http://www.eurekalert.org/pub_releases/2015-08/rup-imc082715.php

Inducing metabolic catastrophe in cancer cells

A study published in The Journal of Cell Biology describes a way to force cancer cells to destroy a key metabolic enzyme they need to survive.

Cancer cells survive the stressful environment inside a tumor in part through autophagy, the controlled digestion and recycling of damaged components. However, blocking the process doesn't kill cancer cells, so researchers have been looking for a way to make cells vulnerable to autophagy shutdown.

Researchers at Harvard Medical School in Boston used an ovarian cancer cell line that is resistant to the autophagy inhibitor spautin-1 or an upgraded version of this molecule. After screening more than 8,200 compounds, they found that quizartinib was the most effective at enhancing the cells' vulnerability to either of the autophagy blockers. Quizartinib inhibits FLT3, an enzyme that is important for the normal development of hematopoietic stem cells and a validated target for acute myeloid leukemia (AML). The drug is currently in clinical trial for treatment of AML, but its value beyond has not been well explored.

The team found that quizartinib and the improved version of spautin-1 killed tumor cells from a variety of cell lines while leaving noncancerous cells unscathed. Treating cancer cells with quizartinib alone inhibited an important metabolic pathway, glycolysis, and activated macroautophagy, the best known type of autophagy in which the cell digests a large portion of its contents. In contrast, cells that received both compounds couldn't initiate macroautophagy, but they switched on chaperone-mediated autophagy, a selective form of the process that eliminates individual molecules.

One of its targets was the enzyme Hexokinase2 (HK2), which is crucial for glucose metabolism and is often overexpressed in cancer cells. By eliminating HK2, quizartinib and the autophagy inhibitor may prevent cancer cells from metabolizing absorbed glucose and mobilizing stored nutrients, thereby triggering cancer cell death. The study provides evidence that combining an FLT3 inhibitor with an autophagy blocker could be a new way to treat cancer.

Xia, H.-g., et al. 2015. J. Cell Biol. http://dx.doi.org/10.1083/jcb.201503044

http://bit.ly/1NU7myt

Neanderthals Had Houses With Hot Water

Not bad for a caveman

By Erin Blakemore

Early humans' living conditions were hardly high-tech - after all, Neanderthals essentially lived in caves. But recently, conceptions of how early humans lived have been changing. Now, reports Cinta S. Bellmunt for *IPHES News*, there's evidence that Neanderthal caves could have featured hot water.

Researchers from the Catalan Institute of Human Paleoecology and Social Evolution have been investigating a 60,000-year-old cave in Barcelona, Spain, writes Bellmunt. The cave has yielded a large quantity of archaeological treasures that give a sense of what home life was like for Neanderthals.

Most notably, archaeologists uncovered what they think is a hole located near hearths that could have been used to heat water. Other remains show evidence of sleeping areas, trash disposal areas, and areas used for the creation of stone tools and even the slaughtering of animals, Bellmunt reports. It appears that the Neanderthals ate deer, wild goats, and even horses.

Revelations that Neanderthals lived in caves complete with hot water and plenty of food adds to a growing picture of the behavior of these early humans. In 2013, writes *National Geographic*'s Ker Than, scientists confirmed that Neanderthals carefully buried their dead, too. It seems that cavemen had better manners (and nicer living conditions) than some initially thought. *h/t Archaeology.org*

http://www.eurekalert.org/pub_releases/2015-08/difr-cta082815.php

Closer to a treatment for the 'asthma of the esophagus'

Scientists elucidate the role of a key molecule involved in eosinophilic esophagitis (EoE) and pave the way to a treatment for this enigmatic and hard-to-treat food allergy

Scientists from the D'Or Institute of Research and Education (IDOR), the Federal University of Rio de Janeiro (UFRJ) and the Yale University School of Medicine have elucidated the chemical process behind a mysterious gastrointestinal disease that is becoming more frequent every day: the eosinophilic esophagitis (EoE), also known as the "asthma of the esophagus". The researchers identified a molecule which plays a key role in this condition and that can be a target in a new therapeutic strategy.

The eosinophilic esophagitis is a chronic inflammatory disorder of the esophagus. In patients with this condition, a type of white blood cell from the immune system, the eosinophil, builds up in the lining of the tube that connects the mouth to the stomach, the esophagus. This buildup inflames and injures the esophageal tissue leading to tissue scarring and fibrosis, which causes difficulty for swallow. In severe cases, the patients may need to undergo a procedure to dilate the esophagus to let the food pass.

The disease is relatively new, with the first diagnosis made in the 70's. Scientists don't know yet what can trigger this kind of esophageal inflammation. The most accepted hypothesis is that it may be caused by allergic hypersensitivity to certain foods (like nuts and milk), air pollution or chemical components present in the modern industrialized foods and oral hygienic products.

Trying to better understand the disease, the leader of the study, Heitor De Souza, from IDOR, decided to look for a molecule called MIF (macrophage migration inhibitory factor), which his group had already seen involved in other allergenic inflammations. MIF is released by our immune cells, including eosinophils, when our body is under attack of pathogens.

Analyzing biopsies from patients diagnosed with EoE, De Souza saw that MIF was highly expressed in their esophageal mucosa compared with healthy people and patients suffering from other esophageal diseases, like gastroesophageal reflux disease. The presence of MIF could explain the accumulation of eosinophils, as this molecule is known to attract immune cells and prevent them from dying. Indeed, in vitro experiments proved that MIF significantly increases the attraction of eosinophils.

The researchers also tested the role of MIF in mice modeled for EoE. Sick mice genetically modified to be MIF deficient have reduced inflammation compared with mice that have not been modified. Furthermore, the early administration of a drug that blocks the effect of MIF prevented the eosinophils accumulation in the esophagus and the development of esophagitis in treated mice.

"Our work is the first to show the role of MIF in EoE", says De Souza. "Together, our results implicate MIF in the pathogenesis of EoE and suggest that targeting MIF might represent a novel therapy for EoE."

There is no cure for EoE. The current treatment for the disease is based on the intake of corticosteroids, which can lead to side effects and cannot be taken uninterruptedly. The study can pave the way to an effective and safer therapy for patients with this condition.

"If we could give the patients a medicine that blocks MIF, it would be more effective and safer than giving them corticosteroids like we do today", points out De Souza. "We are now one step closer to an effective treatment for this condition."

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Meet Pentecopterus, a new predator from the prehistoric seas

You don't name a sea creature after an ancient Greek warship unless it's built like a predator.

New Haven, Conn. - That's certainly true of the recently discovered Pentecopterus, a giant sea scorpion with the sleek features of a penteconter, one of the first Greek galley ships. A Yale University research team says Pentecopterus lived 467 million years ago and could grow to nearly six feet, with a long head shield, a narrow body, and large, grasping limbs for trapping prey. It is the oldest described eurypterid -- a group of aquatic arthropods that are ancestors of modern spiders, lobsters, and ticks.

A detailed description of the animal appears in the Sept. 1 online edition of the journal BMC Evolutionary Biology.

"This shows that eurypterids evolved some 10 million years earlier than we thought, and the relationship of the new animal to other eurypterids shows that they must have been very diverse during this early time of their evolution, even though they are very rare in the fossil record," said James Lamsdell, a postdoctoral associate at Yale University and lead author of the study. "Pentecopterus is large and predatory, and eurypterids must have been important predators in these early Palaeozoic ecosystems," Lamsdell said.

This is an artist's rendering of Pentecopterus. **Credit: Patrick Lynch/Yale University**

Geologists with the Iowa Geological Survey at the University of Iowa discovered the fossil bed in a meteorite crater by the Upper Iowa River in northeastern Iowa. Fossils were then unearthed and collected by temporarily damming the river in 2010. Researchers from Yale and the University of Iowa have led the analysis.

The fossil-rich site yielded both adult and juvenile Pentecopterus specimens, giving the researchers a wealth of data about the animal's development. In addition, the researchers said, the specimens were exceptionally well preserved.

"The Winneshiek site is an extraordinary discovery," said Yale paleontologist Derek Briggs, co-author of the study. "The fossils are preserved in fine deposits of sediments where the sea flooded a meteorite impact crater just over 5 km in diameter." Briggs is the G. Evelyn Hutchinson Professor of Geology and Geophysics at Yale and curator of invertebrate paleontology at the Yale Peabody Museum of Natural History.

"What's amazing is the Winneshiek fauna comprise many new taxa, including Pentecopterus, which lived in a shallow marine environment, likely in brakish water with low salinity that was inhospitable to typical marine taxa," said Huaibao Liu of the Iowa Geological Survey and the University of Iowa, who led the fossil dig and is a co-author of the paper. "The undisturbed, oxygen-poor bottom waters within the meteorite crater led to the fossils' remarkable preservation. So this discovery opens a new picture of the Ordovician community that is significantly different from normal marine faunas."

The National Science Foundation supported the research. Additional co-authors of the study were Robert M. McKay and Brian Witzke of the Iowa Geological Survey and the University of Iowa.

http://www.eurekalert.org/pub_releases/2015-08/cp-waq082415.php

We've all got a blind spot, but it can be shrunk

You've probably never noticed, but the human eye includes an unavoidable blind spot.

That's because the optic nerve that sends visual signals to the brain must pass through the retina, which creates a hole in that light-sensitive layer of tissue. When images project to that precise location, we miss them. Now researchers reporting in the Cell Press journal Current Biology on August 31 have some good news: this blind spot can be effectively "shrunk" with training, despite the fact that the hole in our visual field cannot be.

The findings raise the possibility that similar methods might improve vision in people with age-related macular degeneration, which is the leading cause of blindness in Western countries.

"We did not confidently expect to see much reduction in functional blindness, as you can never develop photosensitivity within the blind spot itself," says Paul Miller of The University of Queensland in Australia. "You can only enhance sensitivity at the blind spot periphery, but this proved sufficient to bring about a ten percent reduction in functional blindness."

The researchers trained 10 people for 20 consecutive weekdays on a direction-discrimination task in which they were presented with a drifting sinusoidal waveform in a ring centered about the physiological blind spot of one of their eyes. The size of the ring was adjusted such that participants could correctly gauge the direction of movement about 70% of the time.

At the end of the training, those individuals showed improvements in the ability to correctly judge both the direction and the color of the waveform. Training on one eye did not transfer to the blind spot in the untrained eye, suggesting that the improvement wasn't simply a matter of practicing the task. Rather, the researchers say, the data are consistent with the notion that training enhanced the sensitivity of neurons with receptive fields that partially overlap, or abut, the physiological blind spot. As a result, they say, the eye apparently becomes more sensitive to weak signals originating primarily from within the region of blindness.

If training protocols can reduce blindness associated with the physiological blind spot, they might prove similarly effective in other cases of blindness. Such training protocols might also be used to assist in the recovery of vision along with other developing technologies, such as the bionic eye or retinal stem cell therapy.

Miller says they plan to further optimize their training protocol in normally sighted people around the physiological blind spot and to then test its use in people with age-related macular degeneration.

This work was supported by the Australian Research Council.

Current Biology, Miller et al.: "Reducing the size of the human physiological blind spot through training" http://dx.doi.org/10.1016/j.cub.2015.07.026

http://www.eurekalert.org/pub_releases/2015-08/bu-srh083115.php

Study reveals human body has gone through four stages of evolution

Studying 430,000-year-old fossils from northern Spain found that evolution of the human body's size and shape has gone through four main stages

BINGHAMTON, NY - Research into 430,000-year-old fossils collected in northern Spain found that the evolution of the human body's size and shape has gone through four main stages, according to a paper published this week.

A large international research team including Binghamton University anthropologist Rolf Quam studied the body size and shape in the human fossil collection from the site of the Sima de los Huesos in the Sierra de Atapuerca in northern Spain. Dated to around 430,000 years ago, this site preserves the largest collection of human fossils found to date anywhere in the world. The researchers found that the Atapuerca individuals were relatively tall, with wide, muscular bodies and less brain mass relative to body mass compared to Neanderthals. The Atapuerca humans shared many anatomical features with the later Neanderthals not present in modern humans, and analysis of their postcranial skeletons (the bones of the body other than the skull) indicated that they are closely related evolutionarily to Neanderthals.

"This is really interesting since it suggests that the evolutionary process in our genus is largely characterized by stasis (i.e. little to no evolutionary change) in body form for most of our evolutionary history," wrote Quam.

Comparison of the Atapuerca fossils with the rest of the human fossil record suggests that the evolution of the human body has gone through four main stages, depending on the degree of arboreality (living in the trees) and bipedalism (walking on two legs). The Atapuerca fossils represent the third stage, with tall, wide and robust bodies and an exclusively terrestrial bipedalism, with no evidence of arboreal behaviors. This same body form was likely shared with earlier members of our genus, such as Homo erectus, as well as some later members, including the Neanderthals. Thus, this body form seems to have been present in the genus Homo for over a million years.

It was not until the appearance of our own species, Homo sapiens, when a new taller, lighter and narrower body form emerged. Thus, the authors suggest that the Atapuerca humans offer the best look at the general human body shape and size during the last million years before the advent of modern humans.

The study, titled "Postcranial morphology of the middle Pleistocene humans from Sima de los Huesos, Spain," was published in Proceedings of the National Academy of Sciences.

http://bit.ly/1NJTtUv

Some Sexually Transmitted Microbes Might Be Good for You

There's a whole lot of bacteria and viruses that pass from person to person, using any means they can find

By Marissa Fessenden

Plenty of microbes — bacteria and viruses alike — use the close contact of a sexual encounter to leap from one host to the next. As a result, health experts wisely counsel protection to avoid the health issues and infertility these infections can bring. While everyone should certainly heed those warnings and practice safe sexual contact, biologists also know that some sexually transmitted microbes can provide benefits, reports Niki Wilson for *BBC*.

Take the GB virus C (GBC-C) for example, which often shows up with other much more dangerous viruses like HIV. But when it comes along for the ride, studies show that GBV-C actually reduces the mortality rate of HIV patients by 59 percent, Wilson reports. It's also been shown to boost the chance of surviving an infection with Ebola.

Wilson writes:

Extraordinary discoveries such as this should make us wonder what else we are missing, says Betsy Foxman, of the University of Michigan, US.

In the past we've characterized sexually transmitted microbes as bad, she says. The preventative measures we've taken to protect against them may mean that we now lack some that are potentially beneficial.

However, figuring out how to protect against the bad while letting in the good may be a bit of a challenge. Foxman points to a need for more targeted antibiotics that kill only harmful bugs, and let the harmless (or beneficial) ones keep on keeping on. Or perhaps there's a way to inoculate people with the good bugs after they take a course of antibiotics.

Beneficial sexually transmitted microbes aren't just found in humans of course. There are a few microbes that pass between mating aphids that can make the infected insects more resistant to parasitoids or better able to tolerate heat. Mosquitos carry bacteria in their gut that can pass as a nutritional coating on the surface of developing eggs, ready to provide a snack to just-hatched larvae. Promiscuous female birds and lizards may actually gain protective microbes — in the form of healthy, diverse microbial communities or in the form of viruses that kill harmful bacteria, Wilson writes.

All these findings emphasize once again the many questions scientists have about the microbiome, or the bacteria and viruses that live in and around humans. The fact that sexually transmitted microbes have a complicated story as well doesn't seem as surprising in that light. But until scientists really get the story straight, keep in mind that many STIs are harmful. Sex doesn't automatically spell certain death (as it does with the male dark fishing spider) but it's worth being safe when you have it.

http://www.eurekalert.org/pub_releases/2015-09/foas-cmh090115.php

Can marijuana help transplant patients? New research says maybe

New research published in the Journal of Leukocyte Biology show that mice receiving THC, the active ingredient in marijuana, had a delay in the rejection of an incompatible organ

Here's another discovery to bolster the case for medical marijuana: New research in mice suggests that THC, the active ingredient in marijuana, may delay the rejection of incompatible organs. Although more research is necessary to determine if there are benefits to humans, this suggests that THC, or a derivative, might prove to be a useful antirejection therapy, particularly in situations where transplanted organs may not be a perfect match. These findings were published in the September 2015 issue of The Journal of Leukocyte Biology.

"We are excited to demonstrate for the first time that cannabinoid receptors play an important role in the prolongation of rejection of a foreign graft by suppressing immune response in the recipient, said Mitzi Nagarkatti, Ph.D., a researcher involved in the work from the University of South Carolina School of Medicine. "This opens up a new area of research that would lead to better approaches to prevent transplant rejection as well as to treat other inflammatory diseases."

To make this discovery, Nagarkatti and colleagues used two groups of mice that were genetically different, and transplanted skin from one group to the other. All of the mice received incompatible skin, but one group was treated with vehicle (placebo) and the other was treated with THC. The scientists observed that the rejection of the skin graft in mice that received THC was delayed when compared to the control group that only received a placebo.

Please note: Transplant patients should not use marijuana as a therapy without the consent of their physician and should only do so in compliance with any and all local, state and federal laws.

"More and more research is identifying potential beneficial effects of substances contained in marijuana, but a major challenge has been identifying the molecular pathways involved," said John Wherry, Ph.D., Deputy Editor of the Journal of Leukocyte Biology. "These new studies point to important roles for the cannabinoid receptors as targets that might be exploited using approaches that refine how we think about substances derived from marijuana."

Details: Jessica M. Sido, Prakash S. Nagarkatti, and Mitzi Nagarkatti. Δ9-Tetrahydrocannabinol attenuates allogeneic host-versus-graft response and delays skin graft

rejection through activation of cannabinoid receptor 1 and induction of myeloid-derived suppressor cells. J. Leukoc. Biol. September 2015 98:435-447; doi:10.1189/jlb.3A0115-030RR ; http://www.jleukbio.org/content/98/3/435.abstract

http://www.eurekalert.org/pub_releases/2015-09/e-fif082715.php

First imagery from echolocation reveals new signals for hunting bats

Some elite hunting species can detect prey that is completely motionless

The ability of some bats to spot motionless prey in the dark has baffled experts until now. By creating the first visual images from echolocation, researchers reveal we have been missing how bats sense their world.

Publishing in the journal eLife, scientists from Queen Mary University of London (QMUL) and the University of Bristol suggest that instead of searching for prey directly, bats intimately learn the layout of a home range - down to the surface of individual leaves and stones. When one of these familiar leaves is covered by an insect, the normal echoes are interrupted and this "acoustic shadow" is a very strong signal to the hunting bat.

***Elite hunter from bat world has previously unknown cues at its disposal*. Credit: Elizabeth Clare**

The researchers also describe a new phenomenon of "acoustic camouflage", employed by hunted prey to elude the elite hunters.

Most bats hunt by detecting the movement of flying insects using echolocation. Only a third of all bat species are able to hunt for prey on surfaces. Previous studies have concluded that these bats must detect prey by sight, smell and sound.

However, the common big-eared bat Micronycteris microtis, a neotropical species from South and Central America, has been found to use echolocation alone. Experts have speculated that by hovering beside prey, this species bombards it and the surface on which it rests with short sound waves. By continually changing their angle of scanning, the prey becomes easier to pick out.

In the new study, researchers in Bristol developed a new imaging technique to allow them to enter the bat's world view. They built four acoustic cues into the system, combining the duration and amplitude of echoes with the depth profile of objects and the strength of the shadow cast by insects.

"Using information like X-rays to build pictures is well established in medicine with the use of CT scans and ultrasound, but no-one has ever before attempted to create images from sounds generated in ecology," says lead author Dr Elizabeth Clare from QMUL.

"We constructed a brand new technique for tomographic imaging which allows us to perceive more accurately which cues are most important to the bat," says co-author Marc Holderied from the University of Bristol.

The research team found that the acoustic cues available to bats to detect motionless prey don't improve greatly if the profile of the insect seems to stand out more. It might be expected that a hawkmoth, which rests with its wings sticking up, would be easier to find than a small butterfly with extremely thin wings. Instead, detection improves according to the kind of surface on which the insect rests.

Insects are much easier to detect on flat surfaces - such as slate and smooth leaves - and hardest to detect on rough bark. The data help explain why some species of bat remain faithful to a defined hunting ground and why they scan leaves so thoroughly. But surprisingly, the team's data suggest that bat should not look for prey, but search surfaces with which they are familiar, particular smooth ones, and then home in on patches where there are 'echo gaps' in what they'd normally find.

"Our findings also suggest a new phenomenon of acoustic camouflage, where insects are harder to discern on rough surfaces such as bark, and bats compensate for this by focusing their attention on the simpler, mirror-like surfaces in their patch," says Dr Clare.

The paper 'Acoustic shadows help gleaning bats find prey, but may be defeated by prey acoustic camouflage on rough surfaces' can be freely accessed online at http://dx.doi.org/10.7554/eLife.07404 Contents, including text, figures, and data, are free to re¬use under a CC BY 4.0 license.

http://www.eurekalert.org/pub_releases/2015-09/uoc--sto090115.php

Studying the outliers

Researchers discover a gene variant that provides a delaying mechanism for Alzheimer's disease

Medical research has yet to discover an Alzheimer's treatment that effectively slows the disease's progression, but neuroscientists at UC Santa Barbara may have uncovered a mechanism by which onset can be delayed by as much as 10 years.

That mechanism is a gene variant -- an allele -- found in a part of the genome that controls inflammation. The variant appears to prevent levels of the protein eotaxin from increasing with age, which it usually does hand in hand with inflammation. The findings appear in the journal Molecular Psychiatry.

Lead author Matthew Lalli, who earned his Ph.D. working in UCSB's Kosik Research Group, sequenced the genomes of more than 100 members of a Colombian family affected with early-onset Alzheimer's. These individuals have a

rare gene mutation that leads to full-blown disease around age 49. However, in a few outliers, the disease manifests up to a decade later.

"We wanted to study those who got the disease later to see if they had a protective modifier gene," said co-author Kenneth S. Kosik, co-director of UCSB's Neuroscience Research Institute and a professor in the Department of Molecular, Cellular and Developmental Biology. "We know they have the mutation. Why are they getting it so much later when the mutation so powerfully determines the early age at onset in most of the family members? We hypothesized the existence of gene variant actually pushes the disease onset as much as 10 years later."

Lalli used a statistical genetics approach to determine whether these outliers possess any protective gene variants, and he found a cluster of them. "We know that age is the greatest risk factor for Alzheimer's beyond genetics," said Lalli, who is now a postdoctoral fellow at Washington University in St. Louis. "The variant that we found is age-related, so it might explain the actual mechanism of how an increase in age increases the risk of Alzheimer's -- through a rise in eotaxin."

To replicate the findings, the UCSB researchers collaborated with UC San Francisco to study 150 individuals affected with Alzheimer's or dementia. UCSF investigators measured levels of eotaxin in the participants' blood and collected DNA samples to confirm who carried the gene variant identified in the Colombian population.

The results showed that people in the UCSF study with the same variant had eotaxin levels that did not rise with age. They also experienced a modest but definite delay in the onset of Alzheimer's. "If you have that variant, maybe one way to delay or reduce your risk for Alzheimer's is by genetically holding in check the normal increase in eotaxin that occurs in most of the population," Kosik explained.

"Although the gene mutation in the Colombian population is extremely rare, this variant is not," he added. "It occurs in about 30 percent of the population, which means it has the potential to protect a lot of people against Alzheimer's."

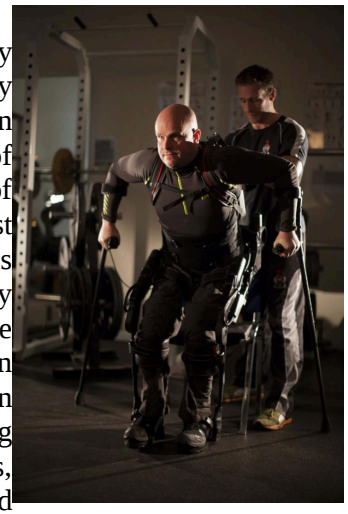
Previous independent work at Stanford University has shown that adding eotaxin to young mice made them functionally older. Stanford is also currently testing whether blood transfusion from young individuals to older ones confers benefits. "The results of this work may provide additional evidence that eotaxin plays a role in the deleterious effects of aging," said Lalli.

"We have an important preliminary finding," said Kosik. "If this is a true mechanism of Alzheimer's progression, then we can modify the level of eotaxin in individuals to treat the disease. But our results must be replicated and proved by other laboratories -- and in larger populations."

http://www.eurekalert.org/pub_releases/2015-09/uoc--cpm090115.php

Completely paralyzed man voluntarily moves his legs, UCLA scientists report

Robotic step training and noninvasive spinal stimulation enable patient to take thousands of steps



A 39-year-old man who had had been completely paralyzed for four years was able to voluntarily control his leg muscles and take thousands of steps in a "robotic exoskeleton" device during five days of training -- and for two weeks afterward -- a team of UCLA scientists reports this week. This is the first time that a person with chronic, complete paralysis has regained enough voluntary control to actively work with a robotic device designed to enhance mobility. In addition to the robotic device, the man was aided by a novel noninvasive spinal stimulation technique that does not require surgery. His leg movements also resulted in other health benefits, including improved cardiovascular function and muscle tone.

This is Mark Pollock with trainer Simon O'Donnell. **Credit: Courtesy of Mark Pollock**

The new approach combines a battery-powered wearable bionic suit that enables people to move their legs in a step-like fashion, with a noninvasive procedure that the same researchers had previously used to enable five men who had been completely paralyzed to move their legs in a rhythmic motion. That earlier achievement is believed to be the first time people who are completely paralyzed have been able to relearn voluntary leg movements without surgery. (The researchers do not describe the achievement as "walking" because no one who is completely paralyzed has independently walked in the absence of the robotic device and electrical stimulation of the spinal cord.)

In the latest study, the researchers treated Mark Pollock, who lost his sight in 1998 and later became the first blind man to race to the South Pole. In 2010, Pollock fell from a second-story window and suffered a spinal cord injury that left him paralyzed from the waist down.

At UCLA, Pollock made substantial progress after receiving a few weeks of physical training without spinal stimulation and then just five days of spinal stimulation training in a one-week span, for about an hour a day. "In the last few weeks of the trial, my heart rate hit 138 beats per minute," Pollock said. "This is

an aerobic training zone, a rate I haven't even come close to since being paralyzed while walking in the robot alone, without these interventions. That was a very exciting, emotional moment for me, having spent my whole adult life before breaking my back as an athlete."

Even in the years since he lost his sight, Pollock has competed in ultra-endurance races across deserts, mountains and the polar ice caps. He also won silver and bronze medals in rowing at the Commonwealth Games and launched a motivational speaking business. "Stepping with the stimulation and having my heart rate increase, along with the awareness of my legs under me, was addictive. I wanted more," he said. The research will be published by the IEEE Engineering in Medicine and Biology Society, the world's largest society of biomedical engineers.

"It will be difficult to get people with complete paralysis to walk completely independently, but even if they don't accomplish that, the fact they can assist themselves in walking will greatly improve their overall health and quality of life," said V. Reggie Edgerton, senior author of the research and a UCLA distinguished professor of integrative biology and physiology, neurobiology and neurosurgery.

The procedure used a robotic device manufactured by Richmond, California-based Ekso Bionics which captures data that enables the research team to determine how much the subject is moving his own limbs, as opposed to being aided by the device. "If the robot does all the work, the subject becomes passive and the nervous system shuts down," Edgerton said.

The data showed that Pollock was actively flexing his left knee and raising his left leg and that during and after the electrical stimulation, he was able to voluntarily assist the robot during stepping; it wasn't just the robotic device doing the work.

"For people who are severely injured but not completely paralyzed, there's every reason to believe that they will have the opportunity to use these types of interventions to further improve their level of function. They're likely to improve even more," Edgerton said. "We need to expand the clinical toolbox available for people with spinal cord injury and other diseases."

Edgerton and his research team have received many awards and honors for their research, including Popular Mechanics' 2011 Breakthrough Award.

"Dr. Edgerton is a pioneer and we are encouraged by these findings to broaden our understanding of possible treatment options for paralysis," said Peter Wilderotter, president and CEO of the Christopher and Dana Reeve Foundation, which helped fund the research. "Given the complexities of a spinal cord injury, there will be no one-size-fits-all cure but rather a combination of different interventions to achieve functional recovery.

"What we are seeing right now in the field of spinal cord research is a surge of momentum with new directions and approaches to remind the spine of its potential even years after an injury," he said.

Grace Peng, director of NIBIB's Rehabilitation Engineering Program, said, "This is a great example of a therapeutic approach that combines two very different modalities -- neuromodulation and robotic assist devices -- to achieve a result that could not be realized with either approach alone. This multi-device approach, much like multi-drug therapy, may ultimately benefit patients with impaired mobility in a wide variety of rehabilitation settings."

NeuroRecovery Technologies, a medical technology company Edgerton founded, designs and develops devices that help restore movement in patients with paralysis. The company provided the device used to stimulate the spinal cord in combination with the Ekso in this research.

Edgerton said although it likely will be years before the new approaches are widely available, he now believes it is possible to significantly improve quality of life for patients with severe spinal cord injuries, and to help them recover multiple body functions. Although his laboratory is making dramatic progress, it only is able to work with a small number of patients due to limited resources.

"We could accomplish a lot more in advancing the science and technology with more resources," Edgerton said.

The lead author of the new research is UCLA research scientist Parag Gad. Lead co-authors were Yury Gerasimenko, director of the laboratory of movement physiology at Russia's Pavlov Institute and a researcher in the UCLA department of integrative biology and physiology; and Dr. Daniel Lu, associate professor of neurosurgery in UCLA's David Geffen School of Medicine. Other key UCLA contributors were research technician Sharon Zdunowski, researchers Dimitry Sayenko and Roland Roy, research associate Piia Haakana and Amanda Turner, Edgerton's laboratory coordinator.

In addition to the Reeve foundation, the research was funded by the National Institutes of Health's National Institute of Biomedical Imaging and Bioengineering (grants U01EB15521 and R01EB007615), the F. M. Kirby Foundation, the Walkabout Foundation, the Dana and Albert R. Broccoli Foundation, Ekso Bionics, NeuroRecovery Technologies and the Mark Pollock Trust.

http://www.eurekalert.org/pub_releases/2015-09/mgh-mgs082715.php

Mass. General study identifies another way urate may protect against Parkinson's disease

Brain cells called astrocytes make key contribution, phase 3 trial of urate-boosting treatment to get underway in 2016

A study from members of the research team investigating whether increasing blood levels of the antioxidant urate can slow the progression of Parkinson's disease has found that the neuroprotective effects of urate extend beyond its own

antioxidant properties. In their paper receiving online publication in the journal Neurobiology of Disease, the Massachusetts General Hospital (MGH) investigators report that urate also stimulates brain cells called astrocytes to activate a major antioxidant pathway believed to have a role in several neurodegenerative disorders. A National Institute of Neurological Disorders and Stroke (NINDS)-funded phase 3 trial of a urate-elevating drug, led by the senior author of the current study, will begin enrolling patients next year.

"While the antioxidant properties of urate are well-established, several other direct antioxidant treatments like vitamin E have failed to show disease-modifying benefits in clinical trials for Parkinson's disease," says Michael Schwarzschild, MD, PhD, MassGeneral Institute of Neurodegenerative Disease, senior author of the current paper and principal investigator of the urate clinical trials.

"This new evidence of a more nuanced molecular mechanism for urate-induced neuroprotection boosts our enthusiasm that this will be a truly novel strategy and not 'just another direct antioxidant' that will fail to protect the brain cells that degenerate in Parkinson's."

Based on epidemiologic studies indicating that people with naturally higher levels of urate have a reduced risk of developing Parkinson's disease, Schwarzschild and colleagues at MGH and elsewhere previously showed that the disease appears to progress more slowly in patients with higher urate levels.

While their studies also found urate elevation to be protective in cellular and animal models of Parkinson's, other evidence - including a 2012 study by the MGH team - implied that protection was limited without the presence of star-shaped brain cells called astrocytes. The current study was designed to determine the nature of astrocytes' contribution to urate-induced neuroprotection.

A series of experiments in cultured cells confirmed that urate-treated astrocytes could protect dopamine-releasing cells similar to those that are damaged in Parkinson's from oxidative damage. Analysis of fluid around those astrocytes revealed high levels of another antioxidant called glutathione, which is part of a pathway controlled by a protein called Nrf2, defects in which have been implicated in several neurodegenerative diseases.

After confirming that urate application did significantly increase astrocytes' release of glutathione and activation of the Nrf2 pathway, the researchers also showed that the neuroprotective property of fluid surrounding the cells was significantly reduced if glutathione was removed. An important next step, Schwarzschild notes, will be confirming that Nrf2 activation in astrocytes is an essential part of urate's protective effects in an animal model of Parkinson's disease.

The phase 3 trial of the nutritional supplement inosine, which is converted to urate in the body, is a follow-up to the phase 2 trial, led by Schwarzschild and colleagues at the Harvard School of Public Health and the University of Rochester Medical Center. Published in 2013 and supported by the Michael J. Fox Foundation for Parkinson's Research, that two-year trial confirmed that the studied dosages successfully raised urate levels in 74 recently diagnosed Parkinson's patients without producing serious side effects.

SURE-PD3 (Study of URate Elevation in Parkinson's Disease, phase 3) - planned to enroll 270 patients with early-stage Parkinson's - will investigate whether moderate urate elevation resulting from two years of inosine treatment slows disease progression.

The double-blinded, placebo-controlled trial will be conducted at 60 Parkinson Study Group sites across the U.S. - with the MGH acting as clinical coordinating center and the University of Rochester Medical Center as data coordinating center - and supported by up to $26 million from the NINDS.

Additional funds from the Michael J. Fox Foundation will support clinical pharmacology studies designed to improve the safely of the phase 3 trial by investigating potential interactions between inosine and common foods or other medications that may be taken by participants.

"Reaching a phase 3 trial indicates that inosine is among a small set of therapeutic candidates for Parkinson's that have shown enough promise in previous studies - as well as sufficient safety - to warrant the major investment required to test for efficacy," says Schwarzschild, a professor of Neurology at Harvard Medical School.

"We still face the major challenges of finding the right patient volunteers and rigorously conducting the trial, since clearly demonstrating the effectiveness of inosine against disease progression is required before we could conclude that its promise has been realized. In the meantime, we need to keep cautioning patients and caregivers against using inosine outside of carefully designed trials, since excess urate can cause kidney stones or gout."

Information for potential participants in the phase 3 trial - individuals with early-stage Parkinson's who do not yet require drug treatment - will be available early next year at ClinicalTrials.gov and FoxTrialFinder.org.

Rachit Bakshi, PhD, MassGeneral Institute of Neurodegenerative Disease (MGH-MIND), is lead and corresponding author of the Neurobiology of Disease paper. Additional co-authors are Hong Zhang, Robert Logan, Yuehang Xu, and Xiqun Chen, MD, MGH-MIND; and Ila Joshi, PhD, MGH Dermatology. The study was supported by Department of Defense grant W81XWH-11-1-0150, and National Institutes of Health grants K24-NS060991 and R21-NS084710.

http://www.eurekalert.org/pub_releases/2015-09/jhub-srs090115.php

Suicide-by-firearm rates shift in 2 states after changes in state gun laws

Connecticut's suicide-by-firearm rate declined after permits were required to purchase handguns; Missouri's increased after it repealed its handgun purchaser licensing requirement

A new study examining changes in gun policy in two states finds that handgun purchaser licensing requirements influence suicide rates. Researchers estimate that Connecticut's 1995 law requiring individuals to obtain a permit or license to purchase a handgun after passing a background check was associated with a 15.4 percent reduction in firearm suicide rates, while Missouri's repeal of its handgun purchaser licensing law in 2007 was associated with a 16.1 percent increase in firearm suicide rates.

The study, from researchers with the Johns Hopkins Center for Gun Policy and Research, appears in a special issue of Preventive Medicine that focuses on gun violence prevention research.

"Although these laws were not designed to reduce suicides, many of the risk factors that disqualify someone from legal gun ownership - domestic violence, history of committing violent crimes, substance abuse, severe mental illness and adolescence - are also risk factors for suicide," says lead study author Cassandra Crifasi, PhD, MPH, an assistant scientist with the Johns Hopkins Center for Gun Policy and Research, part of the Johns Hopkins Bloomberg School of Public Health. Crifasi cautions the findings do not indicate a clear causal relationship.

"When we examined whether there were changes in suicides committed by other means following the changes in the laws, there was some evidence that Connecticut experienced lower than expected rates of suicides by means other than firearms," she says. "This suggests that factors other than handgun purchaser licensing may have contributed to the decline in suicides."

There was no significant change in suicide by other means following Missouri's repeal of the law.

Suicide is the second leading cause of death among people ages 15 to 34 in the United States, and half of all suicides are committed with a firearm. In 2013, more than 21,000 individuals in the U.S. committed suicide using a firearm, compared to approximately 11,000 homicides committed with guns.

Prior research had shown that states with handgun purchaser licensing laws tended to have lower suicide rates than states without such laws after controlling for differences across state populations. This new study is the first to examine whether changes in the policy led to changes in the risk of suicide over time.

"Contrary to popular belief, suicidal thoughts are often transient, which is why delaying access to a firearm during a period of crisis could prevent suicide," says study author Daniel Webster, ScD, MPH, director of the Johns Hopkins Center for Gun Policy and Research. "Just as research indicates that handgun purchaser licensing laws are effective in reducing firearm homicides, they could reduce suicides by firearms as well."

Previous research from the Johns Hopkins Center for Gun Policy and Research found that Connecticut's handgun purchaser licensing legislation led to a 40 percent drop in gun homicides in the state, and Missouri's 2007 repeal of its handgun license law was associated with a twenty-five percent increase in its firearm homicide rates. The laws had no effects on homicides committed by means other than firearms.

Handgun licensing laws require buyers to obtain a permit to purchase that is contingent upon passing a background check, including private sales. They also typically require an in-person application at a law enforcement agency and, in some cases, applicants must successfully complete a safety training course and experience waits while their application is under review.

Public opinion survey data published in Preventive Medicine earlier this year from Johns Hopkins researchers show that the majority of Americans (72 percent) and gun owners (59 percent) support requiring people to obtain a license from a local law enforcement agency before buying a handgun to verify their identity and ensure they are not legally prohibited from having a gun.

"Effects of Changes in Permit-to-Purchase Handgun Laws in Connecticut and Missouri on Suicide Rates" was written by Cassandra K. Crifasi, PhD, MPH, John Speed Meyers, MPA, Jon Vernick, JD, MPH and Daniel W. Webster, ScD, MPH.

The research was supported by The Joyce Foundation.

http://www.bbc.com/news/health-34115112

Wasp venom 'a weapon against cancer'

The venom of a wasp native to Brazil could be used as a weapon to fight cancer, scientists believe.

By Michelle Roberts Health editor, BBC News online

A toxin in the sting kills cancer cells without harming normal cells, lab studies suggest. The University of Brazil team say the experimental therapy latches to tumour cells and makes them leak vital molecules. The work is at an early stage and more studies are needed to check the method will work safely in humans.

Polybia paulista is an aggressive social wasp endemic in south-east Brazil.
Though its sting is largely seen as unwelcome, scientists increasingly believe it could be put to good use. It contains an important toxin called MP1 which the insect uses to attack prey or defend itself. And recent studies in mice suggest it may target and destroy cancer cells.
Prof Joao Ruggiero Netto and colleagues set out to discover how, by putting it under the microscope. They found MP1 interacts with fat molecules that are abnormally distributed on the surface of cancer cells, creating gaping holes that allow molecules crucial for cell function to leak out.
In healthy cells, the same molecules are hidden on the inside. This means healthy tissue should avoid MP1's attack, the scientists say in Biophysical Journal.
Co-researcher Dr Paul Beales, from the University of Leeds, said cancer therapies that attacked the lipid composition of the cell membrane would be an entirely new class of anti-cancer drugs. "This could be useful in developing new combination therapies, where multiple drugs are used simultaneously to treat a cancer by attacking different parts of the cancer cells at the same time," he said.
Dr Aine McCarthy, science information officer for Cancer Research UK said: "This early stage research increases our understanding of how the venom of the Brazilian wasp can kill cancer cells in the laboratory. "But while these findings are exciting, much more work is needed in the lab and in clinical trials before we will know if drugs based on this research could benefit cancer patients."

http://www.eurekalert.org/pub_releases/2015-09/foas-vai090115.php

Vitamin a implicated in the development of alcoholic liver disease

New research in The FASEB Journal suggests that the future development of novel treatments for alcoholic liver disease may focus on counteracting alcohol's effect on vitamin A levels in the liver

With a name like "Alcoholic Liver Disease," you may not think about vitamin A as being part of the problem. That's exactly what scientists have shown, however, in a new research report appearing in the September 2015 issue of The FASEB Journal. In particular, they found that chronic alcohol consumption has a dramatic effect on the way the body handles vitamin A. Long-term drinking lowers vitamin A levels in the liver, which is the main site of alcohol breakdown and vitamin A storage, while raising vitamin A levels in many other tissues. This opens the doors for novel treatments of alcoholic liver disease that focus on counteracting alcohol's effect on vitamin A in the liver.
"We hope this study will lead to a broader understanding and appreciation of the fact that excessive consumption of alcohol has a negative effect on vitamin A function in the body," said Robin D. Clugston, Ph.D., a researcher involved in the work from the Department of Medicine, Division of Preventive Medicine and Nutrition at Columbia University Medical Center in New York, New York. "Ultimately, we hope that vitamin A will be seen as a broad target for alcohol in multiple tissues of the body and that our understanding of alcohol-induced disease will be linked together by its effects on vitamin A."
Clugston and colleagues conducted multiple experiments using several groups of mice including those who received alcohol-containing food and alcohol-free food. They analyzed the liver and other organs (i.e., kidney, spleen, heart, lung, white adipose, brown adipose and blood), from both groups of mice and measured tissue vitamin A levels. The alcohol-fed mice had distinct changes in how their body handled vitamin A. In general, vitamin A levels were lower in the liver and higher in other tissues. This strongly suggests that vitamin A in the liver is reduced by excessive alcohol consumption and that these findings are important in the development of alcoholic liver disease.
"This research not only give us new insights into how chronic alcoholism affects vitamin A in the liver," said Gerald Weissmann, M.D., Editor-in-Chief of The FASEB Journal, "but it also sheds light on how our body processes vitamin A overall. This is particularly important since some people get too much vitamin A through 'supplements,' while others still do not get enough because of poor access to proper nutrition."
Details: Robin D. Clugston, Li-Shin Huang, and William S. Blaner. Chronic alcohol consumption has a biphasic effect on hepatic retinoid loss. FASEB J. September 2015 29:3654-3667; published ahead of print May 18, 2015, doi:10.1096/fj.14-266296 ; http://www.fasebj.org/content/29/9/3654.abstract

http://www.bbc.com/news/science-environment-34116491

Enigma of the trees that resist wildfires

By Alejandra Martins BBC Mundo

Scientists are investigating whether the trees could provide a buffer zone to hinder the spread of wildfires

Spanish scientists Bernabé and José Moya couldn't believe their eyes. More than 20,000 hectares of forest were charred. But in the middle of the devastation, a group of cypresses was still standing tall and green.
When a fire swept through an experimental plot in Andilla, in the Spanish

province of Valencia in 2012, it gave researchers the perfect opportunity. The plot, which was part of CypFire, a project financed by the European Union, was established during the 1980s to test the resistance of more than 50 varieties of Mediterranean cypress to a pathogenic fungus. After the fire event of 2012, it also provided further anecdotal evidence of the peculiar resilience of the species in the face of fire.

Botanist Bernabé Moya and his brother, environmental engineer José Moya, both from the department of monumental trees in Valencia, had been involved in the project for several years. "On our way to what we knew would be a Dante-esque scene during that tragic summer, we felt deep sadness at the thought of losing a plot of such value to the conservation of biodiversity," Bernabé Moya told BBC Mundo. "But we had hope that perhaps some of the cypresses had survived."

"When we got there we saw that all the common oaks, holm oaks, pines and junipers had completely burnt. But only 1.27% of the Mediterranean cypresses had ignited."

Puzzling resilience

The fire in Valencia led to a three-year international study to find the reasons behind the resilience of the species and discover if it could provide buffer zones to hinder or prevent the rapid spread of wildfires. Human-induced fires represent one of the most frequent causes of forest degradation in the Mediterranean region. More than 269.000 fires were reported in the region between 2006 and 2010 with more than two million hectares of forest land burnt, according to the UN's Food and Agriculture Organization (FAO). The study was published in this month's issue of the Journal of Environmental Management.

The lab tests were performed by scientists from the Forest Fire Laboratory at INIA-CIFOR in Spain, and the Institute for Sustainable Plant Protection in Florence (IPSP), Italy. "In the past, this species was not studied in depth or only a few parameters were measured," explained Gianni Della Rocca, research technologist at IPSP. "Furthermore, using different techniques the results of flammability tests in vegetation can be different or even contradictory."

A crucial difference of the new tests is that they were performed not only on dead dry samples but also on live fine twigs with leaves taken from different crown heights, which revealed one of the key traits of the species: its high water content.

"We observed that the Mediterranean cypress, because of the particular structure of its leaves, is able to maintain a high water content even in situations of extreme heat and drought, and this is a very favourable starting point concerning fire risk," explains Mr Della Rocca. "The cuticle is thick and the stomata are arranged on the inside and protected side of the scale-like leaves and therefore less subject to high water loss".

Moya says that "ignition time of live parts of the Mediterranean cypress is between one, five and seven times that of other Mediterranean species like Quercus ilex, Juniperus communis or Pinus pinaster under the experimental conditions of our tests" The litter on the forest floor, made up of small fragments of leaves, also forms an intricate and compact layer and is slow to decompose.

"The thick and dense litter layer acts as a 'sponge' and retains water, and the space for air circulation is reduced", says Della Rocca.

The hollow crown

Scientists used selected genotypes of one variety of Mediterranean cypress, Cupressus sempervirens var. horizontalis, which is resistant to bark canker disease.

"This pandemic caused by the pathogenic fungus Seiridium cardinale is a very dangerous threat to the cypress. It causes the dieback of large portions of the crown and resin exudations from trunk and branches", explains Mr Della Rocca.

In contrast to other varieties that have dense crowns, the horizontalis branches insert themselves at angles between 45 and 90 degrees to the trunk. This means trees have a sparse canopy and dead foliage does not usually remain trapped.

According to Mr Della Rocca, "the crown structure of a tree is important because it determines the surface/volume ratio of potential fuel, the amount of circulating air and the moisture retention."Plantations with selections of cypresses have already been made in Valencia, Spain, and Siena, Italy, to further research the role of crown structure. "In a few years, we will have cypress barriers and observations at real scale," Mr Della Rocca says.

In highly resinous species, like pines, and during the heating phase, volatile organic compounds or VOCs, mainly terpenes derived from resins common in conifers, are crucial in priming or accelerating combustion.

The cypress is different.

"From preliminary tests we observed that, in our experimental conditions, in pines, the degassing of those flammable compounds happens quickly. The ignition starts soon from those gases and then it is transmitted to the twigs and needles," says Mr Della Rocca. "In the case of the cypress, maybe the volatile very flammable compounds are degassed a bit at a time during the warming phase that precedes the ignition so they don't contribute to the combustion process."

Mr Della Rocca and his colleagues are now carrying out separate research to further understand the role of VOCs on flammability.

Other territories

Could the Mediterranean cypress help combat wildfires in other parts of the world, like California or the Patagonia in Chile and Argentina?

According to Bernabé Moya, the species has a "great plasticity in terms of soil, climate and altitude. It can grow on all soils, even degraded ones, apart from those

that are water-logged, and it thrives from sea level to altitudes of more than 2,000 metres".

The species has been introduced in Latin America, says Mr Moya, and could grow without problems in the temperate climate of California, Chile or Argentina. "The first thing would be to study the adaptability of different varieties of Mediterranean cypress to local conditions and establish experimental plots," he explains.

One of the main conclusions of the European study, according to Mr Rocca, is that peculiar plantations with selected varieties of cypress seem a possible alternative new tool to counteract the risk of wildfires in some sensitive sites like wild-urban-interfaces or wild-industrial-interfaces. "Our study has led to the introduction of Cupressus sempervirens var. horizontalis into a special list of tree species eligible for interventions against forest fires in a Regional Law of Tuscany," he explains. In Valencia, Bernabé Moya and his colleagues will plant the first barriers of the Cypress system in the autumn, using specially selected varieties of Mediterranean cypress.

For Mr Moya, "the vulnerability of vegetation to fires is linked to the lack of information available to the public, the lack of support for research and the lack of plans for the sustainable management of forests - a situation that will get worse with climate change".

For the Spanish scientist, many problems like desertification, wildfires, soil degradation and loss of biodiversity could be reverted if there was more tree planting and if people took more care of forests in the first place. "It is urgent that humanity takes these problems seriously," he told the BBC. "The fight against fires concerns us all. We owe it to the forests and we owe it to future generations".

http://www.eurekalert.org/pub_releases/2015-09/tu-pcr090115.php

Psychological consequences remain profound in coastal areas of Tohoku *Depressive symptoms are still higher in coastal areas than in inland areas affected by the Great East Japan Earthquake and tsunami*

A second round of aggregate findings from a study by Tohoku University's Tohoku Medical Megabank Organization (ToMMo) has revealed that depressive symptoms continue to be higher in coastal areas than in inland areas affected by the Great East Japan Earthquake and the tsunami that followed.

Of the 7,285 residents who participated in the study, 28 percent admitted to having depressive symptoms (CES-D: score of 16 and above). The prevalence rate for those living in coastal areas was higher than those in inland areas, with the odds ratio of 1.4 after adjusting for gender and age. Similarly, the proportion of residents with a score of 13 and above for K6 - which assesses psychological health status including depression and anxiety - was higher in coastal areas than in inland areas (odds ratio 1.4: 95% confidence interval, 1.1-1.8).

Four percent of the 6933 participants were also found to have experienced distress and difficulty in daily life due to the recollection of events during the Great East Japan Earthquake, and are considered to be affected by considerable posttraumatic stress reaction (PTSR).

"The findings provide tangible evidence pointing towards continuing mental health needs among communities affected by the disaster" said Prof. Hiroaki Tomita, who is leading ToMMo's mental health promotion group. The proportion of residents who showed considerable PTSR was also significantly higher in coastal areas than inland areas, with an odds ratio of 2.4 (95% confidence interval, 1.6-3.7).

Psychologists who have been trained to support psychological problems in post-disaster settings have provided support in more than 600 cases of telephone-based or face-to-face consultations to residents who had shown psychological problems in the survey. On the other hand, the study showed no significant difference between coastal and inland communities in the ratio of residents who showed indicators for somatic problems - including Helicobacter pylori infection, which can cause various gastric problems - and raised NT-proBNP levels used as a marker for potential heart failure.

The Tohoku Medical Megabank Project Community-Based Cohort Study was started in 2013. The data was collected from residents who were recruited at specific health checkup sites established by municipalities in Miyagi Prefecture.

CES-D (The Center for Epidemiologic Studies Depression Scale) is a screening test for depression developed by the National Institute of Mental Health (NIMH) in the United States.

The K6 (the Kessler 6-item screening scale for psychological distress) is a scale for measuring the degree of psychological problems, including mental stress. It is designed to screen for mental disorders including depression and anxiety.

http://www.bbc.com/news/health-34130620

Children paralysed in Ukraine polio outbreak

Two children have been paralysed in the first polio outbreak in Europe for five years, according to the World Health Organization (WHO).

By James Gallagher Health editor, BBC News website

Both cases were in Ukraine where only half the children are fully immunised. It is likely large numbers of other children have also been infected without developing symptoms.

The WHO said the risk of the virus spreading further in the country was "high" and that the outbreak needed to be rapidly controlled. One of the paralysed children was four years old and the other just 10 months. Both were from south-

western Ukraine near the border with Romania, Hungary, Slovakia and Poland. The outbreak started from the weakened form of the virus that is used in vaccination. Sometimes it can mutate and start to spread if immunisation levels are too low.

Oliver Rosenbaum, a spokesperson for the Polio Eradication Initiative at the WHO, told the BBC News website: "It is now a dangerous strain. "There are two cases of paralysis, but for sure they are not the only ones. That's one of the big dangers of the disease, there are a lot of asymptomatic cases."

Wild polio leads to paralysis in one in every 200 infections, while the vaccine-derived strain tends to be milder. The WHO is recommending that everyone visiting the region is fully vaccinated and that all residents and anyone staying for more than a month gets an extra dose of polio vaccine.

The last cases in Europe were in Russia in 2010 when 14 people were paralysed when a wild polio strain was imported from Tajikistan.

http://www.eurekalert.org/pub_releases/2015-09/acs-etp090215.php

Exposure to phthalates could be linked to pregnancy loss

Study suggests that exposure to substances used in some everyday products may be associated with miscarriage early in pregnancy

A new study of more than 300 women suggests that exposure to certain phthalates - substances commonly used in food packaging, personal-care and other everyday products - could be associated with miscarriage, mostly between 5 and 13 weeks of pregnancy. The research, appearing in the ACS journal Environmental Science & Technology, is the first epidemiological study on non-work-related exposure to phthalates to provide evidence for the possible link among a general population.

Out of concern over the potential health effects of phthalates, the U.S. has banned six of these substances from use in certain products made for young children. But many are still included as ingredients in paints, medical tubes, vinyl flooring, soaps, shampoos and other items. Research on phthalates has shown that long-term exposure to low levels of the some of these compounds harms lab animals' health and can increase their risk for pregnancy loss. Additionally, at least one study found that female factory workers exposed to high levels of phthalates through their work were at a higher risk for miscarriage. But there is little epidemiological evidence of phthalates' effects on pregnancy among women with non-occupational exposure. Jianying Hu, Huan Shen and colleagues wanted to find out if there might be a link.

The researchers tested urine samples from 132 women who had miscarriages and 172 healthy pregnant women in China. They found pregnancy loss was associated with higher levels of urinary phthalate metabolites from diethyl phthalate (DEP), di-isobutyl phthalate (DiBP) and di-n-butyl phthalate (DnBP). Although this doesn't prove that phthalates cause pregnancy loss, the study suggests an association exists that the researchers say should be studied further.

The authors acknowledge funding from the National Natural Science Foundation of China and the Beijing National Science Foundation.

http://www.eurekalert.org/pub_releases/2015-09/vu-ete090215.php

Evidence that Earth's first mass extinction was caused by critters not catastrophe

A powerful analogy for what is happening today

NASHVILLE, Tenn. - In the popular mind, mass extinctions are associated with catastrophic events, like giant meteorite impacts and volcanic super-eruptions.

But the world's first known mass extinction, which took place about 540 million years ago, now appears to have had a more subtle cause: evolution itself.

"People have been slow to recognize that biological organisms can also drive mass extinction," said Simon Darroch, assistant professor of earth and environmental sciences at Vanderbilt University. "But our comparative study of several communities of Ediacarans, the world's first multicellular organisms, strongly supports the hypothesis that it was the appearance of complex animals capable of altering their environments, which we define as 'ecosystem engineers,' that resulted in the Ediacaran's disappearance." The study is described in the paper "Biotic replacement and mass extinction of the Ediacara biota" published Sept. 2 in the journal Proceedings of the Royal Society B.

"There is a powerful analogy between the Earth's first mass extinction and what is happening today," Darroch observed. "The end-Ediacaran extinction shows that the evolution of new behaviors can fundamentally change the entire planet, and we are the most powerful 'ecosystem engineers' ever known."

The earliest life on Earth consisted of microbes - various types of single-celled microorganisms. They ruled the Earth for more than 3 billion years. Then some of these microorganisms discovered how to capture the energy in sunlight. The photosynthetic process that they developed had a toxic byproduct: oxygen. Oxygen was poisonous to most microbes that had evolved in an oxygen-free environment, making it the world's first pollutant.

But for the microorganisms that developed methods for protecting themselves, oxygen served as a powerful new energy source. Among a number of other things, it gave them the added energy they needed to adopt multicellular forms. Thus, the Ediacarans arose about 600 million years ago during a warm period following a long interval of extensive glaciation.

"We don't know very much about the Ediacarans because they did not produce shells or skeletons. As a result, almost all we know about them comes from imprints of their shapes preserved in sand or ash," said Darroch.

What scientists do know is that, in their heyday, Ediacarans spread throughout the planet. They were a largely immobile form of marine life shaped like discs and tubes, fronds and quilted mattresses. The majority were extremely passive, remaining attached in one spot for their entire lives. Many fed by absorbing chemicals from the water through their outer membranes, rather than actively gathering nutrients.

Paleontologists have coined the term "Garden of Ediacara" to convey the peace and tranquility that must have prevailed during this period. But there was a lot of churning going on beneath that apparently serene surface.

After 60 million years, evolution gave birth to another major innovation: animals. All animals share the characteristics that they can move spontaneously and independently, at least during some point in their lives, and sustain themselves by eating other organisms or what they produce. Animals burst onto the scene in a frenzy of diversification that paleontologists have labeled the Cambrian explosion, a 25-million-year period when most of the modern animal families - vertebrates, molluscs, arthropods, annelids, sponges and jellyfish - came into being. "These new species were 'ecological engineers' who changed the environment in ways that made it more and more difficult for the Ediacarans to survive," said Darroch.

He and his colleagues performed an extensive paleoecological and geochemical analysis of the youngest known Ediacaran community exposed in hillside strata in southern Namibia. The site, called Farm Swartpunt, is dated at 545 million years ago, in the waning one to two million years of the Ediacaran reign.

"We found that the diversity of species at this site was much lower, and there was evidence of greater ecological stress, than at comparable sites that are 10 million to 15 million years older," Darroch reported. Rocks of this age also preserve an increasing diversity of burrows and tracks made by the earliest complex animals, presenting a plausible link between their evolution and extinction of the Ediacarans.

The older sites were Mistaken Point in Newfoundland, dating from 579 to 565 million years ago; Nilpena in South Australia, dating from 555 to 550 million years ago; and the White Sea in Russia, dating also from 555 to 550 million years ago million years ago.

Darroch and his colleagues made extensive efforts to ensure that the differences they recorded were not due to some external factor.

For example, they ruled out the possibility that the Swartpunt site might have been lacking in some vital nutrients by closely comparing the geochemistry of the sites.

It is a basic maxim in paleontology that the more effort that is made in investigating a given site, the greater the diversity of fossils that will be found there. So the researchers used statistical methods to compensate for the variation in the differences in the amount of effort that had been spent studying the different sites.

Having ruled out any extraneous factors, Darroch and his collaborators concluded that "this study provides the first quantitative palaeoecological evidence to suggest that evolutionary innovation, ecosystem engineering and biological interactions may have ultimately caused the first mass extinction of complex life."

Marc Laflamme, Thomas Boag and Sara Mason from the University of Toronto; Douglas Erwin and Sarah Tweedt from the Smithsonian Institution, Erik Sperling from Stanford University; Alex Morgan and Donald Johnston from Harvard University; Rachel Racicot from Yale University; and Paul Myrow from Colorado College collaborated in the study.

The project was supported by grants from the Connaught Foundation, National Science and Engineering Research Council of Canada, NASA Astrobiology Institute, National Geographic Society and National Science Foundation grant EAR 1324095.

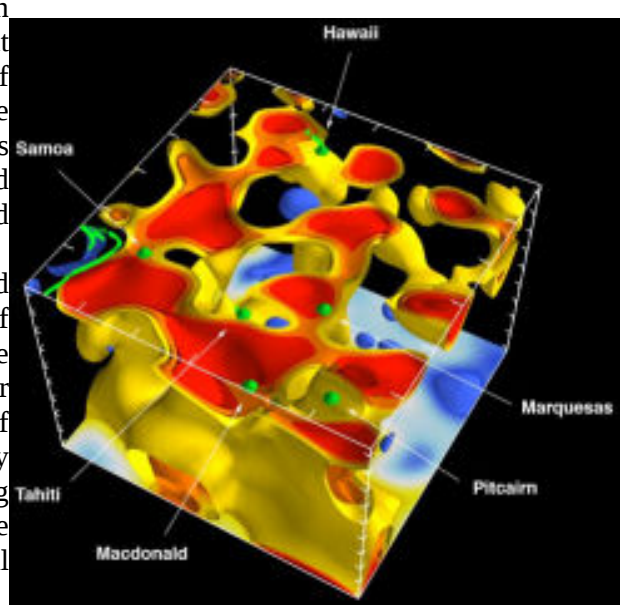
http://www.eurekalert.org/pub_releases/2015-09/uoc--cso083115.php

CT scan of Earth links deep mantle plumes with volcanic hotspots

Scans prove that plumes of hot rock anchored at core-mantle boundary rise to form island chains

University of California, Berkeley, seismologists have produced for the first time a sharp, three-dimensional scan of Earth's interior that conclusively connects plumes of hot rock rising through the mantle with surface hotspots that generate volcanic island chains like Hawaii, Samoa and Iceland.

Essentially a computed tomography, or CT scan, of Earth's interior, the picture emerged from a supercomputer simulation at the Department of Energy's National Energy Research Scientific Computing Center (NERSC) at the Lawrence Berkeley National Laboratory.



This is a supercomputer simulation of plumes of hot rock rising through the mantle to form volcanic island chains. **Animation by Scott French, NERSC and Berkeley Lab; video by Roxanne Makasdjian and Stephen McNally, UC Berkeley.**

While medical CTs employ X-rays to probe the body, the scientists mapped mantle plumes by analyzing the paths of seismic waves bouncing around Earth's interior after 273 strong earthquakes that shook the globe over the past 20 years.

Previous attempts to image mantle plumes have detected pockets of hot rock rising in areas where plumes have been proposed, but it was unclear whether they were connected to volcanic hotspots at the surface or the roots of the plumes at the core mantle boundary 2,900 kilometers (1,800 miles) below the surface.

The new, high-resolution map of the mantle -- the hot rock below Earth's crust but above the planet's iron core -- not only shows these connections for many hotspots on the planet, but reveals that below about 1,000 kilometers the plumes are between 600 and 1,000 kilometers across, up to five times wider than geophysicists thought. The plumes are likely at least 400 degrees Celsius hotter than surrounding rock.

"No one has seen before these stark columnar objects that are contiguous all the way from the bottom of the mantle to the upper part of the mantle," said first author Scott French, a computational scientist at NERSC who recently received his Ph.D. from UC Berkeley.

Senior author Barbara Romanowicz, a UC Berkeley professor of earth and planetary science, noted that the connections between the lower-mantle plumes and the volcanic hotspots are not direct because the tops of the plumes spread out like the delta of a river as they merge with the less viscous upper mantle rock.

"These columns are clearly separated in the lower mantle and they go all the way up to about 1,000 kilometers below the surface, but then they start to thin out in the upper part of the mantle, and they meander and deflect," she said. "So while the tops of the plumes are associated with hotspot volcanoes, they are not always vertically under them."

Ancient anchors

The new picture also shows that the bases of these plumes are anchored at the core-mantle boundary in two huge blobs of hot rock, each about 5,000 kilometers in diameter, that are likely denser than surrounding rock. Romanowicz estimates that those two anchors -- directly opposite one another under Africa and the Pacific Ocean -- have been in the same spots for 250 million years.

French and Romanowicz, who also is affiliated with the Institut de Physique du Globe and the Collège de France in Paris, will publish their findings in the Sept. 3 issue of the British journal Nature.

The Earth is layered like an onion. An exterior crust contains the oceans and continents, while under the crust lies a thick mantle of hot but solid rock 2,900 kilometers thick. Below the mantle is the outer core, composed of liquid, molten iron and nickel, which envelopes an inner core of solid iron at the center of the planet.

Heated by the hot core, the rock in the mantle rises and falls like water gently simmering in a pan, though this convection occurs much more slowly. Seismologists proposed some 30 years ago that stationary plumes of hot rock in the mantle occasionally punched through the crust to produce volcanoes, which, as the crust moved, generated island chains such as the Galapagos, Cape Verde and Canary islands.

The Hawaiian Islands, for example, consist of 5 million-year-old Kauai to the west but increasingly younger islands to the east, because the Pacific Plate is moving westward. The newest eruption, Loihi, is still growing underwater east of the youngest island in the chain, Hawaii.

Until now, evidence for the plume and hotspot theory had been circumstantial, and some seismologists argued instead that hotspots are very shallow pools of hot rock feeding magma chambers under volcanoes.

Romanowicz, who uses seismic waves to study Earth's interior, had previously worked with French, then a graduate student, on a tomographic model of the upper 800 kilometers of the mantle, which showed periodic hot and cold regions of rock underlying hotspot volcanoes. The new study completes that picture down to the core-mantle boundary.

She noted that if higher temperature alone were responsible for the rising plumes, they would be only 100-200 kilometers wide, ballooning out only when they approach the surface. The fact that they appear to be five times wider in the lower mantle suggests that they also differ chemically from the surrounding cooler rock.

This supports models where the material in the plume is a mixture of normal mantle rock and primordial rock from the dense rock anchoring the plume at the core-mantle boundary. In fact, lava emerging from hotspot volcanoes is known to differ chemically and isotopically from lava from other volcanoes, such as those erupting at subduction zones where Earth's crust dives into the upper mantle.

The supercomputer analysis did not detect plumes under all hotspot volcanoes, such as those in Yellowstone National Park. The plumes that feed them may be too thin to be detected given the computational limits of the global modeling technique, French said.

Millions of hours of computer time

To create a high-resolution CT of Earth, French used very accurate numerical simulations of how seismic waves travel through the mantle, and compared their predictions to the ground motion actually measured by detectors around the globe. Earlier attempts by other researchers often approximated the physics of wave propagation and focused mainly on the arrival times of only certain types of

seismic waves, such as the P (pressure) and S (shear) waves, which travel at different speeds. French used numerical simulations to compute all components of the seismic waves, such as their scattering and diffraction, and tweaked the model repeatedly to fit recorded data using a method similar to statistical regression. The final computation required 3 million CPU hours on NERSC's supercomputers, though parallel computing shrank this to a couple of weeks.

Romanowicz hopes eventually to obtain higher resolution supercomputer images of Earth's interior, perhaps by zooming in on specific areas, such as that under the Pacific Ocean, or by using new data.

"Tomography is the most powerful method to get this information, but in the future it will be combined with very sensitive gravity measurements from satellites and maybe electromagnetic sounding, where people do conductivity measurements of the interior," she said.

This study was supported by the National Science Foundation (EAR-1417229) and the European Research Council. NERSC is supported by the U.S. Department of Energy Office of Science (DE-AC02-05CH11231).

http://www.eurekalert.org/pub_releases/2015-09/tau-tat090215.php

Texas A&M team finds neuron responsible for alcoholism

Researchers find neuron responsible for alcohol consumption, could stop cycle of alcoholism

Scientists have pinpointed a population of neurons in the brain that influences whether one drink leads to two, which could ultimately lead to a cure for alcoholism and other addictions.

A study, published in the Journal of Neuroscience by researchers at the Texas A&M Health Science Center College of Medicine, finds that alcohol consumption alters the structure and function of neurons in the dorsomedial striatum, a part of the brain known to be important in goal-driven behaviors. The findings could be an important step toward creation of a drug to combat alcoholism.

"Alcoholism is a very common disease," said Jun Wang, M.D., Ph.D., the lead author on the paper and an assistant professor in the Department of Neuroscience and Experimental Therapeutics at the Texas A&M College of Medicine, "but the mechanism is not understood very well."

Now, Wang and his team have helped come a little closer to that understanding. Using an animal model, the researchers determined that alcohol actually changes the physical structure of medium spiny neurons, the main type of cell in the striatum. These neurons can be thought of like a tree, with many branches, and many small protrusions, or spines, coming off of them. They each have one of two types of dopamine receptors, D1 or D2, and so can be thought of as either D1 or D2 neurons. D1 neurons are informally called part of a "go" pathway in the brain, while D2 neurons are in the "no-go" pathway. In other words, when D2 neurons are activated, they discourage action -- telling you to wait, to stop, to do nothing.

Although it is well known that the neurotransmitter dopamine is involved in addiction, this study goes further, showing that the dopamine D1 receptor also plays an important role in addiction. The team found that periodic consumption of large amounts of alcohol acts on D1 neurons, making them much more excitable, which means that they activate with less stimulation.

"If these neurons are excited, you will want to drink alcohol," Wang said. "You'll have a craving." That is to say, when neurons with D1 receptors are activated, they compel you to perform an action -- reaching for another bottle of tequila, in this case. This then creates a cycle, where drinking causes easier activation, and activation causes more drinking.

These changes in activation of D1 neurons might be related to the physical changes happening at the sub-cellular level in brains that have been exposed to alcohol. They have longer branching and more of the mature, mushroom-shaped spines -- the type that stores long-term memories -- than their abstaining counterparts.

Conversely, the placebo group, the ones not exposed to alcohol, tended to have more of the immature versions of the mushroom-shaped spines in D1 neurons of their brains. The total number of spines didn't change in the two groups, but the ratio between mature and immature was dramatically different between the alcohol group and the placebo group. This has important implications for memory and learning in drug addiction.

"When you drink alcohol, long-term memory is enhanced, in a way," Wang said. "But this memory process is not useful -- in fact, it underlies addiction since it affects the 'go' neurons." Because there was no difference in the number of each type of spine in the D2 (no-go) neurons of alcohol-consuming and control models, the researchers realized there was a specific relationship between D1 neurons and alcohol consumption. "We're now able to study the brain at the neuron-specific and even spine-specific level," Wang said.

How do you determine which neuron, which type of neurons or which group of neurons is responsible for a specific disease? That's what the next part of the study tried to answer.

The alcohol-consuming animal models with the increased mature spines in D1 neurons also showed an increased preference to drink large quantities of alcohol when given the choice. "Even though they're small, D1 receptors are essential for alcohol consumption," Wang said.

Furthermore, and perhaps most excitingly, when those same animal models were given a drug to at least partially block the D1 receptor, they showed much-

reduced desire to drink alcohol. However, a drug that inhibited the D2 dopamine receptors had no effect. "If we suppress this activity, we're able to suppress alcohol consumption," Wang said. "This is the major finding. Perhaps in the future, researchers can use these findings to develop a specific treatment targeting these neurons."

The study, which was co-authored with researchers from the University of California San Francisco, was supported by a grant from the National Institute on Alcohol Abuse and Alcoholism (NIAAA).

"My ultimate goal is to understand how the addicted brain works," Wang said, "and once we do, one day, we'll be able to suppress the craving for another round of drinks and ultimately, stop the cycle of alcoholism."

http://bit.ly/1JL2lTS

Baby's Cells Can Manipulate Mom's Body for Decades

An evolutionary approach may help scientists understand why mothers become genetic chimeras and how that affects their health

Mothers around the world say they feel like their children are still a part of them long after they've given birth. As it turns out, that is literally true. During pregnancy, cells from the fetus cross the placenta and enter the mother's body, where they can become part of her tissues.

This cellular invasion means that mothers carry unique genetic material from their children's bodies, creating what biologists call a microchimera, named after the legendary beasts made of different animals. The phenomenon is widespread among mammals, and scientists have proposed a number of theories for how it affects the mother, from better wound healing to higher risk of cancer.

Now a team of biologists argues that to really understand what microchimerism does to moms, we need to figure out why it evolved in the first place.

"What we are hoping to do is not only provide an evolutionary framework for understanding how and why microchimerism came to be, but also to assess how this affects health," says lead author Amy Boddy, a geneticist at Arizona State University.

Maternal-fetal conflict has its origins with the very first placental mammals millions of years ago. Over evolutionary time, the fetus has evolved to manipulate the mother's physiology and increase the transfer of resources like nutrition and heat to the developing child. The mother's body in turn has evolved countermeasures to prevent excessive resource flow.

Things get even more intriguing when fetal cells cross the placenta and enter the mother's bloodstream. Like stem cells, fetal cells are pluripotent, which means they can grow into many kinds of tissue. Once in the mother's blood, these cells circulate in the body and lodge themselves in tissue. They then use chemical cues from neighboring cells to grow into the same stuff as the surrounding tissue, Boddy says.

Although the mother's immune system typically removes unchanged fetal cells from the blood after pregnancy, the ones that have already integrated with maternal tissues escape detection and can remain in mom's body.

Microchimerism can get especially complex when a mother has multiple pregnancies. The mother's body accumulates cells from each baby—and potentially functions as a reservoir, transferring cells from the older sibling into the younger one and forming more elaborate microchimeras. The presence of fetal cells in the mother's body could even regulate how soon she can get pregnant again.

"I think one promising area for further research concerns unexplained pregnancy losses, and whether older siblings, as genetic individuals, can play a role in delaying the birth of younger siblings," says David Haig, an evolutionary biologist at Harvard University.

Given all this complexity, microchimeras have been difficult to study until recently, the authors note in their paper, which will be published in an upcoming issue of *BioEssays*. The phenomenon was discovered several decades ago, when male DNA was detected in the bloodstream of a woman. But the technologies of the time couldn't get a detailed enough picture of the genetics to tease apart the minute cellular situation.

Now, deep-sequencing technologies allow researchers to identify the origin of DNA in a mother' tissues more comprehensively by sampling many areas in the genome, including genes implicated in immunity. These genes are unique to an individual and thus can help differentiate a mother's DNA from that of her children with greater precision.

"If the cell populations can be isolated, then modern techniques should allow the genetic individual of origin to be unambiguously identified," says Haig.

Still, understanding how the fetal cells are interacting with maternal cells is going to be difficult, says Boddy. Little is understood about the cellular signaling that causes fetal cells to regulate maternal physiology.

"It's likely a negotiation between the maternal body and the fetal cells, where there is an expectation in the maternal body of a certain level of microchimerism that it needs to function properly," said Boddy. For example, previous experiments showed that when mouse fetal cells are exposed to lactation hormones in the lab, they take on similar attributes to those of mammary cells, hinting that breast tissue may be one hot spot for microchimerism.

"Normal, healthy lactation may be the consequence of the fetal cells signaling to the mother's body to make milk," says co-author Melissa Wilson Sayres, also at

Arizona State. But previous work has also suggested that the same features that allow fetal cells to integrate into the mother's tissues—like evading her immune system—also makes them similar to cancer cells, which could lead to greater cancer vulnerability in the mother.

Based on evolutionary reasoning, the authors predict that fetal cells should be found primarily in the tissues that play a role in transferring resources to the fetus. That includes the breast, where they may impact milk production; the thyroid, where they can affect metabolism and heat transfer to the baby; and the brain, where they may influence neural circuitry and maternal attachment to the child.

The next steps will be to use modern sequencing tools to go looking for fetal cells in these spots, and then begin studying how the cells are communicating in each region of mom's body.

"What is really interesting and novel about this work is putting the issue of microchimerism and maternal health into an evolutionary framework," says Julienne Rutherford, a biological anthropologist at the University of Illinois at Chicago.

"If these fetal cells are interacting with maternal physiology, where in the maternal body would we expect the greatest effect on function? That's been a big question mark. Putting this into an evolutionary context was incredibly clever and novel and very exciting. It's a beautiful example of theory driving testable predictions."

http://www.eurekalert.org/pub_releases/2015-09/cru-ach090215.php

Aspirin could hold the key to supercharged cancer immunotherapy

Giving cancer patients aspirin at the same time as immunotherapy could dramatically boost the effectiveness of the treatment, according to new research published in the journal Cell today (Thursday).

Francis Crick Institute researchers, funded by Cancer Research UK, have shown that skin, breast and bowel cancer cells often produce large amounts of prostaglandin E2 (PGE2). This molecule dampens down the immune system's normal response to attack faulty cells, which helps cancer to hide. It is a trick that allows the tumour to thrive and may explain why some immunotherapy treatments have not been as effective as hoped.

Aspirin is part of a group of molecules called COX inhibitors, which stop the production of PGE2 and help reawaken the immune system. Combining immunotherapy with aspirin or other COX inhibitors substantially slowed bowel and melanoma skin cancer growth in mice, compared to immunotherapy alone*.

Study author Professor Caetano Reis e Sousa, senior group leader at the Francis Crick Institute, said: "We've added to the growing evidence that some cancers produce PGE2 as a way of escaping the immune system. If you can take away cancer cells' ability to make PGE2 you effectively lift this protective barrier and unleash the full power of the immune system.

"Giving patients COX inhibitors like aspirin at the same time as immunotherapy could potentially make a huge difference to the benefit they get from treatment. It's still early work but this could help make cancer immunotherapy even more effective, delivering life-changing results for patients."

Professor Peter Johnson, Cancer Research UK's chief clinician, said: "PGE2 acts on many different cells in our body, and this study suggests that one of these actions is to tell our immune system to ignore cancer cells. Once you stop the cancer cells from producing it, the immune system switches back to 'kill mode' and attacks the tumour.

"This research was carried out in mice so there is still some way to go before we will see patients being given COX inhibitors as part of their treatment. But it's an exciting finding that could offer a simple way to dramatically improve the response to treatment in a range of cancers."

Zelenay, S. et al, 'Cyclooxygenase-dependent tumor growth through evasion of immunity'. Cell, 2015. DOI: 10.1016/j.cell.2015.08.015

**The type of immunotherapy tested was anti-PD-1. For more information on how these treatments work, you can read our blog and watch our animation on cancer immunotherapy: http://scienceblog.cancerresearchuk.org/2014/06/02/new-immunotherapy-drugs-hit-the-headlines-how-do-they-work/ And: https://www.youtube.com/watch?v=k41b40XYbXw*

http://www.eurekalert.org/pub_releases/2015-09/uoaf-faw090315.php

Finding a way forward in the fight against prion disease

UAlberta study finds bile acids may prolong survival in models of prion disease

For much of her adult life Valerie Sim has been fascinated by a disease very few in the world can claim to even begin to understand. Sim is one of Canada's foremost authorities on prion disease--more commonly known as bovine spongiform encephalopathy, or mad cow disease in cattle, or Creutzfeldt-Jacob disease among humans. In both cases there is no cure; nor are there treatments available. But Sim's latest research is providing new hope for the future.

Sim, an assistant professor in the University of Alberta's Faculty of Medicine & Dentistry, and Leonardo Cortez, a research associate in her lab, are the main authors of a study in the August issue of the Journal of Virology examining the use of two bile acids as possible therapeutic treatments for prion disease. The research found that ursodeoxycholic acid (UDCA) and tauroursodeoxycholic acid (TUDCA) helped slow the progression of the disease if given early in the disease

process. The bile acids appear to bind the proteins (prions) that cause disease and prevent them from spreading.

"These compounds are normally used to help digest lipids and fats, but interestingly they've been used in naturopathic and Chinese remedies for hundreds of years," says Sim. "Right now we have nothing to offer patients with prion disease. This could be a way forward."

Creutzfeldt-Jacob disease is rare in humans, affecting approximately one person out of every million. It is a fatal neurodegenerative disease caused when a protein in the brain takes on a wrong shape, which then converts other proteins to misfold as well. When that occurs, it begins a tremendously accelerated type of dementia, affecting a person's memory, coordination, vision and balance. While most cases are sporadic and unpredictable, in about 10 per cent of all cases the disease is actually inherited. In extremely rare cases it can also be transmitted through eating contaminated meat.

While Sim's research marks important new progress, she cautions it needs further study in humans. She also notes that the use of UDCA and TUDCA would not be effective in most cases of prion disease as patients only come to medical attention after the disease is already too far progressed. She does believe the findings could have application for the 10 per cent of Creutzfeldt-Jacob patients who have a genetic form of the disease and who could seek early long-term treatment.

"Some of those people know they are carriers of the disease and currently we have nothing we can give them that works," says Sim. "This is not a cure, but may have some benefit if given early. And for these patients, any benefit is better than nothing."

With possible clinical applications still years away, Sim and her team are continuing their research. They hope to learn if UDCA and TUDCA would have long-term health benefits for patients with prion disease, or if it would simply extend life at the end stage of the disease when symptoms are at their worst. They are also testing to see if they can boost the effectiveness of UDCA and TUDCA by combining them with other anti-prion compounds.

While work continues on the research, Sim says there are still common sense solutions that can be taken in the meantime to keep the brain functioning at its best.

"I wouldn't propose going out and adding bile acids to the water in an attempt to prevent such a rare disease," she says. "For now, the best ways to reduce the risk of the more common dementias are to stop smoking, exercise, eat well, and get a healthy night's sleep. These are much better for the brain."

Research funding was provided by Alberta Innovates - Bio Solutions, Alberta Innovates - Health Solutions, and the University Hospital Foundation.

http://www.eurekalert.org/pub_releases/2015-09/uok-ltl090215.php

Laughter, then love: Study explores why humor is important in romantic attraction

Men might want to ditch the pickup lines and polish their punchlines in their quest to attract women

LAWRENCE - Men might want to ditch the pickup lines and polish their punchlines in their quest to attract women, new research at the University of Kansas suggests. Jeffrey Hall, associate professor of communication studies, found that when two strangers meet, the more times a man tries to be funny and the more a woman laughs at those attempts, the more likely it is for the woman to be interested in dating. However, an even better indicator of romantic connection is if the two are spotted laughing together.

Those findings were among the discoveries Hall made in his search for a link between humor and intelligence. For the past decade, research has debated whether women appreciate men's humor, which is often cited as one of the most valued traits in a partner, because it allows them to suss out the smarts of potential mates. But Hall said finding someone who appreciates your sense of humor is valuable in its own right.

"The idea that humor is a signal of intelligence doesn't give humor its due credit," Hall said. "If you meet someone who you can laugh with, it might mean your future relationship is going to be fun and filled with good cheer."

In the article "Sexual Selection and Humor in Courtship: A Case for Warmth and Extroversion," which was published online last month in the journal Evolutionary Psychology, Hall discusses three studies he performed that didn't find a connection between humor and intelligence.

In the first study, 35 participants studied the Facebook profile pages of 100 strangers to gauge their personalities. Their evaluations were compared with a survey completed by the Facebook users. Hall found humorous people were much more likely to be extroverted than intelligent and were seen by strangers that way, too. The data also suggested that men and women posted similar amounts of humorous content to their pages.

In the second study, nearly 300 students filled out a survey on humor in courtship. Looking at GPA and ACT scores, the study found that there was no connection between how smart the person was and how funny he or she claimed to be. But it did find a relationship with humor and extroversion. The study also didn't find a difference in how men and women comprehended or appreciated humor.

To find out how humor use by men and humor appreciated by women played a role in romantic attraction, the final study brought together 51 pairs of single,

heterosexual college students who didn't know each other. The pairs sat alone in a room and talked for about 10 minutes. Afterward they filled out a survey.

The results didn't indicate that one sex tried to be funnier than the other. However, it did suggest the more times a man tried to be funny and the more times a woman laughed at his jokes, the more likely she was romantically interested. The reverse was not true for women who attempted humor.

It also showed that when the pair laughed together, they were more interested in each other.

Finding no link between humor and intelligence, Hall offers four explanations for why humor is so important in finding partners:

Humor points to having a sociable and agreeable personality. "Part of what it means to be social is the ability to joke along with people," Hall said.

Men use humor to gauge if women are interested in them. "Men are trying to get women to show their cards," Hall said. "For some men it is a conscious strategy."

When men make jokes and women laugh, they may be performing a script in courtship. Men acting like jokers and women laughing along may be part of it, too. "The script is powerful and it is enduring, and it dictates everything from asking someone out to picking up the tab," Hall said.

Humor is valuable for humor's sake. "Shared laughter might be a pathway toward developing a more long-lasting relationship," Hall said.

http://nyti.ms/1K09rTx

A Glass for Enjoying a Sip of Whisky While Floating in Space

When space tourism finally takes off and the rich and famous head off for a holiday in orbit as easily as on the Riviera, they may want to sip something stronger than Tang as they gaze down at Earth.

By KENNETH CHANG SEPT. 3, 2015

Something like whisky, perhaps.

“When they go on a bit of an adventure, it’s the thing people want to take with them,” said Peter Moore, the brand director for Ballantine’s, a maker of blended Scotch.

Ballantine’s is already looking ahead to that future, financing the development of a glass for sipping while floating in weightlessness, which it unveiled on Friday.

“This is about getting ourselves ready,” Mr. Moore said. “Space tourism is going to develop. Personally, I think it’s going to develop quite quickly.”

Rendering of Ballantine's zero-gravity whisky glass. Credit Open Space Agency

Without gravity, it is impossible to pour a liquid, and runaway droplets could splash in inconvenient places like electronic circuitry. For a glass that offered a refined drinking experience reminiscent to that on Earth required the manipulation of some counterintuitive principles of fluid dynamics.

The bottom of the bulbous glass, made of gold-plated stainless steel, contains a spiral ring for a reservoir of whisky to cling to. Through a phenomenon known as capillary action, first observed by Leonardo da Vinci, the whisky is drawn upward through a helical channel within the side of the glass to a mouthpiece at the rim for a space traveler to drink.

“It’s so magical how things behave when you take gravity away,” said James Parr, founder of the Open Space Agency, an organization of space technology enthusiasts in London that designed the space glass for Ballantine’s.

On Earth, the downward drag of gravity overwhelms the capillary action. To test whether the design worked, Mr. Parr took the space glass to Bremen, Germany, to a 480-foot tall laboratory facility known as a drop tower. Whisky was poured into the bottom of the glass, which was then placed into a cylindrical capsule and winched to the top of a vacuum-sealed shaft. Dropping the capsule down the airless shaft creates nearly zero-gravity conditions for about four seconds, until it makes a cushioned landing at the bottom.

During the drop, video cameras recorded the motion of the whisky. “The whisky started climbing up the capillary to the mouthpiece, and it happened completely to script,” Mr. Parr said.

In addition, Ballantine’s master blender, Sandy Hyslop, created a special version with a sweeter, spicier taste to compensate for the muted sensory experiences that astronauts report in the weightlessness of orbit. Without gravity, water in an astronaut’s body floats upward, and the result is congestion similar to a perpetual head cold.

Neither the whisky nor the glass will be a commercial product anytime soon. There is only one space glass in the world at present (two more, tweaked and improved, are being made), and just 11 bottles of the space blend.

There is whiskey currently zipping around the Earth on the International Space Station — but only for the sake of science. In August, the Japanese conglomerate Suntory sent up an experiment to test a hypothesis that aging liquor in a zero-gravity environment, in the absence of convection, would lead to a mellower final product.

Ardbeg, a Scotch whisky maker, sent up a similar experiment in 2011, which came back to Earth last year, to be analyzed for differences in taste and chemical make-up compared with samples that had been aged on the ground.

At present, opportunities for drinking whiskey, or any alcohol, in space are limited.

NASA packed spirits for its astronauts once — brandy to celebrate Christmas during the Apollo 8 swing around the moon in 1968. But Frank Borman, the commander, ordered that the brandy remain unopened. (James Lovell later auctioned off his two-ounce bottle, still unopened.)

In 1969, after Apollo 11 set down on the moon, Buzz Aldrin held a private Communion for himself with wine and bread. "I poured the wine into the chalice our church had given me," he wrote in an article published in the magazine Guideposts the following year. "In the one-sixth gravity of the moon the wine curled slowly and gracefully up the side of the cup."

In the 1970s, NASA added sherry to the menu for astronauts on the Skylab space station, but backtracked when letters of outrage arrived. Since then, prohibition has been the rule on NASA missions.

The Russians have had a more lax attitude to alcohol in space, at least during the era of the Mir space station. (In 1998, Jerry Linenger, a NASA astronaut on Mir, took a photograph of his Russian colleagues breaking out bottles of cognac to relax right after extinguishing a fire that almost destroyed Mir.) In recent years, they have been reticent about whether their astronauts are bringing spirits to the International Space Station.

But the space whisky glass could be used for any beverage. Mr. Parr said he had had preliminary talks with Made in Space, a company that sent a 3-D printer to the space station, to discuss the possibility of fabricating one of the glasses in space for more extensive testing by astronauts.

From the beginning of the space age, astronauts have had to drink through straws out of plastic bags. Donald Pettit, a NASA astronaut, complained about that during a trip to the space station in 2008, which caught the attention of Mark Weislogel, a professor of materials and mechanical engineering at Portland State University in Oregon.

Dr. Weislogel's research involves moving liquids in low gravity via capillary action without pumps, a principle used to shift fuel from tanks to engines, circulate coolant and process water. He emailed Dr. Pettit with a suggestion for a coffee cup that would work in weightlessness.

Dr. Pettit took a sheet of plastic and folded and taped it into the shape that Dr. Weislogel had suggested, with a teardrop-shaped cross-section like an aircraft wing, one side rounded and the other with a sharp fold.

The fluid flowed upward along the fold to the top of the cup where Dr. Pettit could sip it, and as he sipped, more fluid flowed up, allowing him to empty the cup. "It's a result of surface tension and curvature of a surface," Dr. Weislogel said. "The fluid seeks out the narrower region of the container."

Donald Pettit demostrating drinking coffee in space.

"He made several of them, and he toasted with a bunch of astronauts all drinking from these little things," Dr. Weislogel said. "It was funny."

More recently, when he heard that the an espresso machine built by Lavazza, an Italian coffee company, and Argotec, an aerospace engineering firm, would be headed to the space station this year, Dr. Weislogel and his collaborators at IRPI, a small aerospace company, came up with a more carefully engineered version. It looks somewhat like a toddler's bootie, an odd shape that "falls out of the mathematics," Dr. Weislogel said.

Pieces of a space whisky glass: a gold mouthpiece where a space traveler would sip the whisky and a 3-D printed plastic viewing dome with a helical channel for the whisky to travel up from the convex gold-plated bottom that would hold the reservoir of liquid. The glass would be filled through the black one-way valve on the bottom, and a magnet would allow it to sit firmly to a metal surface. **Open Space Agency**

The cup has been tested by astronauts on the space station with coffee, tea, juice and smoothies. "It works very well," he said.

Ballantine's space glass grew out of brainstorming on how to innovate whiskey drinking for the 21st century. Initial ideas like a Bluetooth-connected whisky glass fell by the wayside. But when the idea of whisky in space was floated, "There was a little bit of intake of breath," Mr. Moore recalled, "and 'isn't that a little bit far out?'"

After view Ballantine's video describing the development work and the drop tests, Dr. Weislogel said, "I think this is cool," but added, "This container on its own will also have some problems." A bubble could form, blocking the channel and the flow of whisky, he said.

Space Glass Project: The Microgravity Test ***Video by Ballantines***

Now that the space glass is finished, Ballantine's will look to see what opportunities may exist in space tourism. (Virgin Galactic, Richard Branson's company that aims to send people on short suborbital flights to the edge of space, has already partnered with Grey Goose, the vodka maker.)

"We've created an artifact from the future," Mr. Parr said.

http://www.bbc.com/news/health-34130619

Weight loss surgery 'cures half of type-2 diabetes cases'

Weight loss surgery cures half of patients with type-2 diabetes, for at least five years, a study suggests.

By James Gallagher Health editor, BBC News website

The trial, on 60 people, published in the Lancet, found none of those with type 2 had been cured by medication and diet alone. The surgery improves symptoms both through weight loss and by changing the way the gut functions. Experts said the results were "remarkable" and that too few people were getting access to the surgery.

The team, at King's College London and the Universita Cattolica in Rome, compared standard drug therapy with surgery to rewire the digestive tract. The operations reduced the size of the stomach and left less of the intestines exposed to food.

Prof Francesco Rubino, who operated on the patients, told the BBC News website: "Surgery is able to produce prolonged remission in 50% of cases, patients get to levels of blood sugar that is non-diabetes for five years. "However, 80% who had surgery were able to maintain 'optimal control' [of blood sugar] despite only taking one drug or nothing at all."

While some of those patients still had type-2 diabetes, they were easily keeping their sugar levels to recommended levels. The patients who had surgery were also less likely to have heart problems, a common side-effect of uncontrolled diabetes, and reported improved quality of life.

Prof Rubino added: "Treating surgically, rather than medical therapy, appears more cost-effective, as there is less use of medication."

The results were better two years after surgery. However, some patients relapsed in the past three years. The surgeons say there still needs to be continual monitoring of blood sugar levels even after the operation.

Drs Dimitri Pournaras and Carel le Roux, from Imperial College London, said diabetes was "the plague of the 21st Century" and that the results were "remarkable". They added: "Surgery for diabetes seems to be safe, effective in terms of glycaemic [sugar] control, and is now associated with reduced complications of diabetes. "The ultimate question is whether diabetes surgery is associated with reduced mortality."

However they said surgery needed to "become more available because only a few patients who will benefit are currently offered this potentially life-saving option".

New rules in the UK have been introduced that should increase the number of patients being offered weight loss surgery.

http://www.eurekalert.org/pub_releases/2015-09/ku-sas090415.php

Spasm at site of atherosclerotic coronary artery narrowing increases risk of heart attack

Patients with coronary spasm have a higher risk of experiencing future heart attack

This news release is available in Japanese.

Researchers at Kumamoto University in Japan have found that patients with coronary spasm have a higher risk of experiencing future heart attack particularly when a spasm occurs at the site of atherosclerotic coronary artery narrowing, i.e., coronary atherosclerotic stenosis.

Angina is caused by the narrowing of the blood vessels that carry blood to the heart, and vasospastic angina patients account for about 40% of all angina patients. The incidence and progression of the disease can be reduced through appropriate drug treatment with relatively good prognosis. However, where stenosis of the coronary arteries has developed alongside vasospastic angina, cases of heart attack increase. A detailed study on the positioning of coronary spasm relative to coronary artery stenosis had not been performed, until now.

Dr. Koichi Kaikita's team examined in detail the positional relationship between coronary spasm and arteriosclerosis, and compared the case data of patients with spasm occurring at sites of coronary atherosclerotic stenosis to those whose spasm occurred at another site. Data was gathered from 1,760 cardiology patients of Kumamoto University Hospital between 1991 to 2010 who experienced chest pain and underwent cardiac catheterization at rest.

Case data was divided into three groups, one in which the coronary spasm occurred at a site of stenosis of the coronary artery, one where the spasm occurred at another site, and another group that had spasms but no stenosis.

Out of the 1,760 cases, coronary spasm occurred 873 times and constriction of a coronary artery was observed 358 times.

Both coronary spasm and coronary atherosclerotic stenosis occurred in a total of 233 cases and there was a tendency for these patients to have a lower rate of diabetes than in stenosis only cases. Furthermore, patients who had coronary spasm without stenosis were found to be older than patients who had neither stenosis nor coronary spasm.

The group with coronary spasm occurring at the site of stenosis was found to have the highest risk of experiencing heart attack within five years when compared to the group with a coronary spasm without coronary atherosclerotic stenosis, and the group with a coronary spasm at a site different from the coronary atherosclerotic stenosis.

"Our research shows that coronary spasm occurring at the site of coronary atherosclerotic stenosis is a predictor for acute coronary syndrome," said Dr. Koichi Kaikita. "In other words, these people have a high risk for heart attack in the relatively near future."

Checking for the occurrence of a coronary artery spasm at sites of coronary artery stenosis helps predict a person's risk for a future heart attack and may be useful for beginning sufficient preventative therapy.This study was published online in "The Journal of the American College of Cardiology" on August 31, 2015.

http://bit.ly/1i6ZSN1

This Box Can Bring Dead Hearts Back To Life

The device could widen pool for heart transplants, but raises ethical questions

A new device that can preserve the hearts of the recently-deceased might help people in need of a transplant. However, the technology is raising ethical questions among some doctors regarding declaring a patient dead.

Designed by the Massachusetts-based company called Transmedics, the technology is designed to keep hearts working after the donor's death by supplying the heart with oxygen, blood and nutrients until it can be surgically implanted in another person, Amar Toor writes for *The Verge*. While it is still awaiting the green light from regulators in the United States, the "heart-in-a-box" has been used successfully in 15 heart transplants in the United Kingdom and Australia.

The device presents a novel solution for preparing hearts for transplantation, which typically only come from donor patients who have been declared brain dead. In most cases, once death is declared, the heart is cooled down while still inside the body before it is stopped, detached and transported at about 39 degrees Farenheit, Antonio Regalado writes for the *MIT Technology Review*. Cold temperatures slow down the heart's metabolism, giving doctors time to transfer it to a recipient before its cells start breaking down.

"A human organ has never been kept alive outside of a human body until this machine became a clinical reality," Dr. Abbas Ardehali, the head of UCLA's heart and lung transplant program, tells Chanelle Berlin Johnson for Al-Jazeera America. "It makes intuitive sense to a layperson to say, 'Instead of having my heart on ice, I want it to be warm. I want it to be beating.'"

A heart can only last for a short while without a strong supply of blood and oxygen to keep it pumping. Most doctors avoid using hearts from donors who have died from a lack of blood flow because the organ is usually too damaged to be transplanted in another person, Regalado writes. Even so, the time frame to transplant a heart is only about five six hours from the time of the donor's death: only two hearts in 10 survive long enough on ice to be successfully transplanted, Johnson reports.

With the new device, hearts can be resuscitated and kept beating shortly after the moment of death. Additionally, keeping the heart warm and functioning could give doctors more time to transplant it, potentially increasing the number of eligible hearts by 15-30 percent, Toor writes.

"Cold is the old thing, and warm is the new thing," Korkut Uygun, a transplant surgeon at Massachusetts General Hospital tells Regalado. "Warm is the way to go with metabolically active tissue."

However, the devices are expensive, costing about $250,000 each. And for some doctors, the prospect of reviving a dead heart brings serious ethical questions for determining when a heart should be saved in this manner.

"How can you say it's irreversible, when the circulatory function is restored in a different body? We tend to overlook that because we want to transplant these organs," Robert Truog, a medical ethicist at Harvard University tells Regalado.

But while the "heart-in-a-box" will likely raise questions about when a person should be declared dead, Truog believes it is ultimately up to the donor and their families to decide what should happen with their heart.

"My argument is that they are not dead, but also that it doesn't matter," Truog tells Regalado. "They are dying and it's permissible to use their organs. The question is whether they are being harmed, and I would say they are not."

http://www.eurekalert.org/pub_releases/2015-09/bc-ewg090315.php

Early warning gene signature for Alzheimer's

A 'gene signature' that could be used to predict the onset of diseases, such as Alzheimer's, years in advance has been developed in research published in the open-access journal Genome Biology

A 'gene signature' that could be used to predict the onset of diseases, such as Alzheimer's, years in advance has been developed in research published in the open access journal Genome Biology.

The study aimed to define a set of genes associated with 'healthy ageing' in 65 year olds. Such a molecular profile could be useful for distinguishing people at earlier risk of age-related diseases. This could improve upon the use of chronological age and complement traditional indicators of disease, such as blood pressure.

Lead author James Timmons, from King's College London, UK, said: "We use birth year, or chronological age, to judge everything from insurance premiums to whether you get a medical procedure or not. Most people accept that all 60 year olds are not the same, but there has been no reliable test for underlying 'biological age'.

"Our discovery provides the first robust molecular 'signature' of biological age in humans and should be able to transform the way that 'age' is used to make medical decisions. This includes identifying those more likely to be at risk of Alzheimer's, as catching those at 'early' risk is key to evaluating potential treatments."

The researchers analyzed the RNA of healthy 65 year old subjects, and used the information to develop a signature of 150 RNA genes that indicated 'healthy ageing'. The signature was found to be a reliable predictor for risk of age-related disease when studying RNA from tissues including human muscle, brain and skin. With this RNA signature, they developed a 'healthy age gene score' which they used to test and compare the RNA profiles of different individuals, and demonstrated that a greater score was associated with better health in men and women.

The researchers studied RNA from healthy 70 year old subjects and analyzed follow-up health data over two decades. Despite all subjects being born within a year of each other, their RNA at around 70 years of age demonstrated a very wide distribution in 'healthy age gene score', varying over a four-fold range. This variation was shown to link to long term health. A greater gene score was also associated with better cognitive health and renal function across a 12 year span - both important determinants of mortality.

In particular, they demonstrated that patients diagnosed with Alzheimer's Disease had an altered 'healthy ageing' RNA signature in their blood, and therefore a lower healthy age gene score, suggesting significant association with the disease.

Timmons added: "This is the first blood test of its kind that has shown that the same set of molecules are regulated in both the blood and the brain regions associated with dementia, and it can help contribute to a dementia diagnosis. This also provides strong evidence that dementia in humans could be called a type of 'accelerated ageing' or 'failure to activate the healthy ageing program'."

Given that early intervention is important in Alzheimer's and there is a need to identify those at greatest risk, the authors say that their 'healthy age gene score' could be integrated to help decide which middle-aged subjects could be offered entry into a preventative clinical trial many years before the clinical expression of Alzheimer's.

A novel multi-tissue RNA diagnostic of healthy ageing relates to cognitive health status Sanjana Sood, Iain J. Gallagher, Katie Lunnon, Eric Rullman, Aoife Keohane, Hannah Crossland, Bethan E. Phillips, Tommy Cederholm, Thomas Jensen, Luc JC van Loon, Lars Lannfelt, William E. Kraus, Philip J. Atherton, Robert Howard, Thomas Gustafsson, Angela Hodges and James A. Timmons

Genome Biology 2015 *http://dx.doi.org/10.1186/s13059-015-0750-x*

http://www.bbc.com/news/health-34153135

Test shows how old your body really is

Scientists say they have developed a way of testing how well, or badly, your body is ageing.

By James Gallagher Health editor, BBC News website

They say it could help predict when a person will die, identify those at high-risk of dementia and could affect medicine, pensions and insurance. The team at King's College London say looking at "biological age" is more useful than using a date of birth. However, the work published in Genome Biology, provides no clues as to how to slow the ageing process.

The test looks for an "ageing signature" in your body's cells by comparing the behaviour of 150 genes. It was developed by initially comparing 54,000 markers of gene activity in healthy, but largely sedentary, 25 and 65-year-olds and then whittling them down to a final 150.

Prof Jamie Timmons, from King's College London, told the BBC News website: "There's a healthy ageing signature that's common to all our tissues, and it appears to be prognostic for a number of things including longevity and cognitive decline.

"It looks like from the age of 40 onwards you can use this to give guidance on how well an individual is ageing." The team said "health" and "age" were two separate entities.

And while some lifestyle decisions, like spending all day on the sofa, could be bad for your health they do not appear to affect the speed your body ages. The team believe combining lifestyle factors and your biological age would give a more accurate picture of your health.

Deaths door?

The researchers tried the test out on samples from a group of 70-year-old men in Sweden. They worked out who was ageing well and who was ageing very rapidly and were able to predict who would die in the next few years. "You could actually pick out people who had almost no chance of being dead, and you have people who had an almost 45% chance of being dead," said Prof Timmons told the BBC.

There are plans to pilot the test in organ transplants in the UK to see if people who are technically old, but have a young "biological age", can still donate organs safely. The researchers say it could also alter cancer screening, with people who are ageing rapidly needing to be screened at a younger age.

Prof Simmons said the test would also form a "useful tool" in predicting the onset of dementia. He said that it could be used in conjunction with other checks to identify those at highest risk of developing the neurodegenerative disease and to enrol them in clinical trials. "What we really need now are tools to identify those

most at risk in 10, 20 years time and I think that's where this research will really have an impact," he added.

Worth a pension?

The research group at King's are aware that being able to check your biological age could have wide-ranging consequences from pensions to insurance premiums.

Prof Simmons told the BBC: "It raises a number questions, no doubt, and strenuous debate, but we are judged by our age already so this might be a smarter way of doing it. "You might decide not to pay so much into your pension and enjoy your life as it is now."

Dr Neha Issar-Brown, from the UK's Medical Research Council, said: "This new test holds great potential as with further research, it may help improve the development and evaluation of treatments that prolong good health in older age."

Dr Eric Karran, from the charity Alzheimer's Research UK, said: "One of the biggest questions in human biology is how we age, and how this process impacts our wider health and risk for conditions like Alzheimer's. "There is much interest in developing a blood test for diseases like Alzheimer's but such a test would need rigorously validating to show it was accurate and sensitive before it could be used in the clinic."