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Everything you've heard about sniffing oxytocin might be wrong

There's a sniff of doubt over oxytocin's effects

By Simon Oxenham

The "cuddle chemical". The "moral molecule". Oxytocin has quite a reputation – but much of what we thought about the so-called "love hormone" may be wrong.

Oxytocin is made by the hypothalamus and acts on the brain, playing a role in bonding, sex and pregnancy. But findings that a sniff of the hormone is enough to make people trust each other more are being called into question after a string of studies failed to replicate classic experiments.

Paul Zak at the Centre for Neuroeconomic Studies in Claremont, California, made his moral molecule hypothesis famous in 2011 when he memorably squirted a syringe of the hormone into the air while delivering a TED talk. When people sniff oxytocin before playing a money-lending game, it increases how much they trust each other, he explained.

But several teams have been unable to replicate his finding. Last November, Gideon Nave at the California Institute of Technology in Pasadena and his colleagues reviewed studies of oxytocin, and concluded that the effect of nasal squirts of the hormone on trust are not reliably different from zero.

Nave's team aren't the only ones calling the moral molecule hypothesis into question. In 2012, Moïra Mikolajczak at the Catholic University of Louvain (UCL) in Belgium and her colleagues published their own seminal findings backing a link between trust and oxytocin. They found that when people filled out an anonymous questionnaire about their sex lives and fantasies, they were less likely to seal the envelopes they returned them in if given a nasal dose of oxytocin beforehand.

It was a massive effect: those who received oxytocin were 44 times more likely to leave their envelope unsealed, suggesting that they trusted the recipient not to take a sneaky peak.

But now Mikolajczak's team are casting doubt on their own findings, after they twice failed to replicate the results. This could be because their recent studies made it harder for individual participants to tell whether they were receiving oxytocin or a placebo.

Publication bias

But although the team improved their method and showed that their original finding might not be sound, the journal where their first study appeared decided it did not want to publish the details of their failed attempts to replicate it.

The team are now asking if there is a publication bias: are studies on squirting oxytocin up people's noses more likely to be published if the result is positive? Their experiences suggest that the answer to that is yes. The team have revealed that of their 25 experiments on oxytocin, only the original questionnaire study suggested that intranasal oxytocin does affect trust.

These 25 studies yielded five published papers, only one of which reports a null finding – even though 24 out of their 25 experiments produced null results. That shows that the team has found it much harder to publish reports that squirting oxytocin has no effect. They have repeatedly sent a range of journals drafts of papers showing a null effect, but to no avail.

"Our initial enthusiasm for the [intranasal oxytocin] findings has slowly faded away over the years and the studies have turned us from 'believers' into 'skeptics'," the researchers write.

Nave suspects that it all comes down to probability, and has suggested that experiments like these are statistically equivalent to rolling a 20-sided die. Every time someone tests whether oxytocin works under certain conditions, they have a one in 20 chance of a positive result.

"If enough studies are carried out, every hypothesis will eventually be supported by some reports of experimental 'evidence'," Nave writes. When enough statistical tests are conducted independently, it is practically guaranteed that at some point, a desired result will appear.

If other people have had the same experience as Mikolajczak, then thousands of negative oxytocin findings could be hidden away in desk drawers. Other researchers support this view. There are now questions over whether it is even possible for nasally delivered oxytocin to cross the blood-brain barrier. If not, then it's unlikely that a squirt can have any powerful effect on behaviour.

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Redefining health and well-being in America's aging population

New approach looks at factors in addition to disease

Chronological age itself plays almost no role in accounting for differences in older people's health and well-being, according to a new, large-scale study by a multidisciplinary team of researchers at the University of Chicago.

The work, part of the National Social Life, Health, and Aging Project (NSHAP), supported by the National Institute on Aging of the National Institutes of Health, is a major longitudinal survey of a representative sample of 3,000 people aged 57 to 85 done by the independent research organization NORC at UChicago. The study yielded comprehensive new data about the experience of aging in America that formed the underpinning of the research and its conclusions.

The research presents a sharp departure from the traditional biomedical model's reliance on a checklist of infirmities centered on heart disease, cancer, diabetes, high blood pressure, and cholesterol levels.

Using what they call a "comprehensive model" of health and aging, the team has shown how other factors such psychological well-being, sensory function, mobility and health behaviors are essential parts of an overall health profile that better predicts mortality.

"The new comprehensive model of health identifies constellations of health completely hidden by the medical model and reclassifies about half of the people seen as healthy as having significant vulnerabilities that affect the chances that they may die or become incapacitated within five years," said UChicago biopsychologist Martha McClintock, lead author of "An Empirical Redefinition of Comprehensive Health and Well-being in the Older Adults of the U.S.," in the current issue of the Proceedings of the National Academy of Sciences.

"At the same time, some people with chronic disease are revealed as having many strengths that lead to their reclassification as quite healthy, with low risks of death and incapacity," co-author and demographer Linda Waite added.

The paper is based on the results of a major longitudinal study of aging Americans, funded by the National Institute on Aging, that is the first of its kind to collect this sort of information from a scientifically selected group of people.

The comprehensive model reflects a definition of health long advanced, but little studied, by the World Health Organization that considers health to include psychological, social, and physical factors in addition to the diseases that are the basis for the current medical model of health.

McClintock is the David Lee Shillinglaw Distinguished Service Professor in Psychology. Waite is the Lucy Flower Professor in Sociology. Other members of the team are geriatrician William Dale, associate professor of medicine, and chief, Section of Geriatrics & Palliative Medicine at UChicago Medicine; and sociologist Edward Laumann, the George Herbert Mead Distinguished Service Professor in Sociology.

In addition to finding that chronological age itself plays little or no role in determining differences in health, the research also found that:

Cancer by itself is not related to other conditions that undermine health.

Poor mental health, which afflicts one in eight older adults, undermines health in ways not previously recognized.

Obesity seems to pose little risk to older adults with excellent physical and mental health.

Sensory function and social participation play critical roles in sustaining or undermining health.

Having broken a bone since age 45 is a major marker for future health issues in people's lives.

Older men and women have different patterns of health and well-being during aging.

Mobility is one of the best markers of well-being.

Six new ways of looking at aging

The comprehensive model's healthiest category represented 22 percent of older Americans. This group was typified by higher obesity and blood pressure, but had fewer organ system diseases, better mobility, sensory function, and psychological health. They had the lowest prevalence of dying or becoming incapacitated (six percent) five years into the study.

A second category had normal weight, low prevalence of cardiovascular disease and diabetes, but had one minor disease such as thyroid disease, peptic ulcers, or anemia and were twice as likely to have died or become incapacitated within five years. Two emerging vulnerable classes of health traits, completely overlooked by the medical model, included 28 percent of the older population. One group included people who had broken a bone after age 45. A second new class had mental health problems, in addition to poor sleep patterns, engaged in heavy drinking, had a poor sense of smell and walked slowly, all of which correlate with depression.

The most vulnerable older people were in two classes, one characterized by immobility and uncontrolled diabetes and hypertension. A majority of people in each of these categories were women, who tend to outlive men.

"From a health system perspective, a shift of attention is needed from disease-focused management, such as medications for hypertension or high cholesterol, to overall well-being across many areas," said Dale.

"Instead of policies focused on reducing obesity as a much lamented health condition, greater support for reducing loneliness among isolated older adults or restoring sensory functions would be more effective in enhancing health and well-being in the older population," said Laumann.

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Tiny ocean organism has big role in climate regulation

Scientists have discovered that a tiny, yet plentiful, ocean organism is playing an important role in the regulation of the Earth's climate.

Research, published in the journal Nature Microbiology, has found that the bacterial group Pelagibacterales, thought to be among the most abundant organisms on Earth, comprising up to half a million microbial cells found in every teaspoon of seawater, plays an important function in the stabilisation of the Earth's atmosphere.

Dr Ben Temperton, lecturer in the department of Biosciences at the University of Exeter, was a member of the international team of researchers that has for the first time identified Pelagibacterales as a likely source for the production of dimethylsulfide (DMS), which is known to stimulate cloud formation, and is integral to a negative feedback loop known as the CLAW hypothesis.

Under this hypothesis, the temperature of the Earth's atmosphere is stabilised through a negative feedback loop where sunlight increases the abundance of certain phytoplankton, which in turn produce more dimethylsulfoniopropionate (DMSP). This is broken down into DMS by other members of the microbial community. Through a series of chemical processes, DMS increases cloud droplets, which in turn reduces the amount of sunlight hitting the ocean surface.

These latest findings reveal the significance of Pelagibacterales in this process and open up a path for further research.

Dr Temperton said: "This work shows that the Pelagibacterales are likely an important component in climate stability. If we are going to improve models of how DMS impacts climate, we need to consider this organism as a major contributor."

The research also revealed new information about the way in which the Pelagibacterales produces DMS.

Dr Temperton added: "What's fascinating is the elegance and simplicity of DMS production in the Pelagibacterales. These organisms don't have the genetic regulatory mechanisms found in most bacteria. Having evolved in nutrient-limited oceans, they have some of the smallest genomes of all free-living organisms, because small genomes take fewer resources to replicate.

"The production of DMS in Pelagibacterales is like a pressure release valve. When there is too much DMSP for Pelagibacterales to handle, it flows down a metabolic pathway that generates DMS as a waste product. This valve is always on, but only comes into play when DMSP concentrations exceed a threshold. Kinetic regulation like this is not uncommon in bacteria, but this is the first time we've seen it in play for such an important biogeochemical process."

Dr Jonathan Todd from UEA's School of Biological Sciences said: "These types of ocean bacteria are among the most abundant organisms on Earth - comprising up to half a million microbial cells found in every teaspoon of seawater.

"We studied it at a molecular genetic level to discover exactly how it generates a gas called dimethylsulfide (DMS), which is known for stimulating cloud formation.

"Our research shows how a compound called dimethylsulfoniopropionate that is made in large amounts by marine plankton is then broken down into DMS by these tiny ocean organisms called Pelagibacterales.

"The resultant DMS gas may then have a role in regulating the climate by increasing cloud droplets that in turn reduce the amount of sunlight hitting the ocean's surface."

Dr Emily Fowler from UEA's School of Biological Sciences worked on the characterisation of the Pelagibacterales DMS generating enzymes as part of her successful PhD at UEA. She said: "Excitingly, the way Pelagibacterales generates DMS is via a previously unknown enzyme, and we have found that the same enzyme is present in other hugely abundant marine bacterial species. This likely means we have been vastly underestimating the microbial contribution to the production of this important gas."

The abundant marine bacterium Pelagibacter simultaneously catabolizes dimethylsulfonio propionate to the gases dimethyl sulphide and methanethiol by Jing Sun, Jonathan D.Todd, J. CameronThrash, Yanping Qian, Michael C. Qian, Ben Temperton, Jiazhen Guo, Emily K.Fowler, JoshuaT.Aldrich, Carrie D. Nicora, Mary S Lipton, Richard D. Smith, Patrick De Leenheer, Samuel H Payne, Andrew W.B.Johnston, Cleo L. Davie-Martin, Kimberly H. Halsey and Stephen J. Giovannoni is published in Nature Microbiology.

The study was led by Oregon State University and also involved academics from the University of East Anglia, Louisiana State University, Qingdao Aquarium, China and the Pacific Northwest National Laboratory.

http://www.eurekalert.org/pub_releases/2016-05/ru-rso051616.php

Rice-led study offers new answer to why Earth's atmosphere became oxygenated

Oxygen atmosphere recipe = tectonics + continents + life

Earth scientists from Rice University, Yale University and the University of Tokyo are offering a new answer to the long-standing question of how our planet acquired its oxygenated atmosphere.

Based on a new model that draws from research in diverse fields including petrology, geodynamics, volcanology and geochemistry, the team's findings were published online this week in Nature Geoscience. They suggest that the rise of oxygen in Earth's atmosphere was an inevitable consequence of the formation of continents in the presence of life and plate tectonics.

"It's really a very simple idea, but fully understanding it requires a good bit of background about how the Earth works," said study lead author Cin-Ty Lee, professor of Earth science at Rice. "The analogy I most often use is the leaky bathtub. The level of water in a bathtub is controlled by the rate of water flowing in through the faucet and the efficiency by which water leaks out through the drain. Plants and certain types of bacteria produce oxygen as a byproduct of photosynthesis. This oxygen production is balanced by the sink: reaction of oxygen with iron and sulfur in the Earth's crust and by back-reaction with organic carbon. For example, we breathe in oxygen and exhale carbon dioxide, essentially removing oxygen from the atmosphere. In short, the story of oxygen in our atmosphere comes down to understanding the sources and sinks, but the 3-billion-year narrative of how this actually unfolded is more complex."

Lee co-authored the study with Laurence Yeung and Adrian Lenardic, both of Rice, and with Yale's Ryan McKenzie and the University of Tokyo's Yusuke

Yokoyama. The authors' explanations are based on a new model that suggests how atmospheric oxygen was added to Earth's atmosphere at two key times: one about 2 billion years ago and another about 600 million years ago.

Today, some 20 percent of Earth's atmosphere is free molecular oxygen, or O2. Free oxygen is not bound to another element, as are the oxygen atoms in other atmospheric gases like carbon dioxide and sulfur dioxide. For much of Earth's 4.5-billion-year history, free oxygen was all but nonexistent in the atmosphere.

"It was not missing because it is rare," Lee said. "Oxygen is actually one of the most abundant elements on rocky planets like Mars, Venus and Earth. However, it is one of the most chemically reactive elements. It forms strong chemical bonds with many other elements, and as a result, it tends to remain locked away in oxides that are forever entombed in the bowels of the planet -- in the form of rocks. In this sense, Earth is no exception to the other planets; almost all of Earth's oxygen still remains locked away in its deep rocky interior."

Lee and colleagues showed that around 2.5 billion years ago, the composition of Earth's continental crust changed fundamentally. Lee said the period, which coincided with the first rise in atmospheric oxygen, was also marked by the appearance of abundant mineral grains known as zircons.

"The presence of zircons is telling," he said. "Zircons crystallize out of molten rocks with special compositions, and their appearance signifies a profound change from silica-poor to silica-rich volcanism. The relevance to atmospheric composition is that silica-rich rocks have far less iron and sulfur than silica-poor rocks, and iron and sulfur react with oxygen and form a sink for oxygen.

"Based on this, we believe the first rise in oxygen may have been due to a substantial reduction in the efficiency of the oxygen sink," Lee said. "In the bathtub analogy, this is equivalent to partially plugging the drain."

Lee said the study suggests that the second rise in atmospheric oxygen was related to a change in production -- analogous to turning up the flow from the faucet.

"The bathtub analogy is simple and elegant, but there's an added complication that must be taken into account," he said. "That is because oxygen production is ultimately tied to the global carbon cycle -- the cycling of carbon between the Earth, the biosphere, the atmosphere and oceans."

Lee said the model showed that Earth's carbon cycle has never been at a steady state because carbon slowly leaks out as carbon dioxide from Earth's deep interior to the surface through volcanic activity. Carbon dioxide is one of the key ingredients for photosynthesis.

"On long, geologic timescales, carbon is removed from the atmosphere by the production of condensed forms of carbon, such as organic carbon and minerals called carbonate," he said. "For most of Earth's history, most of this carbon has been deposited not in the deep ocean but rather on the margins of continents. The implications are profound because carbon deposited on continents does not return to Earth's deep interior. Instead, it amplifies carbon inputs into the atmosphere when the continents are subsequently perturbed by volcanism."

Lee said the team's model showed that volcanic activity and other geologic inputs of carbon into the atmosphere may have increased with time, and because oxygen production is tied to carbon production, oxygen production also must increase. The model showed that the second rise in atmospheric oxygen had to occur late in Earth's history.

"Exactly when is model-dependent, but what is clear is that the formation of continental crust naturally leads to two rises in atmospheric oxygen, just as we see in the fossil record," Lee said.

Exactly what caused the composition of the crust to change during the first oxygenation event remains a mystery, but Lee said the team believes it may have been related to the onset of plate tectonics, where the Earth's surface, for the first time, became mobile enough to sink back down into Earth's deep interior.

Lee said the team's new model is not without controversy. For example, the model predicts that production of carbon dioxide must increase with time, a finding that goes against the conventional wisdom that carbon fluxes and atmospheric carbon dioxide levels have steadily decreased over the last 4 billion years.

"The change in flux described by our model happens over extremely long time periods, and it would be a mistake to think that these processes that are bringing about any of the atmospheric changes are occurring due to anthropomorphic climate change," he said. "However, our work does suggest that Earth scientists and astrobiologists may need to revisit what we think we know about Earth's early history."

This work is the result of an ongoing study of the global carbon cycle funded by the National Science Foundation and administered by Rice University.

http://www.eurekalert.org/pub_releases/2016-05/aha-nho051116.php

Nearly half of all heart attacks may be 'silent'

American Heart Association rapid access journal report

DALLAS - Nearly half of all heart attacks may be silent and like those that cause chest pain or other warning signs, silent heart attacks increase the risk of dying from heart disease and other causes, according to new research in the American Heart Association's journal Circulation.

A heart attack does not always have classic symptoms, such as pain in your chest, shortness of breath and cold sweats. In fact, a heart attack can occur without symptoms and it is called a silent heart attack (blood flow to the heart muscle is severely reduced or cut off completely).

"The outcome of a silent heart attack is as bad as a heart attack that is recognized while it is happening," said Elsayed Z. Soliman, M.D., MSc., M.S., study senior author and director of the epidemiological cardiology research center at Wake Forest Baptist Medical Center, Winston-Salem, North Carolina. "And because patients don't know they have had a silent heart attack, they may not receive the treatment they need to prevent another one."

Researchers analyzed the records of 9,498 middle-age adults already enrolled in the Atherosclerosis Risk in Communities (ARIC), a study analyzing the causes and outcomes of atherosclerosis - hardening of the arteries. Researchers examined heart attack differences between blacks and whites as well as men and women. Over an average of nine years after the start of the study, 317 participants had silent heart attacks while 386 had heart attacks with clinical symptoms. Researchers continued to follow participants for more than two decades to track deaths from heart attack and other diseases.

They found that silent heart attacks:

made up 45 percent of all heart attacks; increased the chances of dying from heart disease by 3 times; increased the chances of dying from all causes by 34 percent; and were more common in men but more likely to cause death in women.

"Women with a silent heart attack appear to fare worse than men," Soliman said. "Our study also suggests that blacks may fare worse than whites, but the number of blacks may have been too small to say that with certainty."

Researchers accounted for many factors that could bias results, including smoking, body weight, diabetes, high blood pressure and cholesterol. They did not adjust for access to care but did adjust for income and education, which could impact access to care.

Symptoms of silent heart attacks appear so mild that they are barely noticed, if at all. They are detected later, usually when patients undergo an electrocardiogram, better known as an ECG or EKG, to check their heart's electrical activity, researchers said.

Soliman said that silent heart attacks, once discovered, should be treated as aggressively as heart attacks with symptoms.

"The modifiable risk factors are the same for both kinds of heart attacks," he said. "Doctors need to help patients who have had a silent heart attack quit smoking, reduce their weight, control cholesterol and blood pressure and get more exercise."

In 1987, the ARIC Study began enrolling participants who were free of heart disease in four U.S. communities in Maryland, Minnesota, Mississippi and North Carolina to determine the risk factors for heart disease and health effects of hardening of the arteries over time.

Co-authors are Zhu-Ming Zhang, M.D., M.P.H.; Pentti M. Rautaharju, M.D., Ph.D.; Ronald J. Prineas, M.B., B.S., Ph.D; Carlos J. Rodriguez, M.D.; Laura Loehr, M.D., Ph.D.; Wayne D. Rosamond, Ph.D.; Dalane Kitzman, M.D. and David Couper, M.D., Ph.D. Author disclosures are on the manuscript.

The National Heart, Lung, and Blood Institute funded the study.

http://www.eurekalert.org/pub_releases/2016-05/cu-dgc051316.php

Do germs cause type 1 diabetes?

Germs could play a role in the development of type 1 diabetes by triggering the body's immune system to destroy the cells that produce insulin, new research suggests.

Scientists have previously shown that killer T-cells, a type of white blood cell that normally protects us from germs, play a major part in type 1 diabetes by destroying insulin producing cells, known as beta cells.

Now, using Diamond Light Source, the UK's synchrotron science facility to shine intense super powerful X-rays into samples, a team from Cardiff University's Systems Immunity Research Institute found the same killer T-cells that cause type 1 diabetes are strongly activated by some bacteria. The team hope this research will lead to new ways to diagnose, prevent or even halt type 1 diabetes.

Cardiff University's Professor Andy Sewell, lead author of the study, said: "Killer T-cells are extremely effective at killing off germs, but when they mistakenly attack our own tissues, the effects can be devastating."

"During type 1 diabetes, killer T-cells are thought to attack pancreatic beta cells. These cells make the insulin that is essential for control of blood sugar levels. "When beta cells are destroyed, patients have to inject insulin every day to remain healthy."

Unlike type 2 diabetes, type 1 diabetes is prevalent in children and young adults, and is not connected with diet. There is little understanding of what triggers type 1 diabetes and currently no cure with patients requiring life-long treatment.

In previous studies the Cardiff team isolated a killer T-cell from a patient with type 1 diabetes to view the unique interaction which kills the insulin-producing beta cells in the pancreas.

They found these killer T-cells were highly 'cross-reactive', meaning that they can react to lots of different triggers raising the possibility that a pathogen might stimulate the T-cells that initiate type 1 diabetes.

Cardiff University's Dr David Cole said: "Killer T-cells sense their environment using cell surface receptors that act like highly sensitive fingertips, scanning for germs. "However, sometimes these sensors recognise the wrong target, and the killer T-cells attack our own tissue. We, and others, have shown this is what happens during type 1 diabetes when killer T-cells target and destroy beta cells.

"In this new study, we wanted to find out what was causing these T-cells to kill beta cells. We identified part of a bug that turns on killer T-cells so they latch onto beta cells. This finding sheds new light on how these killer T-cells are turned into rogues, leading to the development of type 1 diabetes."

The research, published in The Journal of Clinical Investigation, provides a first ever glimpse of how germs might trigger killer T-cells to cause type 1 diabetes, but also points towards a more general mechanism for the cause of other autoimmune diseases.

Dr Cole added: "We still have much to learn about the definitive cause of type 1 diabetes and we know that there are other genetic and environmental factors at play. "This research is significant as it pinpoints, for the first time, an external factor that can trigger T-cells that have the capacity to destroy beta cells."

Professor Melanie Welham, Chief Executive at the Biotechnology and Biological Sciences Research Council (BBSRC), who co-funded the study, said: "This demonstrates the value of research that explores the fundamental cell biology of the immune system. "Finding the cellular mechanisms behind the development of autoimmune diseases, such as type 1 diabetes, could lead to treatments that help us lead longer, healthier lives."

Professor Matthias von Herrath, MD, Professor at La Jolla Institute for Allergy and Immunology and Vice President at NovoNordisk commented: "Type 1 diabetes is a very serious and hard to treat condition affecting mainly young people. "This new finding, demonstrating how external factors may trigger T-cells to 'wake-up' and start attacking beta cells, helps to explain how this disease develops and could shape the future direction of new treatments and diagnostics."

The Cardiff study was funded by the Biotechnology and Biological Sciences Research Council (BBSRC) UK, the Juvenile Diabetes Research Foundation (JDRF), and the Wellcome Trust, using facilities provided by Diamond Light Source.The paper can be accessed here: http://www.jci.org/articles/view/85679?key=78b05ef4283be97e99b4

http://bit.ly/23ZDHsj

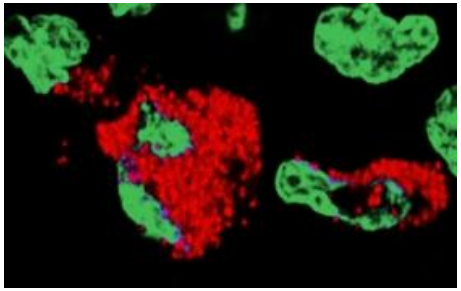
1 Organ Holds the Key to Zika's Devastating Birth Defects

The hidden placenta connects a fetus to outside dangers—and scientists have found new ways to study it

By Marla Broadfoot on May 16, 2016

Editor's note: Catherine Spong's title was changed to reflect her position as acting director of an NIH institute on May 16.

For most people, a Zika virus infection brings little more than a slight fever or a mild rash. But when the mosquito-borne illness strikes during pregnancy, it can set off a slew of devastating birth defects that include microcephaly (a dangerously small head and brain) as well as hearing and vision loss. The one barrier that lies between Zika lurking in a mother's bloodstream and the health of her unborn child is the placenta, a short-lived organ that has been hard to study. Now a cadre of specialists have developed new methods to examine the organ, spurred on by the need to learn how Zika crosses this normally impenetrable barrier.



***Placenta cells infected with Zika virus*Indira Mysorekar**

The placenta is remarkable. It rapidly materializes during pregnancy—supplying the baby with nutrients and oxygen, clearing waste, churning out hormones and fending off infections—before making a bloody exit via the afterbirth. Much of what we know about the human placenta comes from research on this discarded pound of flesh, which requires a kind of finesse found in few labs across the country. The trouble is, these decaying, disk-shaped masses provide just a glimpse of their former selves, much like a cadaver conveys mere bits and pieces of a person's earlier life.

Many scientists felt no urgency to find out more. "I always like to think of the placenta as the engine of your car," says Carolyn Coyne, a virologist at the University of Pittsburgh. "When you drive to work in the morning, your engine doesn't usually cross your mind. But if it breaks down, then you care. Same thing when you're pregnant, you're thinking, of course, about your baby, not the placenta and all the work it's doing. Unless something goes wrong."

Coyne started thinking seriously about the placenta when she became pregnant with her son, seven years ago. She wondered if she could harm her baby by continuing to handle viruses in her lab. So she ran a quick Google search and was troubled to find how little was known about the vital organ.

The human placenta can keep most, but not all, maternal infections from causing birth defects. But how does it accomplish that feat and shield the developing fetus? Soon after the Zika outbreak began Coyne harvested cells from full-term placentas and exposed them to different strains of the virus. She discovered the cylindrically shaped cells called trophoblasts that envelop the placenta exude potent molecules called interferons that usually protect them from infection. When she added the trophoblasts' interferons to other types of cells that inhabit the placenta, like fibroblasts or endothelial cells, those cells suddenly became resistant, too.

Yet multiple studies have detected traces of the Zika virus in the brains and amniotic fluid of affected babies. Unfortunately, cells from old placentas deteriorate too rapidly for Coyne to use them to investigate the way Zika manages

its break-in. One possible solution is to use repeatedly dividing placental cells, which in theory could be studied for eternity. To better mimic the dynamic three-dimensions of real life, Coyne took these cultured, immortalized placental cells for a little spin. She tacked cultured trophoblasts and their companion blood vessel cells onto tiny beads. Then she spun the beads around using an instrument from NASA called a rotating wall vessel bioreactor. It generates a zero-gravity environment.

Coyne says the cells end up floating and whirling around in their growth media, subject to the same shear stress and rotational forces found in a mother's womb, like sea anemones exposed to the onslaught of ocean currents. In contrast to cells grown flat on their backs in lab dishes, the cells cultured in three dimensions resist infection by the parasite that causes toxoplasmosis, behaving like cells from a live placenta. Now she is using the new 3-D model to recreate a Zika infection, testing the hypothesis that reduced levels of interferons might allow Zika to infiltrate placental cells. Coyne thinks that some placentas, in some women, might produce less interferons, putting their babies at higher risk.

A recent study in animal models underscores the role of these protective factors in Zika infection. Indira Mysorekar, a microbiologist at Washington University School of Medicine in Saint Louis, reported last week in Cell that mice engineered to be genetically or chemically deficient in interferons were more vulnerable to the damaging effects of Zika. She found that unlike other viruses like dengue, Zika appears to possess a unique predilection for the placenta. It pushes through multiple cellular barriers to reach the fetus, damaging the placenta along the way and prompting fetal demise in the most severe cases.

Mysorekar explains that the Zika virus seems to follow a kind of molecular homing signal on its path from mother to child. "It may be just one or two viruses that get through, but once they're in they are able to replicate. The cells are full of viruses," she says. "It's scary."

Although the mouse models in Mysorekar's study mirrored many aspects of human Zika infection, they lacked two of Zika's most devastating impacts: brain calcifications and microcephaly. Because nearly every placental mammal has its own unique placenta, the only way to know for certain what is happening in a person is to study one. Catherine Spong, a maternal fetal medicine specialist and acting director of the Eunice Kennedy Shriver National Institute of Child Health and Development, says work is already underway to adapt old technologies and invent new ones that can follow the human placenta as it grows, develops and functions alongside the fetus. But these approaches are years away from realization, providing little reassurance to women faced with the current Zika outbreak. As mosquito season quickly approaches, the virus will likely infect more women and endanger more babies.

Vikki Abrahams, a reproductive immunologist at Yale University, says scientists are only beginning to appreciate the ramifications of emerging infectious diseases like Zika. Even when these pathogens are unable to infect the placenta, they can still trigger a dangerous inflammatory response from the immune system that may lead to problems lasting well beyond pregnancy, including autism, schizophrenia, lower IQ and impaired social skills.

"It is not just nine months," she says. "If we don't have a good understanding about basic pregnancy and the basic questions about how the placenta functions, then we can't understand when things go wrong or how to stop problems that arise, and the damage to mother and offspring will continue to perpetuate. It becomes a global problem affecting the general population."

http://bit.ly/1Tjn6jF

Exercise May Reduce the Risk of These 13 Cancers

Here's another reason to get active: Exercise may reduce the risk of 13 types of cancer, a new study finds.

By Rachael Rettner, Senior Writer | May 16, 2016 11:00am ET

Researchers analyzed information from 1.4 million people in the United States and Europe; the subjects were in 12 different study groups and were followed for about 11 years. Participants were asked whether they did moderate or vigorous exercise in their free time, like walking, swimming or running, and how much physical activity they got.

During the study period, more than 186,000 cases of cancer were diagnosed in the study participants. People were classified as doing higher levels of exercise if they were in the top 10 percent of all people in their study groups for the amount of exercise they did. These individuals had a reduced risk of 13 types of cancer compared to the people who were in the lowest 10 percent of their study groups.

These were the 13 cancers, with their associated amounts of risk reduction:

Esophageal cancer, a 42 percent lower risk
Liver cancer, a 27 percent lower risk
Lung cancer, a 26 percent lower risk
Kidney cancer, a 23 percent lower risk
Stomach cancer of the cardia (top portion of the stomach), a 22 percent lower risk
Endometrial cancer, a 21 percent lower risk
Myeloid leukemia, a 20 percent lower risk
Myeloma, a 17 percent lower risk
Colon cancer, a 16 percent lower risk
Head and neck cancer, a 15 percent lower risk
Rectal cancer, a 13 percent lower risk

Bladder cancer, a 13 percent lower risk

Breast cancer, a 10 percent lower risk

Overall, high levels of physical activity were linked with a 7 percent lower risk of any cancer, according to the study. "These findings support promoting physical activity as a key component of population-wide cancer-prevention and -control efforts," the researchers wrote in the May 16 issue of the journal JAMA Internal Medicine. For most of the cancers (10 out of 13), exercise reduced the risk of the disease regardless of people's body mass index or smoking habits.

Interestingly, high levels of physical activity were actually linked with a slightly higher risk of prostate cancer (5 percent increased risk). A biological reason for this finding is not known, and it's possible that physically active men are more likely to get screened for prostate cancer, which would lead to more cancers identified in this group, the researchers said.

But high levels of exercise were also linked with a 27 percent higher risk of malignant melanoma, which is likely the result of more sun exposure, the researchers said. Efforts to prevent cancer that focus on exercise should also emphasize how people can protect themselves from sun exposure when they exercise outdoors, the researchers said.

The new findings "underscore the importance of leisure-time physical activity as a potential risk-reduction strategy to decrease the cancer burden in the United States and abroad," Marilie Gammon, of the University of North Carolina at Chapel Hill, and colleagues wrote in a commentary accompanying the study.

However, the new study did not look at exactly how much exercise is needed, how intense the exercise should be or when in life people should start exercising to get these benefits, so those questions should be the focus of future research, the commentary said.

More research is also needed to determine exactly how exercise lowers the risk of cancer, the commentary said. Understanding the underlying mechanisms for the link could help identify potential targets for cancer prevention, the authors said.

http://www.eurekalert.org/pub_releases/2016-05/bidm-etn051316.php

Exposure to narrow band of green light improves migraine symptoms

Green light significantly reduces light sensitivity and can reduce headache severity

BOSTON - Light sensitivity, or photophobia, is a frequent symptom of migraine headaches, which affect nearly 15 percent of the world's population. A new study, led by researchers at Beth Israel Deaconess Medical Center (BIDMC) and published today in Brain, has found that exposing migraine sufferers to a narrow band of green light significantly reduces photophobia and can reduce headache severity.

"Although photophobia is not usually as incapacitating as headache pain itself, the inability to endure light can be disabling," said lead author Rami Burstein, PhD, Vice Chair of Research in the Department of Anesthesia, Critical Care and Pain Medicine and Academic Director of the Comprehensive Headache Center at BIDMC, as well as the John Hedley-Whyte Professor of Anaesthesia at Harvard Medical School (HMS). "More than 80 percent of migraine attacks are associated with and exacerbated by light sensitivity, leading many migraine sufferers to seek the comfort of darkness and isolate themselves from work, family and everyday activities."

Five years ago, Burstein and colleagues made the surprising discovery that blue light hurts migraine patients who are blind. This finding prompted the thinking that abnormal sensitivity to light during migraine could be alleviated by blocking blue light. However, because that study involved only blind patients, who cannot detect all colors of light, Burstein and his colleagues devised a way to study the effects of different colors of light on headache in patients without visual impairment.

In this new study, Burstein and colleagues found that of all light to which migraine sufferers are exposed, a narrow band of green light worsens migraine significantly less than all other colors of light and that at low intensities green light can even reduce headache pain. The researchers asked patients experiencing acute migraine attacks to report any change in headache when exposed to different intensities of blue, green, amber and red light. At high intensity of light - as in a well-lit office - nearly 80 percent of patients reported intensification of headache with exposure to all colors but green. Moreover, the researchers found - unexpectedly - that green light even reduced pain by about 20 percent.

To understand exactly why green light causes far less pain to patients with migraines, Burstein and colleagues designed experiments in which they measured the magnitude of the electrical signals generated by the retina (in the eye) and the cortex (in the brain) of these patients in response to each color of light. They found that blue and red lights generated the largest signals in both the retina and the cortex and that green light generated the smallest signals.

Next, applying innovative techniques recently developed by Rodrigo Noseda, PhD, also of BIDMC and Assistant Professor at HMS, they used animal models of migraine to study neurons in the thalamus, an area of the brain that transmits information about light from the eye to the cortex. These neurons were found to be most responsive to blue light and least responsive to green light, explaining why the migraine brain responds favorably to green light.

"These findings offer real hope to patients with migraines and a promising path forward for researchers and clinicians," said Burstein.

Burstein is now working to develop a more affordable light bulb that emits "pure" (narrow band wavelength) green light at low intensity, as well as affordable sunglasses that block all but this narrow band of pure green light. Currently, the cost of one such light bulb is prohibitively high, and the technology to block all but pure green light in sunglasses is available only in light microscopy, which is also very costly.

In addition to Burstein, coauthors include BIDMC investigators Rodrigo Noseda, Alice Lee, Rony Nir, Carolyn Bernstein, Catherine Buettner, Suzanne Bertisch, Alexandra Hovaguimian and Rodrigo Walker; Boston Children's Hospital investigator Anne Fulton; Massachusetts Eye and Ear Infirmary investigator Dean Cestari; and Bruce Doran from Diagnosys.

This study was supported by grants from the National Institutes of Health (R37 NS079678 and RO1 NS069847).

http://www.eurekalert.org/pub_releases/2016-05/uoca-ddd051616.php

Doctors don't die differently than anyone else, CU Anschutz researchers say

Study debunks idea that physicians use less aggressive health care at end of life

AURORA, Colo. - A new study from researchers at the University of Colorado Anschutz Medical Campus appears to disprove the increasingly popular notion that doctors die differently than everyone else, using fewer interventions that often have little value. In fact, the researchers said, their national study found that physicians use more hospice care, spend more time in Intensive Care Units (ICUs) and just as much time in hospitals when compared to the rest of the population.

"The overall narrative that doctors die differently is false," said the study's senior author Stacy Fischer, MD, associate professor at the University of Colorado School of Medicine. "We found that doctors used more hospice care - about two days on average - but when you look at the length of stay in hospital in the last months of life, there is no difference between them and the rest of population."

The paper was published this week in the Journal of the American Geriatrics Society.

In 2011, Ken Murray, a retired family physician, wrote an essay entitled `How Doctors Die' saying doctors were more likely to die at home with fewer end-of-life medical interventions. The essay swiftly went viral and was supported by hypothetical surveys of physicians regarding their wishes for care at the end of life and later by smaller preliminary studies.

Fischer and her colleagues, including Daniel Matlock, MD, MPH of CU Anschutz, wanted to see if doctors with their knowledge of medical treatment and outcomes truly did die differently than others.

They examined data from 9,947 deceased physicians and a random sample of 192,006 non-physicians between 2008 and 2010. In the last six months and one month of life, the proportion of physicians and non-physicians having at least one ICU stay was essentially equivalent. The mean number of days spent in the ICU in the last six months and one month of life was slighter greater for doctors.

The study also showed that 46.4 percent of physicians and 43.2 percent of non-physicians had enrolled in hospice care for the last six months of life. Doctors used hospice an average of 2.4 days longer than others. And the proportion of doctors using hospice within seven days of death was slightly greater than non-physicians.

"Based on prior survey research of physician attitudes toward end-of-life care, it was expected that physicians would have less use of high intensity hospital-based care at the end of life," the authors wrote. "Why might the findings conflict with the prior evidence that demonstrates physician preferences for less aggressive care?"

The differences could be generational, they said, since the average age of the physicians studied was 83. "Many of these physicians trained and practiced medicine at a time before hospice or palliative care and before many of the technological advances in intensive care," Matlock said. "Second, fear and avoidance of dying are strong motivators of much of human behavior and perhaps physicians are not immune to these fears of dying."

Yet the most troubling explanation, Fischer said, is that higher level health care system factors affect end-of-life care independent of patient or clinical factors.

"We need to take a critical look at our health care system and ask what is driving this low value care and by that I mean care that doesn't offer any real quantity or quality of life," she said. "And clearly, despite their medical knowledge, physicians are not immune. We hope our study will help spark a national conversation about this increasingly important issue."

The co-authors include Traci E. Yamashita, MA, Min Sung-Joon, PhD, Alexander K. Smith, MD, MPH and Amy S. Kelley, MD, MSHS.

http://www.eurekalert.org/pub_releases/2016-05/kl-rmb051716.php

Researchers may be one step closer to curing HIV

Scientists from KU Leuven, Belgium, present a new therapeutic approach that may make it possible for HIV patients to (temporarily) stop their medication. The findings shed a completely new light on the search for a cure for HIV.

Existing antiviral inhibitors can suppress the replication of the HIV virus, but they cannot fully remove it from the human body. As a result, HIV patients have to take inhibitors for the rest of their lives. HIV researchers worldwide are currently developing new methods to eliminate the virus.

The HIV virus uses the cellular protein LEDGF as a kind of grappling-hook to attach itself to specific locations in our genetic material. Once its DNA is inside the cells of its human host, the virus can multiply and make the patient sick.

In 2010, the research team of KU Leuven Professor Zeger Debyser developed inhibitors -- called LEDGINs -- that block the 'grappling-hook'. As a result, the virus cannot attach itself to its preferred locations in our DNA.

Doctoral student Lenard Vranckx has now discovered that, when treated with LEDGINs, the HIV virus settles elsewhere in our DNA, in locations where it cannot multiply. Lenard Vranckx explains: "We've shown that a treatment with LEDGINs not only inhibits the integration of the HIV virus, but also ensures that the virus doesn't multiply once the treatment is stopped."

"This discovery paves the way for new clinical studies with LEDGINs," Professor Debyser continues. "We don't know whether this approach will lead to a final cure for HIV, but even a scenario that allows patients to stop their medication for a while is an important step in the right direction."

However, the researchers remain cautious: "We don't want to give anyone false hope. Our discovery is based on cell cultures. The findings still need to be tested in mice and in clinical studies. That's why a potential treatment based on the discovery is still years in the future," says Professor Debyser. "But now, we already know the direction of our future research."

http://www.eurekalert.org/pub_releases/2016-05/aqu-eom051716.php

Europa's ocean may have an Earthlike chemical balance

The ocean of Jupiter's moon Europa could have the necessary balance of chemical energy for life, even if the moon lacks volcanic hydrothermal activity, finds a new study.

WASHINGTON, DC -- Europa is strongly believed to hide a deep ocean of salty liquid water beneath its icy shell. Whether the Jovian moon has the raw materials and chemical energy in the right proportions to support biology is a topic of intense scientific interest. The answer may hinge on whether Europa has environments where chemicals are matched in the right proportions to power biological processes. Life on Earth exploits such niches.

In the new study published in Geophysical Research Letters, a journal of the American Geophysical Union, scientists at NASA's Jet Propulsion Laboratory (JPL), Pasadena, California, compared Europa's potential for producing hydrogen and oxygen with that of Earth, through processes that do not directly involve volcanism. The balance of these two elements is a key indicator of the energy available for life. The study found that the amounts would be comparable in scale; on both worlds, oxygen production is about 10 times higher than hydrogen production.

The work draws attention to the ways that Europa's rocky interior may be much more complex and possibly Earthlike than people typically think, according to Steve Vance, a planetary scientist at JPL and lead author of the new study. "We're studying an alien ocean using methods developed to understand the movement of energy and nutrients in Earth's own systems. The cycling of oxygen and hydrogen in Europa's ocean will be a major driver for Europa's ocean chemistry and any life there, just it is on Earth."

Ultimately, Vance and colleagues want to also understand the cycling of life's other major elements in the ocean: carbon, nitrogen, phosphorus and sulfur.

As part of their study, the researchers calculated how much hydrogen could potentially be produced in Europa's ocean as seawater reacts with rock in a process called serpentinization. In this process, water percolates into spaces between mineral grains and reacts with the rock to form new minerals, releasing hydrogen in the process. The researchers considered how cracks in Europa's seafloor likely open up over time, as the moon's rocky interior continues to cool following its formation billions of years ago. New cracks expose fresh rock to seawater, where more hydrogen-producing reactions can take place.

In Earth's oceanic crust, such fractures are believed to penetrate to a depth of 5 to 6 kilometers (3 to 4 miles). On present-day Europa, the researchers expect water could reach as deep as 25 kilometers (15 miles) into the rocky interior, driving these key chemical reactions throughout a deeper fraction of Europa's seafloor.

The other half of Europa's chemical-energy-for-life equation would be provided by oxidants -- oxygen and other compounds that could react with the hydrogen -- being cycled into the Europan ocean from the icy surface above. Europa is bathed in radiation from Jupiter, which splits apart water ice molecules to create these materials. Scientists have inferred that Europa's surface is being cycled back into its interior, which could carry oxidants into the ocean.

"The oxidants from the ice are like the positive terminal of a battery, and the chemicals from the seafloor, called reductants, are like the negative terminal," said Kevin Hand, a planetary scientist at JPL and co-author of the study. "Whether or not life and biological processes complete the circuit is part of what motivates our exploration of Europa."

Europa's rocky, neighboring Jovian moon, Io, is the most volcanically active body in the solar system, due to heat produced by the stretching and squeezing effects of Jupiter's gravity as it orbits the planet. Scientists have long considered it possible that Europa might also have volcanic activity, as well as hydrothermal vents, where mineral-laden hot water would emerge from the sea floor.

According to Vance, researchers previously speculated that volcanism is paramount for creating a habitable environment in Europa's ocean. If such activity

is not occurring in its rocky interior, the thinking goes, the large flux of oxidants from the surface would make the ocean too acidic, and toxic, for life. "But actually, if the rock is cold, it's easier to fracture," he said. "This allows for a huge amount of hydrogen to be produced by serpentinization that would balance the oxidants in a ratio comparable to that in Earth's oceans."

NASA is currently formulating a mission to explore Europa and investigate the moon's potential habitability. The mission would send a highly capable, radiation-tolerant spacecraft into a long, looping orbit around Jupiter to perform repeated close flybys of Europa. During these flybys, the mission would take high-resolution images; determine the composition of the icy moon's surface and faint atmosphere; and investigate its ice shell, ocean and interior.

This research article will be open access for 30 days from the date of publication. A PDF copy of the article can be downloaded at the following link:
http://onlinelibrary.wiley.com/doi/10.1002/2016GL068547/pdf

http://www.eurekalert.org/pub_releases/2016-05/si-gst051716.php

Genetic switch turned on during fasting helps stop inflammation

A molecular pathway that is activated in the brain during fasting helps halt the spread of intestinal bacteria into the bloodstream, according to a new study by a team of researchers at the Salk Institute.

LA JOLLA - The study, published the week of May 16, 2016 in the Proceedings of the National Academy of Sciences, shows a molecular pathway by which the brain communicates with the gastrointestinal (GI) tract to prevent unnecessary activation of the immune system during fasting by strengthening the barrier against gut microbes. The discovery of this brain-gut signal in fruit flies, which has many parallels to humans, could eventually inform the treatment of inflammatory bowel diseases in people.

In addition to its role in promoting the absorption of nutrients from food, the GI tract is host to a panoply of bacteria. These microbes actually help in the digestive process by producing chemicals that break down complex fats and carbohydrates.

"Fasting has a positive value that spills over not just into the metabolic system, but also inflammation and brain function," says the study's lead investigator Marc Montminy, professor in the Clayton Foundation Laboratories for Peptide Biology and holder of the J.W. Kieckhefer Foundation Chair. "Understanding how the gut maintains this barrier, and creating drugs to enhance that barrier, may have important benefits for people with inflammatory bowel disease."

The new study is part of an ongoing collaborative effort by the Montminy lab and the lab of Salk Professor John Thomas to pin down the mechanisms that a genetic switch in the brain called Crtc uses to control energy balance. A constant network of communication--between our brains and the GI tract, as well as other tissues--helps our bodies keep tabs on our energy expenditure and stores. Crtc interacts with another molecule called CREB, and fasting activates both proteins and boosts formation of long-term memories.

The Montminy and Thomas teams used fruit flies to study the Crtc switch, in part because flies express many of the same metabolism-related genes as humans do. Previous experiments by the two labs have shown that flies whose Crtc gene is deleted become sensitized to fasting--they only survive about half as long without food compared to flies with the Crtc gene. The researchers were aiming to understand why the deletion of Crtc caused flies to die sooner and had hypothesized it was because these mutant flies have fewer fat and sugar stores.

What the team--along with Salk Assistant Professor Janelle Ayres' group--found in the new study, however, was surprising and more complicated. The guts of the flies without Crtc expressed several molecules indicating that their immune system was keyed up. When postdoctoral researcher Run Shen entered Montminy's lab with the evidence--pictures taken from the microscope of fluorescently stained cells lining the flies' guts--"it was totally unexpected," he says.

The new results suggest that the flies are more sensitive to starvation because the immune system is activated, which is energetically taxing. This amped-up immune response suggests that without Crtc, bacteria leak from the gut into the fly's circulation. The researchers found that the normal role of Crtc is to fortify the barriers of the gut to prevent bacteria from entering the bloodstream and awakening the immune system. Without Crtc, the connections between cells that line the gut tube become disrupted, causing bacteria to leak out, activating the immune response and depleting energy reserves.

While looking for molecular partners of Crtc, the researchers uncovered a protein called short neuropeptide F (sNPF), which is also found in the brain and has an equivalent in humans (called neuropeptide Y). This peptide is known to cause flies and mammals to search for food in response to hunger signals. Without sNPF in the brain, the flies showed signs of gut inflammation similar to those flies missing Crtc. What's more, the normally tight seals along the gastrointestinal tract were broken down in the sNPF-lacking flies, letting bacteria out.

Conversely, flies expressing more than the normal amounts of Crtc or sNPF in their neurons were able to survive longer without food and showed less disruption to the tight junctions that maintain their gastrointestinal barriers.

The researchers are conducting more experiments to understand how the neuropeptides activate the gut receptors that help protect it from bacterial invasion.

Other authors on the work were Biao Wang and Maria Giribaldi of the Salk Institute. The work was supported by the National Institutes of Health, the Leona M. and Harry B. Helmsley Charitable Trust and the Glenn Centers for Research in Aging.

http://bit.ly/25dCL9O

Being Super Busy May* Be Good for Your Brain

***Does busyness boost cognition, or do people with better cognition tend to keep busy?**

By Brian Handwerk

Slammed. Swamped. Flat out. Buried. No matter how it's said, the refrain is all too familiar—people are just too busy. But there's good news for the harried and hectic, new research shows that busy lifestyles may be good for your brain.

"There hasn't been much scientific research on busyness itself, although it's something that we talk about so often," explains Sara Festini, a cognitive neuroscientist at the University of Texas at Dallas Center for Vital Longevity, a co-author of the new research published this week in Frontiers in Aging Neuroscience. "So we wanted to look at the relationship of a generally very busy lifestyle to cognition."

Festini and colleagues found that middle-aged and older Americans who keep themselves busy test better across a whole range of different cognitive functions like brain processing speeds, reasoning and vocabulary. The memory of specific events from the past, or episodic memory, is especially enhanced among busy people, they report.

Psychologist Brent Small, director of the University of South Florida's School of Aging Studies, said the results are "in line with a large body of research suggesting that older adults who are actively engaged in cognitive stimulating activities are more likely to perform better on standard cognitive tasks."

"This paper extends that work by examining the concept of busyness," adds Small, who wasn't involved in the new research.

But the strong correlation shown between busyness and brain function also raises an intriguing chicken-and-egg question: Does busyness boost the brain, or might people with better cognitive powers be more likely to keep themselves busy?

Festini and colleagues tested 330 people, healthy individuals aged 50 to 89 who were participating in an ongoing, comprehensive study of age-related changes in brain function called the Dallas Lifespan Brain Study. They first measured participants' busyness with a survey asking questions about their activities. Sample questions include how often people had so many things to do that they went to bed late or missed meals, and how often they had too many things to do in a day to get them all done.

The scientists then evaluated brain function for each individual with a battery of tests, performed in the lab and at home, to evaluate processing speed, working memory, episodic long-term memory, reasoning and crystallized knowledge (or the ability to use skills and knowledge gained over time).

Evaluations of processing speed, for example, included comparing strings of numbers to find differences between them or quickly matching up numbers to symbols in a code. Working memory tests included computer games that asked players to remember which box out of a large group held a hidden ball, or to recall the order in which they'd been shown a number of visual patterns.

Comparing the two sets of results showed a strong relationship between busyness and cognition and, perhaps surprisingly, that the relationship didn't change with age but instead remained consistent from ages 50 to 89. "We think it's informative that we see similar relationships between busyness and cognition throughout middle age and older adulthood," Festini says. "You might expect to see larger differences in old age when there's more change going on with cognition, but we found that the relationship was consistent across our sample." The current study focused on adults 50 to 89 because this range more closely matched other studies co-author Denise Park had conducted, but Festini says she sees similar relationships in all adult's brains, aged 20 and up.

It might also have been expected that busy people would show higher levels of stress to the detriment of brain function, Festini notes. "Stress has been shown to have negative impacts on cognition and the brain," she says. But, at least among this group, if busier members were indeed more stressed, any negative impacts produced by that stress appear to have been outweighed by the benefits of busyness.

Still, Festini cautions, being very busy may well produce as yet unmeasured negative effects. Distractability, for example, wasn't measured in this test format and it may well plague those who burn the candle at both ends.

The test also wasn't designed to tackle the intriguing question of why the relationship between busyness and cognition exists at all.

Do people with better cognitive functions simply tend to lead busier lives? Or might a busier lifestyle boost the brain's cognitive powers by engaging people more frequently in the kinds of learning experiences, from iPad instruction to theater training, that research is increasingly showing to produce cognitive benefits? Might there exist a mutual feedback loop in which each option reinforces the other?

Small notes that his own work has found that changes in lifestyle activities have an interesting two-way relationship with cognition. His team tracked older adults' participation in physical activities like jogging or gardening, social activities like

going out or visiting friends, and cognitive activities like using a computer or playing bridge, and whether that participation changed over time.

“We found evidence that lifestyle activities buffered cognitive decline, but that older adults who were experiencing declines gave up lifestyle activities.”

Another intriguing possibility is that new learning improves cognitive abilities, and that the busy among us may have more opportunities to learn new things because they more frequently engage in challenging tasks and situations that appear to help keep the brain sharp.

The new results may support that idea, which has been explored in previous research including other studies in Park's lab at the UT Dallas Center for Vital Longevity.

“We think these results are consistent with some experimental work that has assigned people to learn challenging new skills like quilting and digital photography,” Festini says. “Those studies found cognitive benefits after a three-month period of intense new learning.”

If this theory turns out to be correct, scientists might devise ways to manipulate the effect and produce structured activities that promote cognitive health. In the meantime, the over-scheduled can at least take some solace that their busy lifestyles appear to go hand in hand with better brain function.

http://www.eurekalert.org/pub_releases/2016-05/gmu-ssq051816.php

Study shows GMU's Lyme disease early-detection test is effective

Researchers plan to apply technology to other diseases

After three years and 300 patients, George Mason University researchers have proof that their early-detection urine test for Lyme disease works.

It's the largest study of its kind looking at early-stage indicators for Lyme disease, said Lance Liotta, co-director and medical director of the George Mason-based Center for Applied Proteomics and Molecular Medicine. "We are looking at a highly specific protein shed from the surface of the bacteria that causes Lyme."

The research was published in the Journal of Translational Medicine.

And now Mason researchers are applying the approach to Ebola, malaria and tuberculosis, among other diseases. The Mason team is working side by side with the private company Ceres Nanoscience, which Liotta and his co-director Chip Petricoin co-founded. A test that works like a pregnancy test could be used in undeveloped countries to quickly identify disease, even when patients aren't near a hospital, he said.

The National Institutes of Health funded the research that led to Mason's patented technology, which traps tell-tale clues (such as the Lyme bacteria protein) that a disease is present. The Mason technology, which is licensed to Ceres, works during the earliest stages of disease and finds the tiniest traces missed by most diagnostic tests.

In the case of Lyme disease, some patients may still have active cases but traditional tests don't register it, Liotta said. These patients may not be receiving the additional round of treatment they need, he said.

"If the patient gets better, the test goes negative," Liotta said. "It's a good way to monitor the patient."

"We're looking to repeat the story again with these other diseases," said Alessandra Luchini, a Mason professor who spearheaded the Lyme test research, is a co-inventor of the technology, and continues to develop new applications. "Other targets for the new type of test include Chagas disease, which is infectious and caused by a parasite, and toxoplasmosis, another parasite-borne disease."

http://www.eurekalert.org/pub_releases/2016-05/uoo-iaa051716.php

Immediate aspirin after mini-stroke substantially reduces risk of major stroke

Benefits of taking aspirin immediately after minor strokes have been underestimated

Using aspirin urgently could substantially reduce the risk of major strokes in patients who have minor 'warning' events, a group of European researchers has found. Writing in the Lancet, the team say that immediate self-treatment when patients experience stroke-like symptoms would considerably reduce the risk of major stroke over the next few days.

Aspirin is already given to people who have had a stroke or transient ischaemic attack (TIA - often called a 'mini-stroke') to prevent further strokes after they have been assessed in hospital and in the longer-term, reducing the subsequent stroke risk by about 15%. However, based on a previous study in Oxford (the EXPRESS Study) the team suspected that the benefits of more immediate treatment with aspirin could be much greater.

Lead researcher Professor Peter Rothwell, a stroke expert from the University of Oxford, explained: 'The risk of a major stroke is very high immediately after a TIA or a minor stroke (about 1000 times higher than the background rate), but only for a few days. We showed previously in the 'EXPRESS Study' that urgent medical treatment with a 'cocktail' of different drugs could reduce the one-week risk of stroke from about 10% to about 2%, but we didn't know which component of the 'cocktail' was most important.'

'One of the treatments that we used was aspirin, but we know from other trials that the long-term benefit of aspirin in preventing stroke is relatively modest. We

suspected that the early benefit might be much greater. If so, taking aspirin as soon as possible after 'warning symptoms' event could be very worthwhile.'

The team - from Oxford (UK), University Medical Center Utrecht (Netherlands), University Duisburg-Essen (Germany), and Lund University (Sweden) - therefore revisited the individual patient data from twelve trials (about 16,000 people) of aspirin for long-term secondary prevention - that is, to prevent a further stroke - and data on about 40,000 people from three trials of aspirin in treatment of acute stroke.

They found that almost all of the benefit of aspirin in reducing the risk of another stroke was in the first few weeks, and that aspirin also reduced the severity of these early strokes. Rather than the 15% overall reduction in longer-term risk reported previously in these trials, aspirin reduced the early risk of a fatal or disabling stroke by about 70-80% over the first few days and weeks.

Professor Rothwell said: 'Our findings confirm the effectiveness of urgent treatment after TIA and minor stroke - and show that aspirin is the most important component.

Immediate treatment with aspirin can substantially reduce the risk and severity of early recurrent stroke. This finding has implications for doctors, who should give aspirin immediately if a TIA or minor stroke is suspected, rather than waiting for specialist assessment and investigations.'

'The findings also have implications for public education. Public information campaigns have worked in getting more people to seek help sooner after a major stroke, but have been less effective in people who have had minor strokes or TIAs. Many patients don't seek medical attention at all and many delay for a few days. Half of recurrent strokes in people who have a TIA happen before they seek medical attention for the TIA.

Encouraging people to take aspirin if they think they may have had a TIA or minor stroke - experiencing sudden-onset unfamiliar neurological symptoms - could help to address this situation, particularly if urgent medical help is unavailable.'

Dr Dale Webb, Director of Research and Information at the Stroke Association, said: 'A TIA is a medical emergency and urgent neurological assessment must always be sought. We welcome this research which shows that taking aspirin after TIA can dramatically reduce the risk and severity of further stroke.

The findings suggest that anyone who has stroke symptoms, which are improving while they are awaiting urgent medical attention can, if they are able, take one dose of 300 mg aspirin.

'The research findings are also timely, as the stroke community is currently working to develop a new set of national clinical guidelines on stroke.'

http://www.bbc.com/news/science-environment-36333760

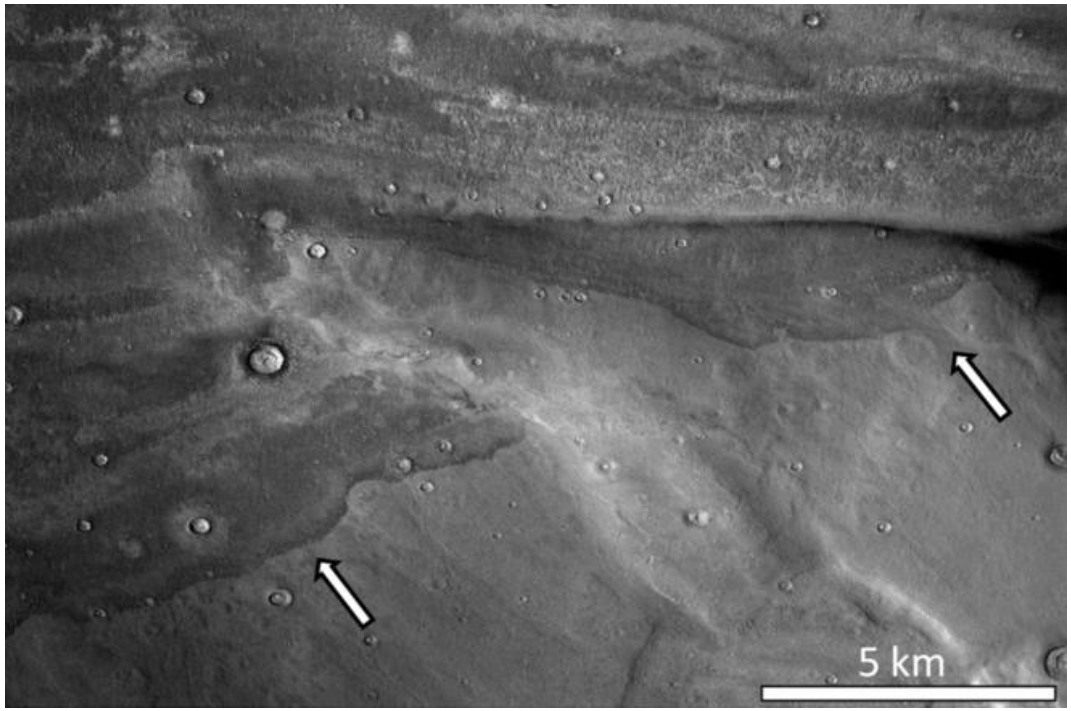
Evidence of ancient tsunamis on Mars

Scientists think they see evidence of two huge tsunamis having once swept across the surface of Mars.

By Jonathan Amos BBC Science Correspondent

They point to satellite data suggesting a major redistribution of sediments over a large region at the edge of the Red Planet's northern lowlands.

The US-led team argues that asteroid or comet strikes into an ocean of water could have triggered the giant waves. Such events could only have occurred more than three billion years ago when the planet was wetter and warmer.



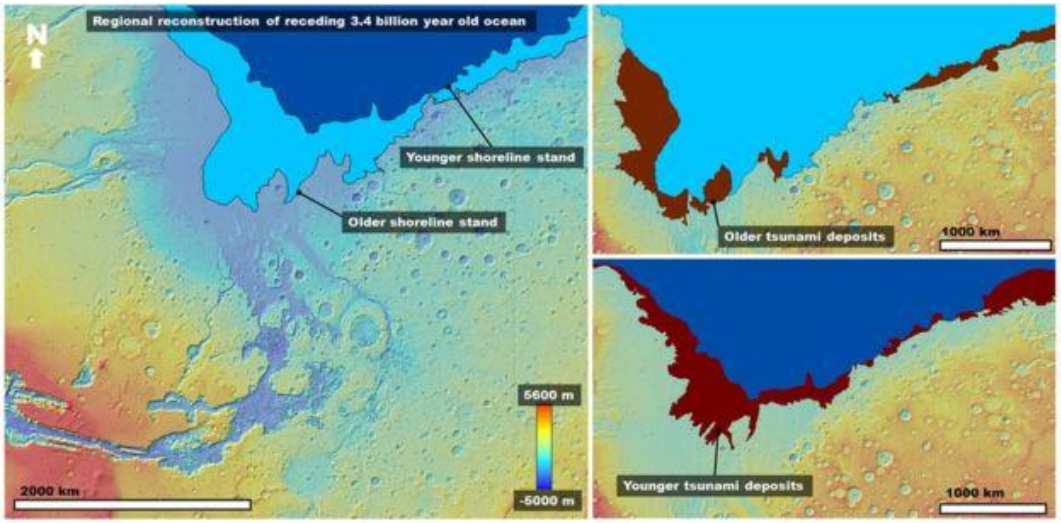
Tsunami-borne sediments (arrow) inundate the land in an upslope direction (towards bottom-right) **Alexis Rodriguez**

Today, Mars is dry and very cold, and any impact would merely dig out a dusty hole.

But researchers have long speculated that the low, flat terrain in Mars' northern hemisphere could have hosted an ocean if the climate conditions were just right.

The nagging doubt with this theory has been the absence of an identifiable shoreline - something the new study could now help explain.

If tsunamis regularly inundated the "land", dumping sediments and scouring new flow channels, they could over time have disguised what otherwise would have been an obvious "coast".



Left: ***A colour-coded digital elevation model of the study area showing the two proposed shoreline levels of an early Mars ocean that existed approximately 3.4 billion years ago.*** **Right:** ***Areas covered by the documented tsunami events extending from these shorelines.*** **Alexis Rodriguez**

"Clearly, it's one of the implications of this work: to have tsunamis, you must have an ocean," said Alexis Palmero Rodriguez from the Planetary Science Institute in Tuscon, Arizona.

"So, we think this is going to remove a lot of the uncertainty that surrounds the ocean hypothesis. Features that have in the past been interpreted as relating to an ocean have been controversial; they can be explained by several, alternative processes. But the features we are describing - such as up-slope flows including large boulders - can only be explained in terms of tsunami waves," he told BBC News.

Did early Mars have a vast northern ocean? **Science Photo Library**

Dr Rodriguez and colleagues' tsunami findings appeared on Thursday in the journal Scientific Reports.

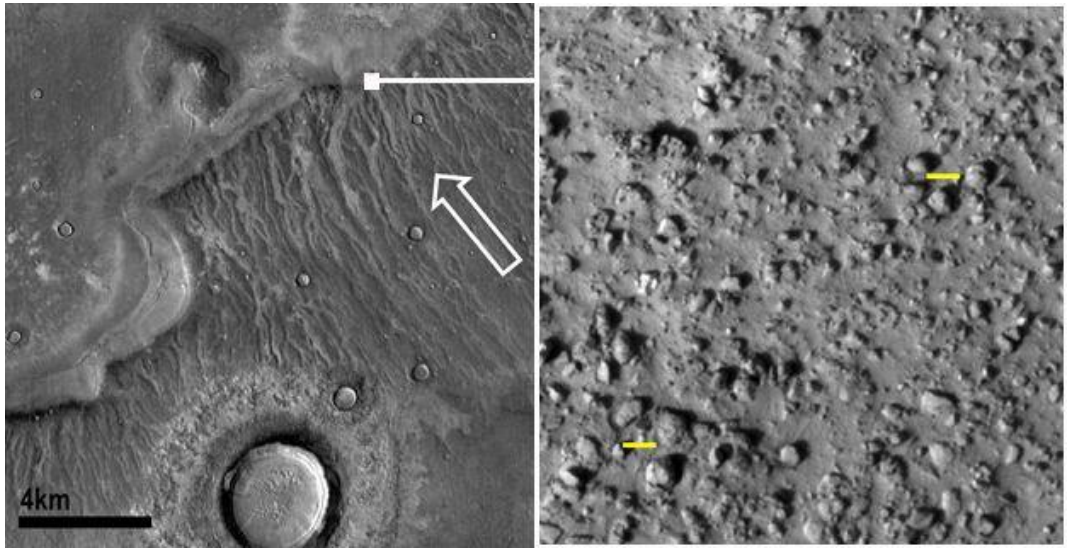
Their work centres on two connected regions of Mars, known as Chryse Planitia and Arabia Terra. The team claims that the sediments observed by satellite betray the action of two ancient mega-tsunamis.

The older event is perhaps easier to understand in an Earth context, where energetic waves can pick up sediments, including massive boulders, and dump them at a higher elevation. The water, as it turns back to run downhill, then cuts new channels - such as the ones identified on Mars by Dr Rodriguez's group.

But the scientists go on to describe the traces of a second, younger event. This is calculated to have occurred a few million years later, when the climate had cooled significantly.

In this instance, the tsunami wave likely froze as it propagated across the land surface. This is suggested by the observation of "lobes" of sediment without the backwash channels.

On Earth, the frozen floes capping a sea or a lake can sometimes be pushed ashore by a storm surge. It is an unusual phenomenon but would be analogous to what is being suggested - albeit on a much larger scale - for Mars.



A view **(right)** ***of a boulder-rich surface (yellow bars are 10m) deposited by the older tsunami, and then eroded*** **(left)** ***by channels produced as the tsunami water returned to the ocean elevation level*** **Alexis Rodriguez**

The team has estimated the energetics of the impacts and their ensuing tsunamis, based on the scale of the sediment distributions. The craters that were produced

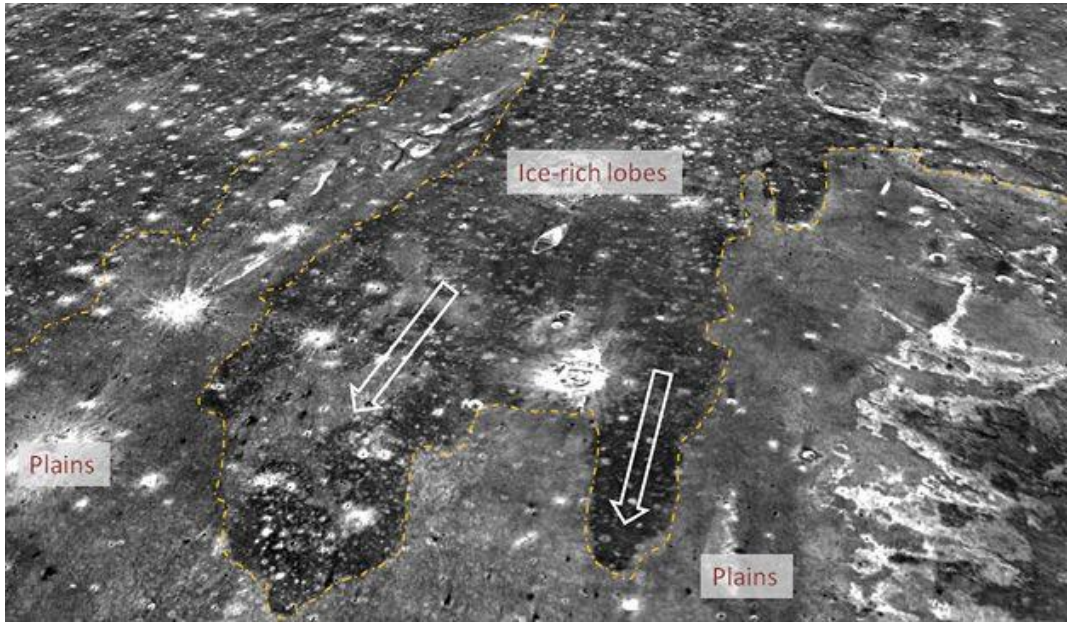
were probably about 30km across, they say. The waves could have been 50m in height, or even 120m at some locations. The areas affected by the tsunamis cover some 800,000 sq km for the older event and 1,000,000 sq km for the younger one.

"On Earth, the K-T boundary impact (that wiped out the dinosaurs) produced an enormous tsunami wave that hit the continental United States, equivalent to the area we see flooded in our study region on Mars," Dr Rodriguez added.

Wet Red Planet?

Having lost some currency, the idea of an ocean on Mars is gaining popularity again. Investigations by Nasa's Curiosity rover at Gale Crater have revealed that the deep bowl likely contained persistent lakes in the past.

Such water, it is argued, could only have been maintained if there was a robust hydrological system on Mars, cycling moisture between a large sea somewhere on the planet, its atmosphere and its land surface.



This satellite image taken using a thermal (temperature) sensor shows ice-rich lobes thought to be the remnants of tsunami waves that transitioned into slurry ice-rich flows as they propagated under extremely cold climatic conditions. The up-slope direction of flow is indicated by the white arrows. The lobe length is about 250km. **Alexis Rodriguez**

"[The] large expanse of currently documented tsunami inundation is but a portion of what occurred along the margin of the Martian northern plains-filling ocean," said co-author Kenneth Tanaka of the US Geological Survey.

"Tsunami-related features along other parts of the ocean margin, and potentially other smaller former bodies of water, remain to be identified, mapped and studied in detail."

Peter Grindrod from University College London was not involved in the study. He commented: "The idea of a northern ocean on Mars has been floating around for decades. But the evidence hasn't been able to push this idea forward as the consensus view.

"However, this possible evidence of tsunami deposits is interesting and, along with other recent studies of widespread deltas, could perhaps mark the beginning of a reinvigoration of the ocean hypothesis."

The lobe deposits from the younger event would be an excellent location for future exploration by surface robots or astronauts, the team believes.

They are relatively undisturbed and so probably retain important information about the nature of the ocean, and possibly even some bio-signatures if the body of water happened to support life.

http://www.eurekalert.org/pub_releases/2016-05/e-tso051916.php

The science of the condolence letter

Should doctors standardize their expressions of sympathy?

The results of a new survey published in ecancermedicalscience indicate that a majority of oncology professionals believe that writing condolence letters to the families of deceased patients is an important component of cancer palliative care.

The study explored whether institutions should consider changing policies to raise condolence letters to a more official standing.

But because this practice is a personal grace note, it has rarely been studied or discussed. In particular, this issue hasn't been researched in the UK, where cultural practices surrounding grief are often private.

Researchers led by Dr Naveen Vasudev of St James's Institute of Oncology and the University of Leeds, UK and Ms Jessica Hayward, a medical student at the University of Leeds, surveyed 47 local oncologists and palliative care consultants to learn more about this overlooked chapter of the cancer care story.

"I was reflecting on my own practice, and I became aware that my colleagues all seemed to be doing different things when expressing condolences," says Dr Vasudev, corresponding author of the study.

"So, we thought it would be interesting to document this variation and try to understand the underlying reasons." These preliminary findings suggest that this habit is very personal and should remain so.

"The doctors in our survey felt strongly about when and how they wished to express their condolences to bereaved relatives," says Ms Hayward.

"Trying to make practice more uniform may be seen as a good thing, but this doesn't seem to be appropriate or feasible."

Notably, the majority of doctors surveyed (72%) were not in favour of introducing policies to unify their practices.

"Condolence letters are a matter of professional discretion and judgement and should not become a 'policy'," one doctor wrote in response to the survey.

Other doctors stressed that every letter should ring with a personal note, lest families be hurt by perceived indifference or formulaic treatment.

"This is a small study, with lots of scope to build on these initial results," says Dr Vasudev. "It would be interesting to document practice on a much wider scale, both increasing numbers and also perhaps to include other specialties beyond oncology and palliative care.

It would also be important to find out the views of bereaved relatives themselves."

"We hope that it might inspire readers to think about this issue, and to reflect on their own current practice following the death of a patient," adds Ms Hayward.

For doctors, this overlooked practice appears to be an important - and now acknowledged - part of the cancer story.

Read the study here: http://ecancer.org/journal/10/full/642-letters-of-condolence-assessing-attitudes-and-variability-in-practice-amongst-oncologists-and-palliative-care-doctors-in-yorkshire.php

http://www.eurekalert.org/pub_releases/2016-05/w-teo051916.php

The effects of laxatives may provide new clues concerning Parkinson's disease

Year-on-year increase in rigidity in Parkinson's disease leveled out with regular use of laxatives

In a recent retrospective analysis, investigators discovered that the year-on-year increase in rigidity found in Parkinson's disease flattened off with the regular use of laxatives to manage constipation. The findings lend support to previous research indicating that changes in the gut--and perhaps an imbalance in the microbes that reside there--may affect aspects of Parkinson's disease. The group is planning further research to confirm the precise mechanisms involved.

"That the apparent effect of regular laxatives appeared in those who had never received drugs for Parkinson's disease points to modification of an underlying disease process," said Dr John Dobbs, co-lead author of the British Journal of Clinical Pharmacology analysis. "Different aspects of Parkinson's disease may, of course, have different drivers," added co-lead author Dr Sylvia Dobbs. "For example, our controlled trial of eradicating Helicobacter from the stomach showed a beneficial effect on the diminished movement characteristic of Parkinson's disease."

http://www.bbc.co.uk/news/business-36328847

Bayer makes takeover offer for agriculture giant Monsanto

German drug and chemicals-maker Bayer has made a takeover bid for agricultural giant Monsanto in a deal that could create the world's biggest supplier of seeds and pesticides.

Monsanto is known as a specialist in genetically modified crops.

The offer comes amid a wave of consolidation in the industry, with rivals Dow Chemical, DuPont and Syngenta all entering mergers recently.

However, any tie-up is likely to depend on regulators' competition concerns.

"There is no assurance that any transaction will be entered into or consummated, or on what terms," Monsanto said in a statement. It added there would be "no further comment" until the board of directors completed its review of the proposal.

Bayer confirmed the talks saying it "recently met with executives of Monsanto to privately discuss a negotiated acquisition" with the goal of creating "a leading integrated agriculture business." Shares in Bayer closed down more than 8% on Thursday after the offer was announced.

There has been speculation for some months that Monsanto, the world's biggest seed company, could become a target for either Bayer or BASF.

Bayer, which has a market value of about $90bn, is the second-largest producer of crop chemicals after Syngenta. Monsanto, which has a market capitalisation of $42bn, attempted to buy Swiss rival Syngenta last year.

However, Syngenta ended up accepting a $43bn offer from ChemChina in February, although that deal is still being reviewed by regulators in the US.

Bayer's acquisition of Monsanto is expected to be bigger in value than the ChemChina-Syngenta deal. The biggest merger in the chemicals industry took place late last year when Dow Chemical teamed up with Du Pont to form a new $130bn company.

Merger worries

Currently agricultural commodities such as corn and soybean are trading at low prices, hurting farmers' incomes and also profits at seed and chemical companies.

Lower sales of seeds, fertilisers and pesticides have led to higher inventories, forcing companies to cut prices and look at ways to become more efficient.

However, a tie-up between Bayer and Monsanto could raise US competition concerns because of the sheer size of the combined company and the control they would have over the seeds and sprays business.

Farmer groups have raised concerns that such mergers could lead to fewer choices and higher prices.

http://nyti.ms/1XpVAR3

W.H.O. Calls Yellow Fever in Africa 'Serious Concern'

An emergency advisory committee to the World Health Organization called the spread of yellow fever in Africa a serious concern on Thursday and advocated drastically expanding vaccinations to combat it.

By DONALD G. McNEIL Jr.MAY 19, 2016

But the agency stopped short of declaring a global health emergency, because a fast-moving outbreak that began in Angola in December appears to be coming under control.

"The committee was of the opinion that we have a serious issue on our hands," said Dr. Oyewale Tomori, a Nigerian yellow fever expert who heads the advisory panel, "but it does not constitute a public health emergency of international concern."

The Angolan outbreak spread to three other countries, including China, and has claimed about 300 lives. In April, the W.H.O. warned that its emergency stock of yellow fever vaccine was close to exhaustion. Dr. Margaret Chan, the director general of the W.H.O., flew to Angola that month to draw attention to the crisis.

But increased manufacturing capacity by the four companies making the vaccine and diversion of doses away from routine vaccination to Africa has brought the stockpile back to its normal level of six million doses, which could triple within a few months, said Dr. Bruce Aylward, the agency's executive director for outbreaks and health emergencies.

The vaccine costs the W.H.O. about $1 a dose, and one shot usually gives lifetime protection, Dr. Tomori said.

The outbreak began in Luanda, Angola's capital, rose to over 2,400 suspect cases and then spread to the Democratic Republic of Congo and Kenya, and to China, where there were 11 cases among expatriate workers.

Urban outbreaks are considered the most dangerous, and a second one had appeared to be erupting in Kinshasa, Congo's capital. But that country has a history of yellow fever vaccination and the spread was relatively slow, Dr. Aylward said. In China, there have been no more cases in a month and all workers traveling to or from Africa are now vaccinated, he said. Many Chinese workers are in Africa building roads and bridges, and employed in oil fields and other industries.

There is no treatment for yellow fever, which is related to dengue, Zika and West Nile viruses, and it is spread by the same Aedes aegypti mosquitoes.

Unlike the Zika virus, it is not known to cause microcephaly in babies, but it is often lethal in itself, killing through high fevers, liver damage and organ failure.

In April, the Centers for Disease Control and Prevention said it could not give Africa as much help as it normally would have because most of its mosquito-disease experts were fighting the Zika virus in Brazil, Puerto Rico and elsewhere.

In March, the disease-alert service ProMED — which warned almost a year ago that Zika might spread in Latin America — issued an unusually strong alert. John P. Woodall, a founder of the service, calculated how much yellow fever vaccine the world could make in a year, and said that if the disease spread to parts of Asia with the right climate and mosquitoes, "hundreds of thousands could die before Y.F. vaccine stocks could be boosted and delivered."

The four manufacturers can make up to 80 million doses a year at full capacity, Dr. Aylward said. The emergency committee was convened partly to consider whether, if the threat of a global epidemic loomed, it would make medical sense to dilute doses to stretch supplies.

That idea was rejected because the outbreak appears to be coming under control. Dr. Tomori said the next step would be to build up enough capacity to routinely vaccinate children in the tropics everywhere there is risk.

Yellow fever normally circulates in monkeys, and human outbreaks are usually limited to jungle villages, logging camps and mining areas. But Luanda has more than six million people.

After more than five million Angolans were vaccinated, cases in Luanda dropped. New clusters appeared in several of the country's provinces and spread to other countries and China, but vaccination now appears to be containing them.

Dilution would be considered again only "if we get any other outbreaks that turn explosive," Dr. Aylward said.

http://bit.ly/1Tu0HLl

Nile Crocodiles Have Moved to Florida

Three "unusual" crocodilians turned out to be more closely related to South African crocs than American ones

By Marissa Fessenden

Florida is home to a variety of both alligators and crocodiles, and in the states alligators are considered the more ferocious of the two. This isn't the case everywhere in the world, however. Nile crocodiles have a considerably fiercer reputation than their American cousins.

So there's no need to worry about Florida's crocodiles, right? Well, maybe ten years ago. Recent DNA analysis has confirmed that three crocodilians captured in southern Florida between 2009 and 2014 were actually Nile crocodiles, reports Oliver Milman for The Guardian.

One was a hatchling, spotted on a porch and the other two were larger crocodiles from near Homestead, writes Sara Laskow for Atlas Obscura. Scientists analyzed

genetic material from the trio and found that they were Nile crocodiles, closely related to those in South Africa. Two were related to each other. The third probably was as well, but problems with the quality of DNA kept the researchers from figuring this out for sure.

Scientists were first alerted to the presence of "unusual looking crocodilians" by private citizens, the team reports in a paper for Herpetological Conservation and Biology. The largest of the three wasn't even three-feet long yet. Contrary to some headlines, these little crocs are not "man-eating." But "Largemouth Bass-eating crocs" doesn't sound as exciting even if that's what lingered in the the largest specimen's stomach.

While it sounds like the discovery of only three individuals isn't much cause for alarm, the researchers suspect there might be more out there. "The odds that the few of us who study Florida reptiles have found all of the Nile crocs out there is probably unlikely," Kenneth Krysko, a herpetologist from the University of Florida and lead author for the paper tells The Guardian.

The group also reported on a fourth individual had escaped from its enclosure at Billie Swamp Safari in 1996 or 1997, and was probably 4 to 5 feet long at the time. By the time it was recaptured in 2000, it had grown to almost 10 feet. Full-grown Nile crocodiles can be 16 feet long. The team didn't get genetic samples from this animal, but they do think that case means Nile crocodiles can thrive in Florida.

How did these creatures get to Florida, nearly 8,000 miles from South Africa?

The DNA analysis shows that they didn't match animals kept at Florida attractions such as Disney's Animal Kingdom, so they must have been brought to the state illegally, reports Terry Spencer for the Associated Press (via the Orlando Sentinel). Already Florida is grappling with the ecosystem-upsetting effects of invasive feral pigs, lionfish and giant pythons. Not only could Nile crocodiles pose a threat to humans and native animals, but they could threaten the approximately 1,000 American crocodiles that already call the Everglades home either through competition or interbreeding. At this point, however, no one knows whether or not there are more Nile crocs in the state of Florida.

http://www.eurekalert.org/pub_releases/2016-05/fos--mmc052016.php

Modified microalgae converts sunlight into valuable medicine

Microalgae modified to produce chemicals such as cancer treatment drugs

A team of scientists from Copenhagen Plant Science Centre at University of Copenhagen have modified a microalgae so it will soon be able to produce valuable chemicals such as cancer treatment drugs and much more just by harnessing energy from the sun

Researchers from Copenhagen Plant Science Centre at University of Copenhagen have succeeded in manipulating a strain of microalgae to form complex molecules to an unprecedented extent. This may pave the way for an efficient, inexpensive and environmentally friendly method of producing a variety of chemicals, such as pharmaceutical compounds.

"So basically, the idea is that we hijack a portion of the energy produced by the microalgae from their photosynthetic systems. By redirecting that energy to a genetically modified part of the cell capable of producing various complex chemical materials, we induce the light driven biosynthesis of these compounds," says Post Doc Agnieszka Janina Zygadlo Nielsen, who along with colleagues Post Doc Thiyagarajan Gnanasekaran and PhD student Artur Jacek Wlodarczyk has been the main researcher behind the study.

The researchers have as such modified microalgae genetically to become small chemical factories with a build in power supply. According to the research team's study, this basically allows sunlight being transformed into everything ranging from chemotherapy or bioplastics to valuable flavor and fragrance compounds.

As Agnieszka Janina Zygadlo Nielsen describes, the problem with many of these substances today is namely that they are extremely expensive and difficult to make, and therefore produced only in small quantities in the medicinal plants.

"A cancer drug like Taxol for instance is made from old yew trees, which naturally produce the substance in their bark. It is a cumbersome process which results in expensive treatments. If we let the microalgae run the production this problem could be obsolete," she explains.

Sustainable production from wastewater

Thiyagarajan Gnanasekaran clarifies that the method can be run sustainably and continuously, and that this is what makes it even more spectacular compared to present methods.

"Our study shows that it is possible to optimize the enzymatic processes in the cells using only sunlight, water and CO2 by growing them in transparent plastic bags in a greenhouse. Theoretically, the water could be replaced with sewage water, which could make the process run on entirely renewable energy and nutrient sources. Recycling wastewater from industry and cities to produce valuable substances would surely be positive," he points out.

Agnieszka Janina Zygadlo Nielsen adds: "If we can create a closed system that produces the valued chemicals from water, sunlight and CO2, it would be a fully competitive method compared to the ones used today, where it is primarily extracted from plants or yeast and E. coli bacteria producing the substances. In theory it should be cheaper on the long run to use our method than adding the large quantities of sugar that the conventional yeast and E.coli cultures amongst other things need to function."

A method with revolutionizing perspectives

However, the research team emphasizes that the method using genetically modified microalgae has its limitations at present time. As Thiyagarajan Gnanasekaran points out, the microalgae use much of the harnessed sunlight to keep their own metabolic processes running:

"It is difficult to produce large quantities of the desired compounds in microalgae because they have to use a large amount of the produced energy for themselves, since they are fully photosynthetic organisms. Exactly for this reason, it makes good sense to have them produce the particularly valuable substances which are cost effective to produce in relatively small quantities at a time, as for instance medicine."

However, according to the team the expanding methods and genetic tools for microalgae are likely to overcome these limitations within near future.

http://www.livescience.com/54825-scientists-measure-intuition.html

The Science of Intuition: How to Measure 'Hunches' and 'Gut Feelings'

The Science of Intuition: How to Measure 'Hunches' and 'Gut Feelings'

By Cari Nierenberg, Live Science Contributor | May 20, 2016 02:19pm ET

Whether you call it a "gut feeling," an "inner voice" or a "sixth sense," intuition can play a real part in people's decision making, a new study suggests.

For the first time, researchers devised a technique to measure intuition. After using this method, they found evidence that people can use their intuition to make faster, more accurate and more confident decisions, according to the findings, published online in April in the journal Psychological Science.

The study shows that intuition does, indeed, exist and that researchers can measure it, said Joel Pearson, an associate professor of psychology at the University of New South Wales in Australia and the lead author of the study. [Top 10 Mysteries of the Mind]

Intuition is a popular topic in psychology these days, and generally refers to a brain process that gives people the ability to make decisions without the use of analytical reasoning, the researchers suggest. Despite widespread acceptance of this idea by psychologists and the public, scientists have lacked a reliable test to gather objective data on intuition and even prove its existence.

Previous studies didn't actually measure intuition because researchers didn't really know how to quantify it, Pearson said. Instead, these studies relied on information from questionnaires that asked people how they were feeling while they made decisions, which is more of a reflection of people's opinion of their intuition than an actual measurement of it, Pearson said.

In the new research, however, Pearson and his colleagues came up with a series of experiments to determine whether people were using their intuition to help guide their decision making or judgment. The researchers defined intuition as the influence of "nonconscious emotional information" from the body or the brain, such as an instinctual feeling or sensation.

Measuring intuition

In the experiments, the researchers showed small groups of about 20 college students black-and-white images of dots moving around on one half of a computer screen. The researchers asked the students to decide whether the dots were generally moving to the left or to the right. As the participants made this decision, on the other side of the computer screen, they saw a bright, flashing square of color.

But sometimes, the researchers embedded an image into the colorful square that was designed to trigger an emotional response from the participants. For example, each image was aimed at eliciting either a positive emotion (a puppy or a baby) or a negative emotion (a gun or a snake). However, the participants were not aware that they were being shown these emotional images because they flashed at speeds too fast to be consciously perceived.

These subliminal images were meant to simulate the type of information involved in intuition — they were brief, emotionally charged and subconsciously perceived.

The results showed that when the participants were shown the positive subliminal images, they did better on the task: They were more accurate in determining which way the dots were moving. But they also responded more quickly and reported feeling more confident in their choice. [10 Things That Make Humans Special]

The experiments also suggested that the participants became better at using their intuition over time, Pearson said. "It's all about learning to use unconscious information in your brain," he said. Just as people can become more comfortable making decisions when they apply logic and reasoning, they may also become more adept at trusting their intuition when they use it more frequently over time, the study revealed.

Intuition can help people make better decisions under the right circumstances, Pearson said. The study showed that information subconsciously perceived in the brain will help with decisions if that information holds some value or extra evidence beyond what people already have in their conscious mind, he said.

In the future, the researchers might be able to develop a method to train people to take advantage of their intuition and then test them to see if their intuition truly improved with more frequent use and practice, Pearson said.

http://bit.ly/1XMmQJT

Ancient 'Mad Libs' Papyri Contain Evil Spells of Sex and Subjugation

Ancient 'Mad Libs' Papyri Contain Evil Spells of Sex and Subjugation

By Owen Jarus, Live Science Contributor | May 20, 2016 12:24pm ET

Ancient, magical spells of love, subjugation and sex: It may sound like a "Game of Thrones" episode, but these evildoings are also found on two recently deciphered papyri from Egypt dating to around 1,700 years ago.

One spell invokes the gods to "burn the heart" of a woman until she loves the spell caster, said Franco Maltomini of the University of Udine in Italy, who translated the two spells. Another spell, targeted at a male, uses a series of magical words to "subject" him, forcing him to do whatever the caster wants.

This papyrus includes a love spell that invokes several gods to "burn the heart" of a woman until she loves the person who cast the spell. **© the Imaging Papyri Project, University of Oxford & Egypt Exploration Society**

The two spells were not targeted at a specific person. Rather, they were written in such a way that the person who cast the spell would only need to insert the name of the person being targeted — sort of like an ancient "Mad Libs."

Researchers date the two spells to the third century A.D., but the names of the ancient spell writers are unknown. The spells are written in Greek, a language widely used in Egypt at the time.

Archaeologists Bernard Grenfell and Arthur Hunt discovered the spells in Oxyrhynchus, Egypt, more than 100 years ago, among a haul of hundreds of thousands of papyri. Over the past century, scientists have gradually studied and translated the papyri. Many of them are now owned by the Egypt Exploration Society and are housed and studied at the University of Oxford in England.

Maltomini is part of a larger group of editors and contributors from multiple institutions who analyzed and translated the most recent batch of these magical texts, which will be published in an upcoming volume of "The Oxyrhynchus Papyri," a series a books devoted to publishing the papyri from Oxyrhynchus.

A love spell

The deciphered love spell invokes several gnostic gods. (Gnosticism was an ancient religion that incorporated elements of Christianity.) It says that the spell caster should burn a series of offerings in the bathhouse (the names of the offerings didn't survive degradation) and write a spell on the bathhouse's walls, which Maltominitranslated as follows:

"I adjure you, earth and waters, by the demon who dwells on you and (I adjure) the fortune of this bath so that, as you blaze and burn and flame, so burn her (the woman targeted)whom (the mother of the woman targeted) bore, until she comes to me…"

Then, the spell names several gods and magical words. It goes on to say, "Holy names, inflame in this way and burn the heart of her…" until she falls in love with the person casting the spell.

Animal droppings and magic

The text of the other deciphered spell calls for the person casting it to engrave onto a small copper plaque a series of magical words, including the phrase translated as ***"subject to me the (name of the) man, whom (the name of the man's mother) bore…" and then to stitch the plaque onto something the man wears, such as a sandal.***

The spell, if successful, was supposed to force the manto do whatever the spell caster wanted,the ancient text says. On the back of that papyrus is a list of recipes that use droppings from animals to treat a wide range of conditions, including headaches and leprosy. Some of the recipes simply say that they help "promote pleasure." One recipe says that a combination of honey and droppings from a bittern bird, used in a way that isn't specified, will "promote pleasure," according tothe ancient text.

http://bit.ly/25baq9n

When DNA Implicates the Innocent

The criminal justice system's reliance on DNA evidence, often treated as infallible, carries significant risks

By Peter Andrey Smith on June 1, 2016

In December 2012 a homeless man named Lukis Anderson was charged with the murder of Raveesh Kumra, a Silicon Valley multimillionaire, based on DNA evidence. The charge carried a possible death sentence. But Anderson was not

guilty. He had a rock-solid alibi: drunk and nearly comatose, Anderson had been hospitalized—and under constant medical supervision—the night of the murder in November.

Later his legal team learned his DNA made its way to the crime scene by way of the paramedics who had arrived at Kumra's residence. They had treated Anderson earlier on the same day—inadvertently "planting" the evidence at the crime scene more than three hours later.

The case, presented in February at the annual American Academy of Forensic Sciences meeting in Las Vegas, provides one of the few definitive examples of a DNA transfer implicating an innocent person and illustrates a growing opinion that the criminal justice system's reliance on DNA evidence, often treated as infallible, actually carries significant risks.

As virtually every field in forensics has come under increased scientific scrutiny in recent years, especially those relying on comparisons such as bite-mark and microscopic hair analysis, the power of DNA evidence has grown—and for good reason. DNA analysis is more definitive and less subjective than other forensic techniques because it is predicated on statistical models.

By examining specific regions, or loci, on the human genome, analysts can determine the likelihood that a given piece of evidence does or does not match a known genetic profile, from a victim, suspect or alleged perpetrator; moreover, analysts can predict how powerful or probative the match is by checking a pattern's frequency against population databases. Since the mid-1990s the Innocence Project, a nonprofit legal organization based in New York City, has analyzed or reanalyzed available DNA to examine convictions, winning nearly 200 exonerations and spurring calls for reform of the criminal justice system.

Like any piece of evidence, however, DNA is just one part of a larger picture. "We're desperately hoping that DNA will come in to save the day, but it's still fitting into a flawed system," says Erin E. Murphy, a professor of law at New York University and author of the 2015 book Inside the Cell: The Dark Side of Forensic DNA. "If you don't bring in the appropriate amount of skepticism and restraint in using the method, there are going to be miscarriages of justice."

For example, biological samples can degrade or be contaminated; judges and juries can misinterpret statistical probabilities. And as the Anderson case brought to light, skin cells can move.

Since 1997, when researchers first showed that it was possible to gather genetic information about a person based on skin cells they had left on an object, this type of trace evidence, also known as touch DNA, has been increasingly collected from surfaces such as door and gun handles. (In some jurisdictions, such as Harris County, Texas, the number of touch DNA cases submitted for laboratory analysis increased more than threefold between 2009 and 2013, often as a means of identifying possible perpetrators for burglaries and thefts.)

Commercial companies now sell kits to law-enforcement agencies that can generate a full genetic profile of an individual from as few as three to five cells. Independent labs and scientists working on such projects as identifying long-deceased individuals also employ the kits.

Until recently, this type of DNA has been regarded as incontrovertible proof of direct contact. But a growing number of studies show that DNA does not always stay put.

For example, a person who merely carried a cloth that had been wiped across someone else's neck could then transfer that person's DNA onto an object he or she never touched, according to a study published earlier this year in the International Journal of Legal Medicine. Similarly, Cynthia M. Cale, a master's candidate in human biology at the University of Indianapolis, recently reported in the Journal of Forensic Sciences that a person who uses a steak knife after shaking hands with another person transfers that person's DNA onto the handle.

In fact, in a fifth of the samples she collected, the person identified as the main contributor of DNA never touched the knife.

Cale and her colleagues are among several groups now working to establish how easily and how quickly cells can be transferred—and how long they persist. "What we get is what we get," Cale says, "but it's how that profile is used and presented that we need to be cautious about."

At the forensics meeting in Las Vegas, Kelley Kulick, a public defender for the County of Santa Clara, presented the idea that Anderson's DNA hitched a ride on the medics' uniforms.

Just how often transferred DNA ends in a wrongful accusation is unknown. "Although clear cases appear to be quite uncommon, I think it's probably more prevalent than we think," says Jennifer Friedman, a public defender in Los Angeles and DNA specialist. "The problem is that what we don't see frequently is the ability to definitely prove that transfer occurred."

The erroneous interpretation of touch DNA for Anderson has now also become a contentious issue for two co-defendants on trial for the Kumra murder, Kulick says. No doubt DNA evidence remains an invaluable investigative tool, but forensic scientists and legal scholars alike emphasize that additional corroborating facts should be required to determine guilt or innocence. Like all forms of evidence, DNA is only one circumstantial clue. As such, Anderson's case serves as a warning that a handful of wayward skin cells should not come to mean too much.

http://www.eurekalert.org/pub_releases/2016-05/esoh-hdo051816.php

How does obesity cause disease in organs distant from those where fat accumulates?

New genetic evidence points the way

Barcelona, Spain: Obesity is on the rise throughout the world, and in some developed countries two-third of the adult population is either overweight or obese. This brings with it an increased risk of serious conditions such as heart disease, stroke, cancer and osteoarthritis. Many of these conditions do not appear to affect the parts of the body where the excess fat accumulates, but rather to involve body systems that are remote from the fat accumulation. Now an international group of scientists has taken an important step towards understanding the links between obesity and the related, yet physically distant, diseases it causes, the annual conference of the European Society of Human Genetics will hear today.

Ms Taru Tukiainen, D.Sc., a postdoctoral researcher working at the Institute for Molecular Medicine Finland (FIMM), Helsinki, Finland and colleagues from the UK and US, set out to study the relationship between body mass index (BMI), a common-used way of measuring obesity, and gene expression in 44 different tissue types, including some that are rarely accessible in large sample sizes, for example the brain and internal organs. "Most tissue sampling is invasive, but we were able to use the GTEx* dataset of tissues from autopsy donors, and therefore sample a far wider range than is usually possible," Ms Tukiainen explains. "This is the first time that such changes in human tissue function in response to alterations in BMI have been explored among so many body systems simultaneously."

The researchers found simultaneous changes in response to obesity in almost all the tissues studied. "These results show that obesity really is a systemic condition, and particularly a condition of systemic inflammation. Interestingly, though, the changes in tissue function appeared to be only partially shared between different types of tissues; some tissues clearly act in pairs with one half of the pair compensating for - or enhancing - the dysfunction of the other. For instance, adipose tissue and adrenal glands, which are both organs secreting hormones essential to metabolism, often react to changes in BMI in completely opposite ways, including a decrease in metabolic activity in the former and an increase in the latter," Ms Tukiainen will say.

Although lifestyle changes are the most effective way to combat obesity, they can be hard work and difficult to maintain. Therefore the biological processes identified by the researchers may help the treatment of obesity by identifying potential drug targets, and particularly tissue-specific targets, they say. The results may also help to distinguish groups of individual who are at higher risk of developing complications, and lead toward personalised care.

"Our research highlights the burden of overweight and obesity on the digestive system. Although this is unsurprising, given the role of digestive system tissues in food processing, we found alarming links between BMI-related changes in different parts of the digestive tract and genes implicated in some diseases, for example Crohn's disease.

"An association between two variables does not necessarily imply there is a causal link and, from the gene expression results alone, we cannot tell which is driving which. Do changes in BMI or changes in gene expression come first? We can, however, address the potential causes by using genetic variants known to be associated with BMI in combination with our data on gene expression," says Ms Tukiainen.

Large-scale genome-wide association studies have already identified nearly 100 genetic variants that influence BMI. Analyses by the group that interpret this information further have shown that many of these gene expression changes, particularly in adipose tissue, appear to be caused by increased BMI.

"I believe that our work adds to the weight of evidence, and provides hypotheses for other researchers to follow up in the hope of being able to translate the results into ways of preventing and treating the very serious complications of obesity," Ms Tukiainen will conclude.

**GTEx is a dataset consisting of thousands of tissue samples in which the RNA from each sample has been sequenced to measure gene expression. Because it is not a dataset collected specifically for obesity research, the donors are representative of the population as a whole, and the obesity epidemic is clearly reflected in that only 31% of GTEx donors are or normal weight; the remainder are either overweight or obese.*

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