they lived within 101-200 metres. At over 200 metres, there was no elevated risk of dementia.

There was no correlation between major traffic proximity and Parkinson's disease or multiple sclerosis.

http://bit.ly/2j21WqE

Foods rich in resistant starch may benefit health

Resistant starch is not digested in the small intestine, occurs naturally in foods such as bananas, potatoes, grains, and legumes

A new comprehensive review examines the potential health benefits of resistant starch, a form of starch that is not digested in the small intestine and is therefore considered a type of dietary fibre. Some forms of resistant starch occur naturally in foods such as bananas, potatoes, grains, and legumes, and some are produced or modified commercially and incorporated into food products.

There has been increasing research interest in resistant starch, with a large number of human studies published over the last 10 years looking at a variety of different health outcomes such as postprandial

glycaemia, satiety, and gut health. The review summarises reported effects and explores the potential mechanisms of action that underpin them. For example, there is consistent evidence that consumption of resistant starch can aid blood sugar control. It has also been suggested that resistant starch can support gut health and enhance satiety via increased production of short chain fatty acids.

"We know that adequate fibre intake--at least 30 g per day--is important for achieving a healthy, balanced diet, which reduces the risk of developing a range of chronic diseases. Resistant starch is a type of dietary fibre that increases the production of short chain fatty acids in the gut, and there have been numerous human studies reporting its impact on different health outcomes," said Dr. Stacey Lockyer, co-author of the Nutrition Bulletin review. "Whilst findings support positive effects on some markers, further research is needed in most areas to establish whether consuming resistant starch can confer significant benefits that are relevant to the general population; however this is definitely an exciting area of nutritional research for the future."

http://bit.ly/2iNs0rV

Buzzing the vagus nerve just right to fight inflammatory disease

Kilohertz frequency electrical block of afferent vagus nerve pathways allows targeted stimulation to reduce inflammation in vivo

Is a treatment only making things better or maybe also making some things a little worse?

That can be a nagging question in some medical decisions, where side effects are possible. But researchers at the Georgia Institute of Technology have figured out a way to keep what helps, while blocking what harms, in a therapy to fight serious chronic inflammatory diseases.

It's simple and works a little like a pacemaker: An implanted device electrically stimulates the vagus nerve, but, in addition, inhibits unwanted nerve activity in a targeted manner.

Forms of vagus nerve stimulation treatment have already been successfully tested in humans by private industry with the intent to market them to patients. But the innovation by Georgia Tech researchers of adding an inhibiting signal could increase the clinical efficacy and therapeutic benefit of existing treatments.

Temporarily snipping a nerve

"We use an electrode with a kilohertz frequency that blocks unwanted nerve conduction in addition to the electrode that stimulates nerve activity," said principal investigator Robert Butera, a professor jointly appointed in Georgia Tech's School of Electrical and Computer Engineering and the Wallace H. Coulter Dept. of Biomedical Engineering. "We've arranged the two near each other, so the blocking electrode forces the stimulation from the stimulating electrode to only go in one direction."

The researchers' innovation could theoretically by implemented relatively quickly by augmenting existing clinical devices. So far, tests in rats have returned very encouraging results, and they have been achieved without taking more drastic measures notable in other experiments to optimize this kind of treatment - such as a vagotomy, the cutting of part of the vagus.

"The original studies in animals on the anti-inflammatory benefits of vagus nerve stimulation resorted to nerve transections to achieve directional stimulation as well as boost effectiveness of nerve stimulation. But cutting the vagus is not clinically viable - due to the multitude of vital bodily functions it monitors and regulates. Our approach provides the same therapeutic benefit, but is also immediately reversible, controllable, and clinically feasible," said lead researcher Yogi Patel, a bioengineering graduate student.

"We call it a virtual vagotomy," Butera said.

Patel, Butera and former Georgia Tech researchers Tarun Saxena and Ravi V. Bellamkonda, published the results of their study in the journal Scientific Reports on Thursday, January 5, 2016. The research

was funded by the National Institutes of Health and the Ian's Friends Foundation.

Vagus nerve: What is it?

To understand how this new bioelectronic fine-tuning works, let's start with the vagus nerve itself.

It lies outside the spinal column and runs in two parts down the front of your neck on either side. It's easy to forget about because, though it does help you feel some limited sensations like pain and heat from a handful of internal organs, those sensations are not as blatant and common as when you reach out and touch something with your hand.

Your voluntary, or somatic, nervous system is responsible for the reaching, touching, and feeling, and the vagus nerve belongs to your involuntary nervous system - actually called the autonomic nervous system. Though you may experience the effects less consciously, you couldn't survive without a vagus.

"The vagus nerve conveys an incredible amount of information related to the state and function of the visceral organs - your digestive tract, your heart, your lungs, information about the nutrients you eat - anything required for homeostasis (physiological balance)," Patel said.

The vagus nerve is the lifeline between the vital function control centers of your brain and your visceral organs, passing messages constantly between your hypothalamus and organs to control things like pulse and respiration, the lubrication of sinuses, and the limiting of immune response.

Inflammation: What role does the vagus nerve play?

That last one is where inflammation comes in. When the immune system becomes hyperactive, it can attack not just pathogens but also healthy tissue, as with patients suffering from diseases such as rheumatoid arthritis, irritable bowel syndrome or Crohn's disease. Drug-based therapies often fail to significantly benefit them.

The two parts of the autonomic (involuntary) nervous system - the sympathetic and the parasympathetic - strongly influence your immune system. The vagus nerve belongs to the parasympathetic.

"It's like a seesaw system. Your sympathetic nervous system helps kick the immune system on, and the parasympathetic nervous system tempers it," Patel said.

Electrical stimulation is good: Any downsides?

Stimulating the vagus nerve supports that tempering effect, but it can also somewhat excite the part of the nervous system that stimulates the immune response, which is counterproductive.

"Every circuit has a path coming from the brain and one going to the brain, and when you stimulate electrically, you usually have no control over which one you get. You usually get both." Patel said. These paths are often in the same nerve being stimulated.

The path leaving the brain and going toward other organs, called the efferent pathway, is the one to stimulate to help relieve chronic inflammatory conditions. The one going to the brain, called the afferent pathway, if stimulated, leads eventually to the hypothalamus, a pea-sized region in the center of the brain, which triggers a chain of hormonal responses, eventually releasing cytokines, messaging molecules that promote inflammation.

"You get a heightened inflammatory response when you stimulate the afferent pathways, which are actively conveying information about your internal state and trigger the immune system when necessary," Patel said. "And if a patient is already in a hyperactive immune state, you don't want to push that even more."

"When chronically inflamed, the body essentially thinks it's in attack mode the entire time," Patel said. "So, the ability to dampen the loop that results in more and more cytokines being produced is one way to shut down that cyclic process of more and more inflammation."

Stimulating downward (efferent), while blocking upward (afferent) vagus nerve activity keeps the good effect while preventing possible bad effects. In animals that received this treatment, blood tests showed that inflammation markedly decreased. Most importantly, this treatment can be turned on or off, and be tuned to the needs of each patient.

No additional authors were involved in the study, which was performed at Georgia Tech. Two of the authors, Saxena and Bellamkonda, are now at Duke University. Research was funded by the National Institutes of Health (grant 2R01EB016407) and Ian's Friends Foundation. All findings, conclusions, and opinions are those of the authors and do not represent views of the funding agencies.

http://bit.ly/2j2qBSt

Stanford study shows development of face recognition entails brain tissue growth

People are born with brains riddled with excess neural connections. Those are slowly pruned back until early childhood when, scientists thought, the brain's structure becomes relatively stable.

Now a pair of studies, published in the Jan. 6, 2017, issue of Science and Nov. 30, 2016, in Cerebral Cortex, suggest this process is more complicated than previously thought. For the first time, the group found microscopic tissue growth in the brain continues in regions that also show changes in function.

The work overturns a central thought in neuroscience, which is that the amount of brain tissue goes in one direction throughout our lives - from too much to just enough. The group made this finding by looking at the brains of an often-overlooked participant pool: children.

"I would say it's only in the last 10 years that psychologists started looking at children's brains," said Kalanit Grill-Spector, a professor of psychology at Stanford and senior author of both papers. "The issue is, kids are not miniature adults and their brains show that. Our lab studies children because there's still a lot of very basic knowledge to be learned about the developing brain in that age range."

Grill-Spector and her team examined a region of the brain that distinguishes faces from other objects. In Cerebral Cortex, they demonstrate that brain regions that recognize faces have a unique cellular make-up. In Science, they find that the microscopic structures within the region change from childhood into adulthood over a timescale that mirrors improvements in people's ability to recognize faces.

"We actually saw that tissue is proliferating," said Jesse Gomez, graduate student in the Grill-Spector lab and lead author of the Science paper. "Many people assume a pessimistic view of brain tissue: that tissue is lost slowly as you get older. We saw the opposite - that whatever is left after pruning in infancy can be used to grow."

Microscopic brain changes

The group studied regions of the brain that recognize faces and places, respectively, because knowing who you are looking at and where you are is important for everyday function. In adults, these parts of the brain are close neighbors, but with some visible structural differences.

"If you could walk across an adult brain and you were to look down at the cells, it would be like walking through different neighborhoods," Gomez said. "The cells look different. They're organized differently."

Curious about the deeper cellular structures not visible by magnetic resonance imaging (MRI), the Stanford group collaborated with colleagues in the Institute of Neuroscience and Medicine, Research Centre Jülich, in Germany, who obtained thin tissue slices of post-mortem brains. Over the span of a year, this international collaboration figured out how to match brain regions identified with functional MRI in living brains with the corresponding brain slices. This allowed them to extract the microscopic cellular structure of the areas they scanned with functional MRI, which is not yet possible to do in living subjects. The microscopic images showed visible differences in the cellular structure between face and place regions.

"There's been this pipe dream in the field that we will one day be able to measure cellular architecture in living humans' brains and this shows that we're making progress," said Kevin Weiner, a Stanford social science research associate, co-author of the Science paper and co-lead author of the Cerebral Cortex paper with Michael Barnett, a former research assistant in the lab.

Neighborhoods of the brain

This work established that the two parts of the brain look different in adults, but Grill-Spector has been curious about these areas in brains

of children, particularly because the skills associated with the face region improve through adolescence. To further investigate how development of these skills relates to brain development, the researchers used a new type of imaging technique.

They scanned 22 children (ages 5 to 12) and 25 adults (ages 22 to 28) using two types of MRI, one that indirectly measures brain activity (functional MRI) and one that measures the proportion of tissue to water in the brain (quantitative MRI). This scan has been used to show changes in the fatty insulation surrounding the long neuronal wires connecting brain regions over a person's lifetime, but this study is the first to use this method to directly assess changes in the cells' bodies.

What they found, published in Science, is that, in addition to seeing a difference in brain activity in these two regions, the quantitative MRI showed that a certain tissue in the face region grows with development. Ultimately, this development contributes to the tissue differences between face and place regions in adults. What's more, tissue properties were linked with functional changes in both brain activity and face recognition ability, which they evaluated separately. There is no indication yet of which change causes the other or if they happen in tandem.

A test bed

Being able to identify familiar faces and places, while clearly an important skillset, may seem like an odd choice for study. The reason these regions are worth some special attention, said Grill-Spector, is because we can identify them in each person's brain, even a 5-year-old child, which means research on these regions can include large pools of participants and produce results that are easy to compare across studies. This research also has health implications, as approximately 2 percent of the adult population is poor at recognizing faces, a disorder sometimes referred to as facial blindness.

What's more, the fusiform gyrus, an anatomical structure in the brain that contains face-processing regions, is only found in humans and great apes (gorillas, chimps, bonobos and orangutans).

"If you had told me five or 10 years ago that we'd be able to actually measure tissue growth in vivo, I wouldn't have believed it," Grill-Spector said. "It shows there are actual changes to the tissue that are happening throughout your development. I think this is fantastic."

Additional Stanford co-authors on the Science paper are Michael Barnett, Vaidehi Natu and Aviv Mezer (now at Hebrew University in Jerusalem); other co-authors are Katrin Amunts, Karl Zilles and Nicola Palomero-Gallagher of Institute of Neuroscience and Medicine, Research Centre Jülich, Jülich, Germany. The Science research was funded by the National Science Foundation, the National Eye Institute, European Union Seventh Framework Programme and a NARSAD Young Investigator Grant.

Additional co-authors on the Cerebral Cortex paper include Anthony Stigliani of Stanford University; Katrin Amunts, Karl Zilles, Simon Lorenz and Julian Caspers of the Institute of Neuroscience and Medicine, Research Centre Jülich, in Jülich, Germany; and Bruce Fischl of Harvard Medical School and the Massachusetts Institute of Technology.

This research was funded by the National Eye Institute, European Union Seventh Framework Programme, the National Institute for Biomedical Imaging and Bioengineering, and the National Institute on Aging, the National Institute for Neurological Disorders and Stroke. It was also made possible by the resources provided by Shared Instrumentation Grants. Additional support was provided by the NIH Blueprint for Neuroscience Research, part of the multi-institutional Human Connectome Project.

http://bit.ly/2iTuXr2

Tibetans Lived in Himalayas Year-Round Up to 12,600 Years Ago

Thousands of years ago, people living on the high mountains of the Tibetan plateau waded into a steamy hot spring, leaving behind footprints in the soft mud.

By Laura Geggel, Senior Writer | January 5, 2017 04:29pm ET

These footprints, which were discovered in 1998, have proved invaluable to modern-day researchers, who recently dated them to between 7,400 and 12,600 years ago.

Based on earlier analyses of other human sites, it was thought that the plateau's earliest permanent human residents had settled there no earlier than 5,200 years ago, the researchers said. But these newfound dates make the ancient Tibetan site of Chusang the oldest permanent base of people on the Tibetan plateau, they said.

Older known human camps do exist in the region, dating to between 9,000 and 15,000 years ago, but they were likely short-term, seasonal

sites, the researchers said. [See Photos of Chusang, the Oldest Known Site Occupied Year-Round on the Tibetan Plateau]

"Chusang is special because you have these human footprints in this carbonate mud," said study co-lead researcher Michael Meyer, an assistant professor of geology at the University of Innsbruck in Austria. "[The footprints] are hardened, so they were able to stay there for thousands or tens of thousands of years."

Dating Tibetan prints

After humans left Africa, they spread across the globe, but it's not entirely clear when they made it to the mountainous region of Tibet, the researchers said. So, when the Chusang site, which shows clear signs of ancient human occupation, was discovered in 1998, researchers rushed to study it.

The 19 human handprints and footprints were found near Chusang, a village known for its hydrothermal springs, located on Tibet's central plateau at an elevation of about 14,000 feet (4,300 meters) above sea level.

A previous attempt to date the prints estimated that they were 20,000 years old, according to a 2002 study published in the journal Geophysical Research Letters. But the region's complex features, such as its sedimentology, raised the possibility that this estimate was "severely flawed," prompting the new study's researchers to take another look, this time using three different dating techniques, they wrote in the study.

These dating techniques included thorium/uranium dating of samples taken from and next to the prints, optically stimulated luminescence (OSL) to determine the date of quartz crystals in the travertine (the sedimentary layer containing the prints), and radiocarbon dating of microscopic plant remains at the site.

The three methods gave the researchers a broad time range, showing that the prints could have been made anywhere between 7,400 years ago and 12,600 years ago, the researchers said. Intriguingly, earlier genetic studies suggested that a permanent population on the high central plateau dates to at least 8,000 to 8,400 years ago, a time frame that fits into the newfound window for the site, the researchers said.

Permanent base

Meyer and his colleagues think these early dwellers of Chusang would have been permanent residents. Their conclusion is based on the logistics of travel to the high-elevation site.

According to estimates from computer modeling, the round-trip travel times from a lower-elevation base camp to Chusang would have taken anywhere from 28 to 47 days. Moreover, this route would have crossed the eastern Himalayan range, which would have been impassable for much of the year during the early Holocene (an epoch that started about 11,500 years ago), they said. Another, more passable route would have taken 41 to 71 days round trip, the researchers said.

"Such travel is unlikely to have been undertaken for seasonal, short-term task pursuits in rugged, mountainous terrain, particularly by age-variable groups that may have included children, as is suggested by the presence of small footprints at Chusang," the researchers wrote in the study.

Rather, Chusang was likely a permanent settlement, one that occurred before people began using agriculture in the area, the researchers said. What's more, from about 11,500 to 4,200 years ago, the region was wetter and more humid than it is today, which would have helped the people living there survive, the researchers said. "The story might not end here," Meyer told Live Science. "There is a chance that there are older sites up here. I think we have to keep exploring."

The study was published online today (Jan. 5) in the journal Science.

http://bit.ly/2iTPdZB

Taking hour-long afternoon naps improves thinking and memory in older Chinese adults

Preserving your memory, as well as your ability to think clearly and make decisions, is a key goal for people as they age.

Researchers have a growing interest in the role sleep plays in helping older adults maintain their healthy mental function.

Recently, researchers examined information provided by nearly 3,000 Chinese adults aged 65 and older to learn whether taking an afternoon nap had any effect on mental health. Their study was published in the Journal of the American Geriatrics Society.

Nearly 60 percent of the people in the study said they napped after lunch in the afternoon. They napped between about 30 minutes to more than 90 minutes, with most people taking naps lasting about 63 minutes.

The participants took several tests to assess their mental status. They answered simple questions--such as questions about the date, the season of the year, etc.--and they did some basic math problems. Participants also were asked to memorize and recall words, and were asked to copy drawings of simple geometric figures. Finally, these older Chinese adults were asked questions about their napping and nighttime sleep habits.

According to the study's results, people who took an hour-long nap after lunch did better on the mental tests compared to the people who did not nap. Those who napped for about an hour also did better than people who took shorter or longer rests. People who took no naps, short naps, or longer naps experienced decreases in their mental ability that were about four-to-six times greater than people who took hour-long naps.

The people who did not nap, and those who took shorter or longer naps, experienced about the same decline in their mental abilities that a five-year increase in age would be expected to cause.

This summary is from "Afternoon Napping and Cognition in Chinese Older Adults: Findings From the China Health and Retirement Longitudinal Study (CHARLS) Baseline Assessment." It appears online ahead of print in the January 2017 issue of the Journal of the American Geriatrics Society. The study authors are Junxin Li, PhD; Pamela Z. Cacchione, PhD; Nancy Hodgson, PhD; Barbara Riegel, PhD; Brendan T. Keenan, MS; Mathew T. Scharf, MD, PhD; Kathy C. Richards, PhD; and Nalaka S. Gooneratne, MD.

http://bbc.in/2iRyrrP

Give peanut to babies early – advice

Babies should be given peanut early - some at four months old - in order to reduce the risk of allergy, according to new US guidance.

By James Gallagher Health and science reporter, BBC News website

Studies have shown the risk of peanut allergy can be cut by more than 80% by early exposure. The National Institute of Allergy and Infectious Diseases said the new guidance was "an important step forward". However, young children should not eat whole peanuts, because of the risk of choking.

Allergy levels are soaring in the US and have more than quadrupled since 2008. It is a pattern replicated across much of the Western world as well as parts of Asia and Africa. Parents are often wary about introducing peanut and in the past have been advised to wait until the child is three years old.

The new guidance says:

Children with other allergies or severe eczema should start on peanut-containing foods at between four and six months old, with medical supervision

Babies with mild eczema should have peanut-containing food at about six months old

Those with no eczema or allergies can have peanut-containing food freely introduced

Dr Anthony Fauci, the director of the National Institute of Allergy and Infectious Diseases, said: "We expect that widespread implementation of these guidelines by healthcare providers will prevent the development of peanut allergy in many susceptible children and ultimately reduce the prevalence of peanut allergy in the United States."

Michael Walker, a member of the European Academy of Allergy and Clinical Immunology, said: "The guidelines are based on sound medical research carried out in the UK. "UK parents should consult their GP, bringing attention to the guidelines if necessary, before attempting peanut allergy prevention in their infant themselves."

Prof Alan Boobis, from Imperial College London, said: "The previous view that delaying the introduction of allergenic foods decreases the risk of food allergy is incorrect and... if anything, the exclusion or delayed introduction of specific allergenic foods may increase the risk of allergy to the same foods, including peanut."

The advice to parents in the UK is still being reviewed and Prof Boobis advised parents to follow NHS guidelines for now.

http://bit.ly/2j5q5Du

Orchids mimic human body odor to attract mosquitoes

According to Shakespeare, "A rose by any other name would smell as sweet." But what makes a rose smell sweet? And why has it evolved to smell that way?

Dr. Jeff Riffell, an associate professor in the Department of Biology at the University of Washington, has spent his career trying to answer such questions. He notes that for a rose, "There are actually about 300 chemicals in its bouquet."

Riffell is interested in how chemical signals, like smells, affect behavior. An important example is how plants use smell to attract pollinators over long distances, which explains why some flowers have evolved to smell sweet. But what if a plant relies on mosquitoes for pollination? Riffell's team found that the result is a plant that smells more like a sweaty gym sock than a rose.

A mosquito with pollen sacs attached to its head visits a Platanthera orchid. **Jeff Riffell**

Mosquitoes are not particularly good at pollinating plants, but do visit them to drink their nectar. It seems that at least one plant, the orchid Platanthera obtusata, has taken advantage of these blood-sucking visitors as pollinators.

Riffell describes a common day studying these orchids: "We'll be cruising around, being bitten by these mosquitoes—so that's kind of a bummer—but we'll see these bright pollen sacs attached all over their heads." In areas where the orchids are common, mainly in the NW United States, they depend almost exclusively on mosquitoes for pollination. For example, Riffell's team found that out of 167 insect visits to orchids, 166 of them were made by mosquitoes.

However, the orchids are a bland green color, and tend to blend in with their background. It was therefore a mystery how the orchids were able to attract mosquitoes and stand out amongst other plants.

That's when Riffell's team began to think with their noses. They began bagging orchids with oven bags to collect the chemical "smells" released by orchids. Riffell describes this as "Very low-tech chemistry (chemistry in the field is great)."

But the team quickly switched to some high-tech chemistry to separate out the dozens of chemicals that make up the orchid's bouquet. They found that many of the chemicals were the same ones given off by common blood-hosts of the mosquitoes. As Riffell puts it, "Smell your armpit, a plant might be emitting that same chemical."

They then examined what happened in a mosquito's brain when it was exposed to the orchid's bouquet. They found a strong, specific pattern of brain activity when mosquitoes were exposed to the bouquet, and although individual chemicals never reproduced this pattern, some were more important than others at generating the response.

Riffell was excited to find these results, since "These are some of the first demonstrations of how mosquito nervous systems process complex sensory information." They also looked at the brain's response to DEET "just to see what would happen," Riffell admits. It seemed to activate all sorts of neural pathways, leading the team to conclude that DEET might be "really confusing" to a mosquito.

Certain features of the orchid-specific brain pattern were recreated when mosquitoes were exposed to body odor. They also found that mosquitoes would actively fly upwind and land on the odor source

when exposed to orchid or body odor scents. These results provide strong evidence that orchids use a particular bouquet that shares features with blood-hosts to attract the mosquitoes they rely on for pollination.

Understanding how mosquitoes process scents might lead to the development of "mosquito bait" that could be used to attract mosquitoes in a given area and census them for diseases such as malaria and Zika, or to develop new repellents.

In the meantime, Riffell and his team are trying to determine how mosquito-mediated pollination affects orchid reproduction. For example, do orchids visited by mosquitoes produce more seeds? For now he says, "We just like going out in the field and doing research," despite the mosquito bites and an occasional whiff of BO in the air.

http://bit.ly/2iqVclq

Accelerated discovery a triple threat to triple negative breast cancer

Findings take research to patients in four years

HOUSTON - Houston Methodist Hospital researchers have advanced a potential treatment for metaplastic breast cancer--the most aggressive subtype of triple negative breast cancer, into patients in just under four years.

In a study published in the Journal of the National Cancer Institute (early online Dec. 31), a multi-institutional team led by Jenny C. Chang, M.D., director of the Houston Methodist Cancer Center, identified a gene driving the formation of metaplastic breast cancer.

"We not only uncovered the biological pathway stimulating cancer growth, but we found a compound that blocked it, increasing the survival of mice carrying human metaplastic breast tumors," said Chang, the study's senior author.

Metaplastic breast cancers account for less than 1 percent of all breast cancers, according to the Susan G. Komen Foundation. This subtype is the most aggressive triple negative breast cancer and remains therapeutically challenging to treat. Highly unresponsive to chemotherapy, these aggressive tumors leave patients with a three-year survival rate of 40 percent, worse than the 70 percent given triple negative breast cancer patients. Identifying the genetic mutation gave Chang and her team a jumpstart on targeting this cancer.

The research team found the same gene mutated in 39 of the 40 tumor samples from metaplastic breast patients. The mutation was in the gene RPL39, which like HER2 (a gene overexpressed in 1 out of 5 breast cancers), is considered an oncogene. This means that cells carrying the erroneous form of this gene divide uncontrollably and result in rapid tumor growth. Identifying RPL39 was the first step in determining how to treat this cancer.

RPL39 regulates the expression of an enzyme called inducible nitric oxide synthase (iNOS). The Houston Methodist researchers found that patients with high expression of RPL39 and iNOS had lower overall survival. Intuitively, the team investigated effects of an iNOS inhibitor on the treatment of metaplastic breast cancer and found the L-NMMA compound shrunk tumors in mice bearing human metaplastic breast tumors.

"The results showed elimination of the cancer in nearly all of the mice when combined with standard chemotherapy," said Chang, also professor of medicine at Weill Cornell Medicine. "Our goal is to turn metaplastic breast cancer from a debilitating disease into a chronic illness."

Houston Methodist Hospital is currently enrolling patients diagnosed with metaplastic breast cancer in a phase I clinical trial for L-NMMA.

Co-authors of the study included Bhuvanesh Dave, Ph.D., Daniel D. Gonzalez, Zhi-Bin Liu, M.D., Helen Wong, Sergio Granados, Ph.D., Joe E. Ensor, Ph.D., and Douglas H. Sieglaff, Ph.D. (Houston Methodist); Xianxian Li, M.D. (Shanghai Cancer Center and Cancer Institute of Fudan); Nadeer E. Ezzedine, Ph.D., Agda Karina Etrovic, Ph.D., Gordon B. Mills, M.D., and Michael Z. Gilcrease, M.D. (University of Texas M.D. Anderson Cancer Center); Kathy D. Miller, M.D. and Milan Radovic, Ph.D. (Indiana University Medical School); Steven S. Gross, Ph.D. (Weill Cornell Medical College); and Oliver Elemento, Ph.D. (Institute for Computational Biomedicine).

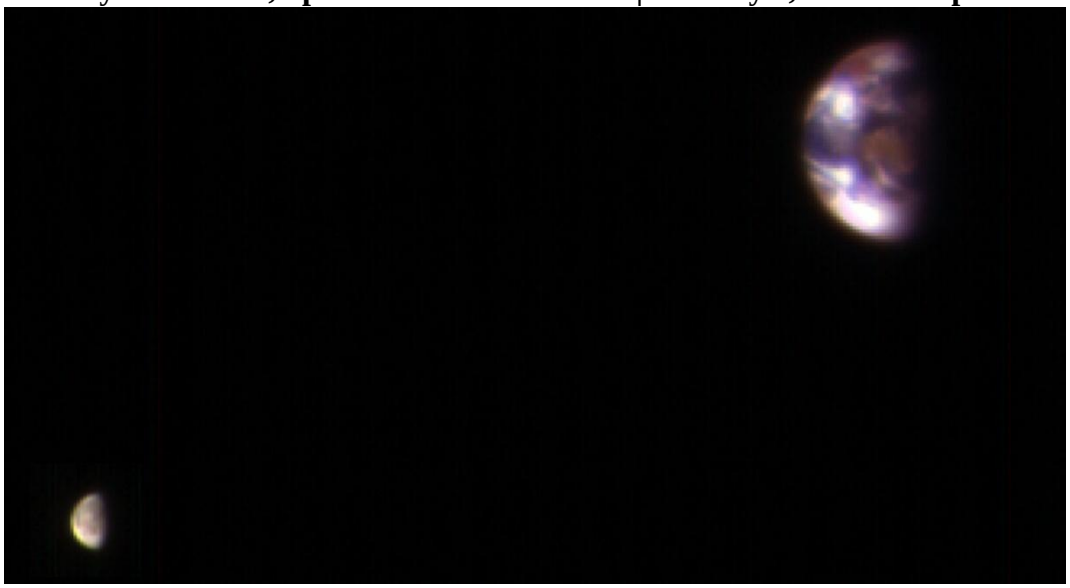
The research was supported in part by Chan Soon Shiong Institute of Advanced Health (AUP-1010-0025), BCRF, and Houston Methodist Foundation Grants.

http://bit.ly/2i2F6Cd

Wow! Mars Probe Snaps Stunning Photo of Earth and Moon

A NASA spacecraft has given humanity a breathtaking, Mars-eye view of Earth and its moon.

By Mike Wall, Space.com Senior Writer | January 6, 2017 05:20pm



This view of Earth and its moon combines two images acquired on Nov. 20, 2016, by the HiRISE camera on NASA's Mars Reconnaissance Orbiter, with brightness adjusted separately for Earth and the moon to show details on both bodies. Relative sizes and distance are correct. Earth and Mars were about 127 million miles (205 million kilometers) when the photos were taken. **NASA/JPL-Caltech/Univ. of Arizona**

The Mars Reconnaissance Orbiter (MRO) used its High Resolution Imaging Science Experiment (HiRISE) camera to capture this new telescopic image of our planet and its natural satellite on Nov. 20, 2016. At the time, Mars and Earth were about 127 million miles (205 million kilometers) apart, NASA officials said.

The amazing new photo is actually a composite of two separate exposures taken to calibrate HiRISE, which is so powerful that it's able to resolve features as small as 3.3 feet (1 meter) across on the Martian surface from MRO's orbital perch.

"The combined view retains the correct positions and sizes of the two bodies [Earth and the moon] relative to each other," NASA officials wrote in a description of the image, which was released today (Jan. 6). "The distance between Earth and the moon is about 30 times the diameter of Earth," they added. "Earth and the moon appear closer than they actually are in this image because the observation was planned for a time at which the moon was almost directly behind Earth, from Mars' point of view, to see the Earth-facing side of the moon."

The newly released image is sharp enough to reveal continent-size details on Earth; indeed, the reddish-brown feature in the middle of the planet is Australia, NASA officials said.

The $720 million MRO mission launched in August 2005 and slipped into orbit around the Red Planet in March 2006. For the past decade-plus, the probe has been studying Martian geology and climate; looking for signs of past water activity on the planet's surface; providing a vital communications link between Mars surface craft such as the Curiosity rover and their handlers here on Earth; and helping researchers evaluate potential landing sites for future robotic and human missions, among other tasks.

MRO occupies a roughly circular orbit that keeps the probe within 155 miles to 196 miles (250 to 316 km) of the Martian surface.

http://bit.ly/2i2M6iF

Milky Way's core could be spewing out planet-sized star chunks

A black hole's spitball may be in our vicinity

By Leah Crane

The Milky Way's supermassive black hole could be chewing up stars and spitting chunks back out at us. If so, planet-sized bits of stars may be shooting away from black holes and hurtling across the universe at

incredible speeds, according to results presented at the meeting of the American Astronomical Society in Grapevine, Texas, this week.

At the centre of the Milky Way lurks a supermassive black hole, Sagittarius A*. Once in about every 10,000 years, a star passes close enough to get caught by the black hole and spaghettified – stretched into a thin noodle by the powerful gravitational field.

That stretched-out matter does not end up exactly uniform, so clumps the size of planets coalesce under their own gravity. Those "planets", with masses ranging from around that of Neptune to several times that of Jupiter, are then flung away from the central black hole at speeds up to 10,000 kilometres per second, simulations by James Guillochon at the Harvard-Smithsonian Center for Astrophysics and Eden Girma at Harvard College suggest.

This should happen relatively often – by their calculations, one out of every thousand free-floating planet-sized bodies should be formed in this way. The closest one to Earth could be a few hundred light years away, and could have arrived from 50 million light years away.

Transporting worlds

"Usually, from something that far away, we're only getting light or maybe high-energy particles," says Guillochon. "This is a way to transport entire worlds from one corner of the universe to the other."

These chunks of spaghettified stars will have a distinctive composition: each one will be a sample of a different part of its parent star. It's like dicing a tomato, says Guillochon – some chunks will be all peel and some will be all seeds.

Such objects are nearly impossible to detect visually because of their faintness and speed, and no one has seen one so far. We could hunt them down based on how their gravity bends the light of stars behind them, but it will be years before that is possible. Plus, there are several other ways to accelerate similar objects to high speeds, says Avi Loeb, also at the Harvard-Smithsonian Center for Astrophysics although not involved in this research.

But, Loeb says, this is still exciting work. "It provides us with the possibility of detecting a whole new population of objects that were otherwise unexpected."

http://nyti.ms/2iWbohY

A Metal Ball the Size of Massachusetts That NASA Wants to Explore

NASA will be heading to a metal world.

By KENNETH CHANG JAN. 6, 2017

The space agency announced on Wednesday that a spacecraft named Psyche would visit an asteroid named Psyche, one of two new missions it will be launching into the solar system in the 2020s.

"For the purpose of simplicity, and out of our initial excitement, we just named our mission directly after what we're going to visit," said Lindy Elkins-Tanton, director of the Arizona State University school of earth and space exploration, who will serve as the mission's principal investigator.

From radar observations, Psyche the asteroid appears ellipsoid in shape, about as wide as Massachusetts. It is also quite dense, with estimates of 200 to 450 pounds per cubic foot, which is much denser than most asteroids. (By comparison, the average density of Earth is 344 pounds per cubic foot.)

Psyche is also very bright, adding to suspicions that it is made of metal. "Humankind has visited rocky worlds and icy worlds and worlds made of gas, but we have never seen a metal world," Dr. Elkins-Tanton said. "It's the only roundish, fairly spherical metal body in our solar system. Not only is it unique, it's improbable."

Planetary scientists like Dr. Elkins-Tanton think it is the nickel-iron core of a small planet that was bashed to pieces early in the history of the solar system. A trip to Psyche could reveal clues about what is at the center of Earth, something scientists will never be able to observe directly.

Psyche, the spacecraft, is to launch in 2023 and arrive at Psyche, the asteroid, in 2030. The spacecraft is to orbit the asteroid for 20 months.

Lucy, the other mission NASA selected on Wednesday, will also explore asteroids. Named after the fossil of a hominid ancestor of humans that lived more than three million years ago, Lucy is to launch in 2021 and then fly by six asteroids that are thought to be relics of the solar system, completing its mission in 2033. Its targets are the Trojans, asteroids that have been captured by Jupiter's gravity and now share the same orbit around the sun as Jupiter.

The characteristics of Trojan asteroids vary widely, and planetary scientists think they formed in different parts of the solar system before being swept into Jupiter's orbit.

"We believe that's telling something about how the solar system formed and evolved," said Harold F. Levison, a scientist at the Southwest Research Institute in Boulder, Colo., who is the principal investigator of Lucy. "The small bodies are really the fossils of planet formation."

Both Psyche and Lucy are part of NASA's Discovery program, a competition where scientists propose missions to the space agency to fit within a certain cost. The price tags for Psyche and Lucy are capped at $450 million each.

NASA also announced that a third finalist, Neocam, a telescope to search for asteroids that could collide with Earth, would receive another year of funding to address issues that have been raised about that proposal. The other two finalists had proposed explorations of Venus, a planet neglected by NASA in recent decades.

http://bbc.in/2ir4Jsz

Urbanisation signal detected in evolution, study shows

A "clear signal" of urbanisation has been identified in the evolution of organisms, which has implications for sustainability and human well-being.

By Mark Kinver Environment reporter, BBC News

In analysis of more than 1,600 cases around the globe, researchers said the changes could affect ecosystem services important to humans. More than half of the world's human populations now live in urban areas, and this proportion is set to grow. The findings appear in the Proceedings of the National Academy of Sciences.

"We found that there is a clear urban signal of phenotypic change, and also greater phenotypic change in urbanising systems compared to natural or non-urban anthropogenic systems," said co-author Marina Alberti from the University of Washington's Department of Urban Design and Planning. "So urbanisation, globally, is clearly affecting things."

Phenotypic change refers to change in an organism's observable traits, such as it morphology, physiology, phenology, or behaviour.

Seeds of change

The changes in plants and animals included alterations in body sizes, shifts in behavioural patterns and adjustments in reproduction.

In a separate study published in 2008, researchers in France observed a rapid evolutionary change in a plant's seed size in order for it to adapt to urban life.

They found that the seeds on Crepis sancta, otherwise known as hawksbeard, were larger on specimens that lived in urban areas, when compared with the seeds from the plants growing in rural settings.

As the plant's seeds were dispersed by the wind, the researchers suggested that heavier seeds fared better because they would drop on to nearby soil, whereas the lighter seeds would be carried by the wind, resulting in them being deposited on concrete and tarmac, where it was impossible to germinate. The speed in which this trait was expressed in the urban-dwelling plants surprised the researchers.

Professor Alberti said the changes that were observed in more than 1,600 studies were having an impact on evolution and that human activity, in the form of urbanisation, would have a lasting legacy on life on Earth. These findings add weight to the idea that the planet is now entering an Anthropocene epoch, a geological measurement of time in which humans are having a significant global impact on the Earth's geology and ecosystems.

Entering a new age?

Prof Alberti observed: "The reason these changes are important is because they change ecosystem function, therefore they have implications for human well-being. "This is because those changes affect, for example, biodiversity but also nutrient cycling, seed dispersal and water purification."

Prof Alberti and colleagues suggested that these changes meant that the alteration in the functions performed by the species, such as food production or the prevention of the spread of infectious diseases, would also be modified.

"There have been a lot of studies on individual cities but there had been no studies that considered the global picture to identify a global urbanisation influence on evolution," she added. "We live on an urban planet already. This is a change that has implications for where we are heading in the future. "We are changing the evolution of Earth and urbanisation has a role, a significant role, in that."

http://bit.ly/2jqMBDi

A 'Dirty Mouth' May Be A Sign Of Integrity; Study Associates Swearing With Increased Honesty

Swearing may be considered impolite and vulgar, but a new two-part study has revealed a more gracious attribute for those with an off-color vocabulary: Honesty.

Jan 3, 2017 01:28 PM By Dana Dovey

According to the research, people are more likely to swear as a way to express themselves, rather than cause harm to others, and the more an individual swears, the more honest they are likely to be.

The researchers found that while liars are known to prefer third-person pronouns and negative words in their speech, honest individuals are more likely to use profanity. According to the researchers, that's because swearing is often used to express one's feelings, and people who do this more regularly portray themselves in a more honest light, The Independent reported.

"The consistent findings across the studies suggest that the positive relation between profanity and honesty is robust, and that the relationship found at the individual level indeed translates to the society level," the study read.

For their report, the team of international researchers asked a group of 276 participants about their swearing habits as well as how honest they were in different situations. In addition, they analyzed the status updates of more than 73,000 Facebook users, measuring for honesty and profanity. In the second study, the same team used previous data to compare the integrity levels of US states with how often they swear. All the experiments had the same result: honesty was associated with higher levels of swearing.

Past research has suggested that swearing may also be a sign of increased intelligence. A 2016 study found that individuals with higher levels of verbal intelligence, that is intelligence associated with oral language, tended to use more swear words.

"Taboo or 'swear word' fluency is positively correlated with overall verbal fluency. The more words you generated in one category meant the more words you generated in another category, orally and verbally," Dr. Timothy Jay, of the Department of Psychology at Massachusetts College Of Liberal Arts and author of the study, previously told Medical Daily .