http://www.sciencedaily.com/releases/2013/06/130603114146.htm

Night Work May Impair Glucose Tolerance

A new study suggests that night work may impair glucose tolerance, supporting a causal role of night work in the increased risk of Type 2 diabetes among shift workers.

Results show that peak glucose levels were 16 percent higher during one night of simulated shift work, compared with one day of a simulated daytime work schedule. Compared with the daytime protocol, insulin levels during the night shift protocol were 40 to 50 percent higher at 80 minutes and 90 minutes after a meal.

"It is surprising that just a single night shift can significantly impair glucose tolerance and increase insulin levels," said lead author Christopher Morris, PhD, postdoctoral research fellow in the Medical Chronobiology Program of the Division of Sleep Medicine at Brigham & Women's Hospital and Harvard Medical School in Boston, Mass. "These findings are important because they demonstrate, under highly-controlled lab conditions, that acute exposure to night work impairs glucose tolerance. Chronic impaired glucose tolerance is likely to lead to Type 2 diabetes."

The research abstract was published recently in an online supplement of the journal Sleep, and Morris will present the findings Tuesday, June 4, in Baltimore, Md., at SLEEP 2013, the 27th annual meeting of the Associated Professional Sleep Societies LLC.

The study group comprised 13 healthy, non-obese adults without significant shift work history, who completed two, eight-day, in-laboratory protocols in random order, one including day work and the other night work. Each condition included four baseline days, followed by either day or night shifts. The diet was isocaloric, identical between conditions, and included standardized mixed meals on Days 1 and 3 of day/night work to assess serum glucose and insulin responses. Subjects began eating at 8 a.m. (day work) or 8 p.m. (night work) and were required to finish eating in 20 minutes. A fasting blood sample was taken before the meal, and then additional blood samples were drawn every 10 minutes for 90 minutes, then every 30 minutes for 90 minutes. Only results pertaining to mixed meals consumed on Day 1 of day work and night work were included in the current analysis.

According to the authors, about 8.6 million Americans regularly perform night work, which is associated with Type 2 diabetes risk in epidemiologic studies.

http://www.eurekalert.org/pub_releases/2013-06/uou-aqt052913.php

A grassy trend in human ancestors' diets

Tooth enamel shows surprising change in our ancient buffet

Salt Lake City - Most apes eat leaves and fruits from trees and shrubs. New studies spearheaded by the University of Utah show that human ancestors expanded their menu 3.5 million years ago, adding tropical grasses and sedges to an ape-like diet and setting the stage for our modern diet of grains, grasses, and meat and dairy from grazing animals.

In four new studies of carbon isotopes in fossilized tooth enamel from scores of human ancestors and baboons in Africa from 4 million to 10,000 years ago, a team of two dozen researchers found a surprise increase in the consumption of grasses and sedges – plants that resemble grasses and rushes but have stems and triangular cross sections.

"At last, we have a look at 4 million years of the dietary evolution of humans and their ancestors," says University of Utah geochemist Thure Cerling, principal author of two of the four new studies published online June 3 by the journal Proceedings of the National Academy of Sciences. Most funding was from the National Science Foundation.

"For a long time, primates stuck by the old restaurants – leaves and fruits – and by 3.5 million years ago, they started exploring new diet possibilities – tropical grasses and sedges – that grazing animals discovered a long time before, about 10 million years ago" when African savanna began expanding, Cerling says. "Tropical grasses provided a new set of restaurants. We see an increasing reliance on this new resource by human ancestors that most primates still don't use today."

Grassy savannas and grassy woodlands in East Africa were widespread by 6 million to 7 million years ago. It is a major question why human ancestors didn't seriously start exploiting savanna grasses until less than 4 million years ago.

The isotope method cannot distinguish what parts of grasses and sedges human ancestors ate – leaves, stems, seeds and-or underground storage organs such as roots or rhizomes. The method also can't determine when human ancestors began getting much of their grass by eating grass-eating insects or meat from grazing animals. Direct evidence of human ancestors scavenging meat doesn't appear until 2.5 million years ago, and definitive evidence of hunting dates to only about 500,000 years ago.

With the new findings, "we know much better what they were eating, but mystery does remain," says Cerling, a distinguished professor of geology and geophysics, and biology. "We don't know exactly what they ate. We don't know if they were pure herbivores or carnivores, if they were eating fish [which leave a tooth signal that looks like grass-eating], if they were eating insects or if they were eating mixes of all of these."

Why Our Ancestor's Diets Matter

The earliest human ancestor to consume substantial amounts of grassy foods from dry, more open savannas "may signal a major and ecological and adaptive divergence from the last common ancestor we shared with African great apes, which occupy closed, wooded habitats," writes University of South Florida geologist Jonathan Wynn, chief author of one of the new studies and a former University of Utah master's student.

"Diet has long been implicated as a driving force in human evolution," says Matt Sponheimer, a University of Colorado, Boulder anthropologist, former University of Utah postdoctoral fellow and lead author of the fourth study.

He notes that changes in diet have been linked to both larger brain size and the advent of upright walking in human ancestors roughly 4 million years ago. Human brains were larger than those of other primates by the time our genus, Homo, evolved 2 million years ago. (Our species, Homo sapiens, arose 200,000 years ago.)

"If diet has anything to do with the evolution of larger brain size and intelligence, then we are considering a diet that is very different than we were thinking about 15 years ago," when it was believed human ancestors ate mostly leaves and fruits, Cerling says.

A set of new studies from the University of Utah and elsewhere found that human ancestors and relatives started eating an increasingly grassy diet 3.5 million years ago. The studies included analysis of tooth enamel from fossils of several early African humans, their ancestors and extinct relatives, some of which are shown here. Top left: Paranthropus bosei, 1.7 million years ago. Top right: Homo sapiens, 10,000 years ago. Center left: Paranthropus aethiopicus, 2.3 million years ago. Center right: Homo ergaster, 1.6 million years ago. Bottom left: Kenyanthropus platyops, 3.3 million years ago. Bottom center: lower jaw from Australopithecus anamensis, 4 million years ago. Bottom right: Homo rudolfensis, 1.9 million years ago.

How the Studies Were Performed: You Are What You Eat

The new studies analyze carbon isotope results from 173 teeth from 11 species of hominins. Hominins are humans, their ancestors and extinct relatives that split from the other apes roughly 6 million years ago. Some of the analyses were done in previous research, but the new studies include new carbon-isotope results for 104 teeth from 91 individuals of eight hominin species. Those teeth are in African museums and were studied by two groups working at separate early human sites in East Africa.

Wynn wrote the study about teeth from Ethiopia's Awash Basin-Hadar area, where research is led by Arizona State University's William Kimbel. Cerling wrote the study about teeth from the Turkana Basin in Kenya, where the research team is led by Turkana Basin Institute paleoanthropologist Meave Leakey, Cerling and geologist Frank Brown, dean of mines and Earth sciences at the University of Utah. Cerling also wrote a study about baboon diets. Sponheimer wrote a fourth study, summarizing the other three.

The method of determining ancient creatures' diets from carbon isotope data is less than 20 years old and is based on the idea "you are what you eat," Sponheimer says.

Tiny amounts of tooth enamel were drilled from already broken fossil teeth of museum specimens of human ancestors and relatives. The powder was placed in a mass spectrometer to learn ratios of carbon isotopes incorporated into tooth enamel via diet.

The ratios of rare carbon-13 to common carbon-12 reveal whether an animal ate plants that used so-called C3, C4 or CAM photosynthesis to convert sunlight to energy. Animals eating C4 and CAM plants have enriched amounts of carbon-13.

C3 plants include trees, bushes and shrubs, and their leaves and fruits; most vegetables; cool-season grasses and grains such as timothy, alfalfa, wheat, oats, barley and rice; soybeans; non-grassy herbs and forbs.
C4 plants are warm-season or tropical grasses and sedges and their seeds, leaves or storage organs like roots and tubers. Well-known sedges include water chestnut, papyrus and sawgrass. C4 plants are common in African savannas and deserts. C4 grasses include Bermuda grass and sorghum. C4 grains include corn and millet.
CAM plants include tropical succulent plants such as cactus, salt bush and agave.
Today, North Americans eat about half C3 plants, including vegetables, fruits and grains such as wheat, oats, rye and barley, and about half C4, which largely comes from corn, sorghum and meat animals fed on C4 grasses and grains, Cerling says.
The highest human C3 diets today are found in northern Europe, where only C3 cool-season grasses grow, so meat animals there graze them, not C4 tropical grasses. The highest C4 diets likely are in Central America because of the heavily corn-based diet.
If early humans ate grass-eating insects or large grazing animals like zebras, wildebeest and buffalo, it also would appear they ate C4 grasses. If they ate fish that ate algae, it would give a false appearance of grass-eating because of the way algae takes up carbonate from water, Cerling says. If they ate small antelope and rhinos that browsed on C3 leaves, it would appear they ate C3 trees-shrubs. Small mammals such as hyrax, rabbits and rodents would have added C3 and C4 signals to the teeth of human ancestors.

The Findings: A Dietary History of Human Ancestors and Relatives

Previous research showed that 4.4 million years ago in Ethiopia, early human relative Ardipithecus ramidus ("Ardi") ate mostly C3 leaves and fruits. About 4.2 million to 4 million years ago on the Kenyan side of the Turkana Basin, one of Cerling's new studies shows that human ancestor Australopithecus anamensis ate at least 90 percent leaves and fruits – the same diet as modern chimps.

By 3.4 million years ago in northeast Ethiopia's Awash Basin, according to Wynn's study, Australopithecus afarensis was eating significant amounts of C4 grasses and sedges: 22 percent on average, but with a wide range among individuals of anywhere from 0 percent to 69 percent grasses and sedges. The species also ate some succulent plants. Wynn says that switch "documents a transformational stage in our ecological history." Many scientists previously believed A. afarensis had an ape-like C3 diet. It remains a mystery why A. afarensis expanded its menu to C4 grasses when its likely ancestor, A. anamensis, did not, although both inhabited savanna habitats, Wynn writes.

Also by 3.4 million years ago in Turkana, human relative Kenyanthropus platyops had switched to a highly varied diet of both C3 trees and shrubs and C4 grasses and sedges. The average was 40 percent grasses and sedges, but individuals varied widely, eating anywhere from 5 percent to 65 percent, Cerling says.

About 2.7 million to 2.1 million years ago in southern Africa, hominins Australopithecus africanus and Paranthropus robustus ate tree and shrub foods, but also ate grasses and sedges and perhaps grazing animals. A. africanus averaged 50 percent C4 grass-sedge-based foods, but individuals ranged from none to 80 percent. P. robustus averaged 30 percent grasses-sedges, but ranged from 20 percent to 50 percent.

By 2 million to 1.7 million years ago in Turkana, early humans, Homo, ate a 35 percent grass-and-sedge diet – some possibly from meat of grazing animals – while another hominin, Paranthropus boisei, was eating 75 percent grass – more than any hominin, according to a 2011 study by Cerling. Paranthropus likely was vegetarian. Homo had a mixed diet that likely included meat or insects that had eaten grasses. Wynn says a drier climate may have made Homo and Paranthropus more reliant on C4 grasses.

By 1.4 million years ago in Turkana, Homo had increased the proportion of grass-based food to 55 percent.

Some 10,000 years ago in Turkana, Homo sapiens' teeth reveal a diet split 50-50 between C3 trees and shrubs and C4 plants and likely meat – almost identical to the ratio in modern North Americans, Cerling says.

Humans: The Only Surviving Primates with a C4 Grass Diet

Cerling's second new study shows that while human ancestors ate more grasses and other apes stuck with trees and shrubs, two extinct Kenyan baboons represent the only primate genus that ate primarily grasses and perhaps sedges throughout its history.
Theropithecus brumpti ate a 65 percent tropical grass-and-sedge diet when the baboons lived between 4 million and 2.5 million years ago, contradicting previous claims that they ate forest foods. Later, Theropithecus oswaldi ate a 75 percent grass diet by 2 million years ago and a 100 percent grass diet by 1 million years ago. Both species went extinct, perhaps due to competition from hooved grazing animals. Modern Theropithecus gelada baboons live in Ethiopia's highlands, where they eat only C3 cool-season grasses.
Cerling notes that primate tropical grass-eaters – Theropithecus baboons and Paranthropus human relatives – went extinct while human ancestors ate an increasingly grass-based diet. Why is an open question.

Titles, Authors and Funding for the Four Studies

(1) "Stable isotope-based diet reconstructions of Turkana Basin hominins."
Authors: Thure Cerling and geologists Frank Brown and Kevin Uno, University of Utah; paleontologist F. Kyalo Manthi, National Museums of Kenya and University of Utah; Emma Mbua, National Museums of Kenya; Louise Leakey and her parents, Meave Leakey and Richard Leakey, all of Turkana Basin Institute, Kenya, and Stony Brook University; Frederick Grine, Stony Brook University; John A. Hart, Lukuru Foundation, Democratic Republic of Congo; Prince Kaleme, Maiko National Park Conservation Project, Frankfurt Zoological Society; Helene Roche, University of Paris; and Bernard Wood, George Washington University.
Funding: National Science Foundation (BCS-0621542), National Geographic Society (7767-04) and the Fulbright Foundation.
(2) "Diet of Australopithecus afarensis from the Pliocene Hadar Formation, Ethiopia."
Authors: Jonathan Wynn and Jessica N. Wilson, University of South Florida; Matt Sponheimer, University of Colorado, Boulder; William Kimbel and Kaye Reed, Arizona State University; Zeresenay Alemseged, California Academy of Sciences; and Zelalem Bedaso, Johns Hopkins University.
Funding: National Science Foundation (BCS-1064030).
(3) "Isotopic evidence of early hominin diets."
Authors: Matt Sponheimer, University of Colorado, Boulder; Zeresenay Alemseged, California Academy of Sciences; Thure Cerling, University of Utah; Frederick Grine, Stony Brook University; William Kimbel and Kaye Reed, Arizona State University; Meave Leakey, Turkana Basin Institute, Kenya, and Stony Brook University; Julia Lee-Thorp, Oxford University; Fredrick Kyalo Manthi, National Museums of Kenya and University of Utah; Bernard Wood, George Washington University; and Jonathan Wynn, University of South Florida.
Funding: National Science Foundation; National Research Foundation of South Africa; Leakey Foundation; Wenner-Gren Foundation; Arizona State University; University of Colorado, Boulder; and George Washington University.
(4) "Diet of Theropithecus from 4 to 1 Ma in Kenya."
Authors: Thure Cerling, University of Utah; Kendra Chritz, University of Utah doctoral student in biology; Nina Jablonski, Pennsylvania State University; Meave Leakey, Turkana Basin Institute, Stony Brook University and National Museums of Kenya; and F. Kylao Manthi, National Museums of Kenya and research faculty in geology and geophysics, University of Utah.
Funding: National Science Foundation (BC-0621542, IOB-0322613, IOB-0322781, BCS-0323553 and BCS-0323596).

http://www.bbc.co.uk/news/science-environment-22758119

French wine 'has Italian origins'

Evidence of the earliest winemaking in France has been described - and it indicates Italian origins.

By Jason Palmer Science and technology reporter, BBC News

Shaped vessels called amphoras, known to have been imported from the Etruscan people of Italy around 500 BC, have shown chemical evidence of wine. A wine press identified in the same region shows that the beverage quickly gained favour and launched a local industry that would conquer the world. The study appears in Proceedings of the National Academy of Sciences. There is also evidence that the wines contained herbal and pine resins, which may have helped preserve them for shipping.

The history of wine development is a patchy one, principally because wine leaves behind few chemical markers that archaeologists today can ascribe definitively to wine, rather than other agricultural products.

The earliest known examples of wine-making as we know it are in the regions of modern-day Iran, Georgia, and Armenia - and researchers believe that modern winemaking slowly spread westward from there to Europe.

In 2004, Patrick McGovern of the University of Pennsylvania Museum led a team whose findings suggested that wine based on rice may have been developed in China at the same time or even before efforts in the Middle East. But details for many parts of the spread from the Middle East, including into France, remained unclear.

Dr McGovern and colleagues have now pinned down another part of the story in the new study.

"You could argue that it comes [into France from] farther north on the continent," he told BBC News.

"You could have it spreading across Germany, say, from Romania - but this really provides a definite set of evidence that it came from Italy."

Molecular historians

The team was examining what are called amphoras, vessels designed for carrying both liquids and solids and for neat packing into a boat's hull.

The Etruscans, a pre-Roman civilisation in Italy, are thought to have gained wine culture from the Phoenicians - who spread throughout the Mediterranean from the early Iron Age onward - because they used similarly shaped amphoras. Further, it is known that the Etruscans shipped goods to southern France in these amphoras - but until now it remained unclear if they held wine or other goods.

Dr McGovern's team focused on the coastal site of Lattara, near the town of Lattes south of Montpellier, where the importation of amphoras continued up until the period 525-475 BC.

They used a high-precision analytical tool called gas chromatography/mass spectrometry, which provides a list of the molecules absorbed into the pottery of the amphoras. The results showed that they did once contain wine - as well as pine resin and herbal components. But more surprising was the find of a wine-pressing platform, where grapes were ground and liquid drained off.

"In a walled town like this, it is unusual to find a wine press from an early period," Dr McGovern said. "Finding the chemical evidence for the press, that was a surprise."
The find is consistent with a pattern seen elsewhere - that wine is introduced from abroad, but a local culture eventually seeks to transplant the grapes and grow their own, local wine industry.
"From there, [winemaking] spread up the Rhone River, the domesticated vine gets transplanted, it crosses with the wild grapes and all sorts of interesting cultivars develop - those are the ones that spread around the world.
"Most of the wine we have today is from French cultivars, which ultimately derive from the Near-East cultivar via the Etruscans," he explained. "There's still a lot of blanks to fill in, but I find it very exciting."
The methods used in the study have pushed the boundaries of what can be gathered chemically from archaeological remains such as those in Lattara.
Regis Gougeon of the University Institute of Vine and Wine at the University of Bourgogne said the work was "undoubtedly a good example of technology and methodology leading the science".
"It was already acknowledged - in particular thanks to Patrick McGovern's work - that viniculture might have travelled from the Near East to the Mediterranean Sea area about 3000 BC," Dr Gougeon told BBC News.
"However, this Etruscan hypothesis is indeed rather new and sheds an interesting light on the possible input of this educated and art-oriented civilisation."

http://nyti.ms/10MMGAP

Plastic Bags to Keep Premature Babies Warm

Technique can be duplicated cheaply and effectively in poorer countries

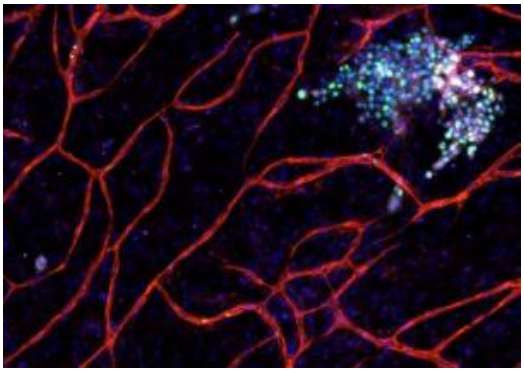
By DONALD G. McNEIL Jr.

In the United States, some very premature babies are swaddled in sterile plastic wrap to keep their body temperature from dropping dangerously. Now a study of newborns in Zambia suggests that the technique can be duplicated cheaply and effectively in poorer countries - using simple plastic bags.
“These are regular plastic bags, similar to grocery bags,” said an author of the study, Dr. Waldemar A. Carlo, a neonatal care specialist at the University of Alabama at Birmingham. “We bought them for as little as 2 cents each. That’s the beauty of it.”
The skin of premature babies is very thin, and water evaporates quickly through it, sometimes leading to life-threatening heat loss, especially in a poor country where heat on neonatal wards can be unsteady.
In the hospital in Lusaka, Zambia, where the study was conducted, the average temperature in the birth wards was near 80 degrees, Dr. Carlo said, but it fluctuated when heaters were moved and windows were opened.
The babies were placed on their mothers’ chests right after birth in typical “kangaroo care,” he said. But kangaroo care is not always enough to warm a child, and when babies were taken to be weighed or observed or because the mother fell asleep or needed medical treatment, putting them in a plastic bag before wrapping them in a blanket did a better job of keeping them warm than a blanket alone.
In the study, published in the journal Pediatrics, there were no instances of overheating or of skin rashes from bag contact.

http://phys.org/news/2013-06-breast-tumor-cells-dormant-metastatic.html

Researchers discover how and where breast tumor cells become dormant and what causes them to become metastatic

Stable microvasculature constitutes a dormant niche for disseminated breast cancer cells, whereas a sprouting neovasculature promotes breast tumor cell growth



Phys.org - The long-standing mystery behind dormant disseminated breast tumor cells and what activates them after years and even decades of latency may have been solved. Researchers with the U.S. Department of Energy (DOE)'s Lawrence Berkeley National Laboratory (Berkeley Lab) have identified the microenvironment surrounding microvasculature – the small blood vessels that transport blood within tissues – as a niche where dormant cancer cells reside. When these blood vessels begin to sprout, the new tips produce molecules that transform dormant cancer cells into metastatic tumors.

Berkeley Lab researchers unlock mystery behind dormant breast tumor cells that become metastatic
A new study shows that stable microvasculature constitutes a dormant niche for disseminated breast cancer cells, whereas a sprouting neovasculature (green points) promotes breast tumor cell growth. **Credit: Ghajar and Bissell**

In a small but significant number of breast cancer patients, cancerous cells can move through the bloodstream from breast tissue to secondary sites in other parts of the body where they may remain in a dormant state,

clinically undetected, for an extended period of time, before suddenly becoming metastatic. It has been difficult if not impossible to predict if and when metastases will occur.

"Our study reveals that a stable microvasculature constitutes a dormant niche, whereas a sprouting neovasculature sparks micrometastatic outgrowth," says cell biologist Mina Bissell, in whose laboratory this work was done. "Sprouting is meant to coincide with tissue growth, but if a tumor cell happens to be in the wrong place at the wrong time, then it comes under the influence of the factors deposited by tip cells and it starts growing."

Bissell, Distinguished Scientist with Berkeley Lab's Life Sciences Division ranks among the world's foremost breast cancer researchers. She is one of two corresponding authors – the other is Cyrus Ghajar a bioengineer and member of Bissell's research group – of a paper describing this study in the journal Nature Cell Biology. The paper is titled "The perivascular niche regulates breast tumor dormancy."

"Some patients may experience metastatic relapse within months, other patients may go several years or even decades without distant recurrence," Bissell says. "The recent discovery of tumor-promoting milieus, referred to as metastatic niches, that are established at distant sites prior to or upon the arrival of disseminated tumor cells could explain cancer cells that relapse early, but in late relapsing populations, what tumor cells do from the time of dissemination to the time they become clinically detectable has been a big question."

Previous research by Bissell and her group showed that the basement membrane, the thin layer of extracellular matrix proteins surrounding breast and other epithelial tissue, provides a microenvironment that induces quiescence in normal epithelial cells and dormant tumor cells alike. Given that breast cancer cells traveling through the bloodstream on their way to secondary sites where breast tumors metastasize most often – lung, bone marrow, brain and liver – must first pass through the basement membrane microvasculature, Ghajar and Bissell suspected that the basement membrane could be a major component of the dormant niche in distant organs.

To test this idea, the researchers utilized two mouse models of human breast cancer metastasis and found dormant disseminated tumor cells residing upon the membrane microvasculature of lung, bone marrow and brain tissue. To determine whether endothelial cells – the cells that line the interior surface of blood vessels - directly influence breast cancer cell growth, they then created unique organotypic models of lung and bone marrow microvascular niches, in which endothelial cells formed blood vessel-like structures in culture as they would in the original organ. When tumor cells were placed on top of these blood vessel-like structures, the in vivo observations of the researchers was reproduced.

With their organotypic models, Ghajar, Bissell and their collaborators discovered that the protein thrombospondin-1, which is prevalent in stable microvasculature, creates a dormant niche by suppressing the growth of breast cancer cells. However, when the tips of these blood cells begin to sprout, the thrombospondin-1 proteins give way to TGF-beta 1 and periostin proteins in the neovasculature, turning it into a metastatic niche that not only permits but accelerates the growth of breast cancer cells.

"Ours is the first study to define the dormant niche on a cellular and molecular basis, and it is interesting that the culprit is the tissue we so often assume is a passive bystander, the microvascular endothelium," Ghajar says. "Moreover, we show that, as with most if not all biological processes, homeostasis is key. In this case, disruption of stable vascular endothelium disrupts this dormant niche and encourages the formation of a microenvironment that sparks micrometastatic outgrowth."

Ghajar says their findings were a surprise in that "Not only was there a loss of growth suppression at neovascular tips, but there was also a gain of tumor promotion. It was never known that endothelial tip cells have such unique secretion or deposition profiles, let alone shown that these profiles actually favor tumor growth."

The identification of dormant niches in basement membrane microvasculature and how those niches become metastatic in the neovasculature holds important implications for future breast cancer therapies.

"Our findings point the way to therapies aimed at managing metastatic disease before it even occurs," Ghajar says. "Dormant disseminated tumors can be ticking time bombs, but now that we know some of the triggers, it may be possible to develop therapies to ensure that disseminated cancer cells remain in a dormant state, or other therapies that eradicate these cells before they form full-blown metastases."

The unique organotypic models developed for this study also hold promise for future therapy research.

"Our organotypic models demonstrate the power of the microenvironment by showing that normal cells in their native architecture naturally steer fully malignant, genotypically aberrant tumor cells into a quiescent state," Ghajar says.

"In the future, our models should provide robust tools to screen for therapies that impact tumor dormancy and metastasis, and should also provide a platform to solve other biological mysteries that underlie dormancy."

Ghajar, Bissell and their collaborators are now investigating whether these results with breast cancer tumors also apply to other types of tumors and in other secondary tissues. They are also looking to identify unique mechanisms specific to other tissues that also result in tumor dormancy.
Provided by Lawrence Berkeley National Laboratory

http://www.eurekalert.org/pub_releases/2013-06/tuhs-dha060313.php

Dogs, humans affected by OCD have similar brain abnormalities

Structural brain abnormalities of dogs afflicted with canine compulsive disorder are similar to those of humans with OCD

NORTH GRAFTON, Mass. - Another piece of the puzzle to better understand and treat obsessive compulsive disorder (OCD) has fallen into place with the publication of new research that shows that the structural brain abnormalities of Doberman pinschers afflicted with canine compulsive disorder (CCD) are similar to those of humans with OCD. The research suggests that further study of anxiety disorders in dogs may help find new therapies for OCD and similar conditions in humans. Published online in advance of print on April 13 in Progress in Neuro-Psychopharmacology & Biological Psychiatry, the findings are a collaboration between veterinarians at the Cummings School of Veterinary Medicine at Tufts University and researchers at the McLean Imaging Center at McLean Hospital, in Belmont, Mass.

The causes of OCD, which affects about 2 percent of the population, are not well understood and the disorder often goes untreated or undiagnosed for decades. People with OCD often exhibit repetitive behaviors or persistent thoughts that are time consuming and interfere with daily routines. Dogs with CCD engage in repetitious and destructive behaviors such as flank- and blanket-sucking, tail chasing, and chewing. However, both OCD and CCD often respond to similar treatments.

"While the study sample was small and further research is needed, the results further validate that dogs with CCD can provide insight and understanding into anxiety disorders that affect people. Dogs exhibit the same behavioral characteristics, respond to the same medication, have a genetic basis to the disorder, and we now know have the same structural brain abnormalities as people with OCD," said Nicholas Dodman, BVMS, DACVB, professor of clinical sciences at the Cummings School of Veterinary Medicine at Tufts University.

The Tufts/McLean research team, led by Niwako Ogata, BVSc, Ph.D., who was a behavior researcher at the Cummings School of Veterinary Medicine and is now an assistant professor of animal behavior at Purdue University College of Veterinary Medicine, examined a sample of 16 Dobermans. Comparing MRI brain images of eight Dobermans with CCD to the control group, Ogata found that the CCD group had higher total brain and gray matter volumes, lower gray matter densities in the dorsal anterior cingulate cortex and right anterior insula, and higher fractional anisotropy in the splenium of the corpus callosum (the degree of which correlated with the severity of the behavioral traits). These findings are consistent with those reported in humans with OCD.

"It has been very gratifying to me to use our imaging techniques developed to diagnose human brain disorders to better understand the biological basis for anxiety/compulsive disorders in dogs, which may lead to better treatments for dogs and humans with these disorders," said Marc J. Kaufman, Ph.D., associate professor of psychiatry at Harvard Medical School and director of the McLean Hospital Translational Imaging Laboratory.

"Canines that misbehave are often labeled as 'bad dogs' but it is important to detect and show the biological basis for certain behaviors," said Ogata. "Evidence-based science is a much better approach to understanding a dog's behavior."

The study builds on existing research to better understand the etiology of compulsive disorders in animals such as CCD, which affects Doberman pinschers and other canine breeds. In 2010, researchers from the Cummings School of Veterinary Medicine, the University of Massachusetts Medical School and the Broad Institute at the Massachusetts Institute of Technology identified a genetic locus on canine chromosome 7 that coincides with an increased risk of OCD.

Ogata N, et al, Brain structural abnormalities in Doberman pinschers with canine compulsive disorder, Prog Neuro-Psychopharmacol Biol Psychiatry (2013), http://dx.doi.org/10.1016/j.pnpbp.2013.04.002

http://www.eurekalert.org/pub_releases/2013-06/esoc-add060313.php

Alzheimer's disease drugs linked to reduced risk of heart attacks

Drugs that are used for treating Alzheimer's disease in its early stages are linked to a reduced risk of heart attacks and death, according to a large study of over 7,000 people with Alzheimer's disease in Sweden.

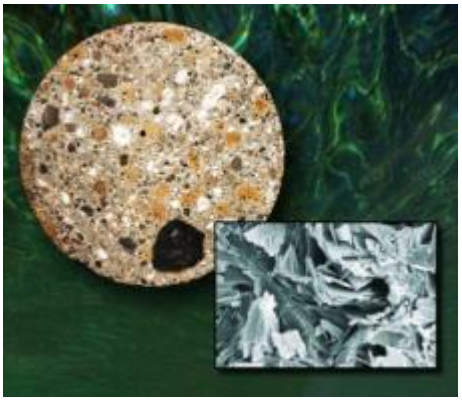
The research, which is published online today (Wednesday) in the European Heart Journal [1], looked at cholinesterase inhibitors (ChEIs), such as donepezil, rivastigmine and galantamine, which are used for treating mild to moderate Alzheimer's disease [2]. Side-effects of ChEIs include a beneficial effect on the vagus nerve,

which controls the rate at which the heart beats, and some experimental studies have suggested that ChEIs could also have anti-inflammatory properties.
Professor Peter Nordström, of Umeå University, Umeå, Sweden, and colleagues followed 7073 people with Alzheimer's disease, who were on the Swedish Dementia Registry from May 2007 to December 2010. They found that those who were on ChEIs had a 36% reduced risk of death from any cause, a 38% reduced risk of a myocardial infarction (heart attack) and a 26% reduced risk of death from cardiovascular causes such as stroke compared to people not taking ChEIs. These results included adjustments for various confounding factors such as age, sex, whether the diagnosis was for Alzheimer's dementia or Alzheimer's mixed dementia (where more than one type of dementia occur simultaneously), level of care, and medical history including medications for other conditions.
Prof Nordström said: "If you translate these reductions in risk into absolute figures, it means that for every 100,000 people with Alzheimer's disease, there would be 180 fewer heart attacks – 295 as opposed to 475 – and 1125 fewer deaths from all causes – 2000 versus 3125 – every year among those taking ChEIs compared to those not using them."
Patients taking the highest recommended doses of ChEIs had the lowest risk of heart attack or death: 65% and 46% lower respectively compared with those who had never used ChEIs.
The researchers also checked whether the reduction in risk applied only to the use of ChEIs or was seen in other drug treatments for dementia. Memantine is a drug indicated for use in moderate to advanced Alzheimer's disease and works in a different way to ChEIs [3]. The researchers found it made no difference to the risk of heart attack or death from any cause.
Prof Nordström said: "As far as we know, this is the first time that the use of ChEIs has been linked to a reduced risk of heart attacks and deaths from cardiovascular disease in general or from any cause. As this is an observational study, we cannot say that ChEI use is causing the reduction in risk, only that it is associated with a reduction. However, the strengths of the associations make them very interesting from the clinical point of view, although no clinical recommendations should be made on the basis of the results from our study. It would be of great value if a meta-analysis of previous, randomised controlled trials could be performed, as this might produce answers on which clinical recommendations could be based."
As the study was based on a nationwide group of patients, Prof Nordström said it should be possible to extrapolate the findings to other countries.
[1] "The use of cholinesterase inhibitors and the risk of myocardial infarction and death: a nationwide cohort study in subjects with Alzheimer's disease", by Peter Nordström, Dorota Religa, Anders Wimo, Bengt Winblad, and Maria Eriksdotter. European Heart Journal. doi:10.1093/eurheartj/eht182
[2] Donepezil, rivastigmine and galantamine are also known by the trade names Aricept, Exelon and Reminyl respectively.
[3] Memantine is known by the trade name Ebixa.

http://www.eurekalert.org/pub_releases/2013-06/dbnl-rsc060313.php

Roman seawater concrete holds the secret to cutting carbon emissions

Berkeley Lab scientists and their colleagues have discovered the properties that made ancient Roman concrete sustainable and durable



The chemical secrets of a concrete Roman breakwater that has spent the last 2,000 years submerged in the Mediterranean Sea have been uncovered by an international team of researchers led by Paulo Monteiro of the U.S. Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab), a professor of civil and environmental engineering at the University of California, Berkeley.
Analysis of samples provided by team member Marie Jackson pinpointed why the best Roman concrete was superior to most modern concrete in durability, why its manufacture was less environmentally damaging – and how these improvements could be adopted in the modern world.

This image shows a drill core of volcanic ash-hydrated lime mortar from the ancient port of Baiae in Pozzuloi Bay. Yellowish inclusions are pumice, dark stony fragments are lava, gray areas consist of other volcanic crystalline materials, and white spots are lime. The inset is a scanning electron microscope image of the special Al-tobermorite crystals that are key to the superior quality of Roman seawater concrete. **Lawrence Berkeley National Laboratory and University of California at Berkeley**

"It's not that modern concrete isn't good – it's so good we use 19 billion tons of it a year," says Monteiro. "The problem is that manufacturing Portland cement accounts for seven percent of the carbon dioxide that industry puts into the air."

Portland cement is the source of the "glue" that holds most modern concrete together. But making it releases carbon from burning fuel, needed to heat a mix of limestone and clays to 1,450 degrees Celsius (2,642 degrees Fahrenheit) – and from the heated limestone (calcium carbonate) itself. Monteiro's team found that the Romans, by contrast, used much less lime and made it from limestone baked at 900˚ C (1,652˚ F) or lower, requiring far less fuel that Portland cement.

Cutting greenhouse gas emissions is one powerful incentive for finding a better way to provide the concrete the world needs; another is the need for stronger, longer-lasting buildings, bridges, and other structures.

"In the middle 20th century, concrete structures were designed to last 50 years, and a lot of them are on borrowed time," Monteiro says. "Now we design buildings to last 100 to 120 years." Yet Roman harbor installations have survived 2,000 years of chemical attack and wave action underwater.

How the Romans did it

The Romans made concrete by mixing lime and volcanic rock. For underwater structures, lime and volcanic ash were mixed to form mortar, and this mortar and volcanic tuff were packed into wooden forms. The seawater instantly triggered a hot chemical reaction. The lime was hydrated – incorporating water molecules into its structure – and reacted with the ash to cement the whole mixture together.

Descriptions of volcanic ash have survived from ancient times. First Vitruvius, an engineer for the Emperor Augustus, and later Pliny the Elder recorded that the best maritime concrete was made with ash from volcanic regions of the Gulf of Naples (Pliny died in the eruption of Mt. Vesuvius that buried Pompeii), especially from sites near today's seaside town of Pozzuoli. Ash with similar mineral characteristics, called pozzolan, is found in many parts of the world.

Using beamlines 5.3.2.1, 5.3.2.2, 12.2.2 and 12.3.2 at Berkeley Lab's Advanced Light Source (ALS), along with other experimental facilities at UC Berkeley, the King Abdullah University of Science and Technology in Saudi Arabia, and the BESSY synchrotron in Germany, Monteiro and his colleagues investigated maritime concrete from Pozzuoli Bay. They found that Roman concrete differs from the modern kind in several essential ways.

One is the kind of glue that binds the concrete's components together. In concrete made with Portland cement this is a compound of calcium, silicates, and hydrates (C-S-H). Roman concrete produces a significantly different compound, with added aluminum and less silicon. The resulting calcium-aluminum-silicate-hydrate (C-A-S-H) is an exceptionally stable binder.

At ALS beamlines 5.3.2.1 and 5.3.2.2, x-ray spectroscopy showed that the specific way the aluminum substitutes for silicon in the C-A-S-H may be the key to the cohesion and stability of the seawater concrete.

Another striking contribution of the Monteiro team concerns the hydration products in concrete. In theory, C-S-H in concrete made with Portland cement resembles a combination of naturally occurring layered minerals, called tobermorite and jennite. Unfortunately these ideal crystalline structures are nowhere to be found in conventional modern concrete.

Tobermorite does occur in the mortar of ancient seawater concrete, however. High-pressure x-ray diffraction experiments at ALS beamline 12.2.2 measured its mechanical properties and, for the first time, clarified the role of aluminum in its crystal lattice. Al-tobermorite (Al for aluminum) has a greater stiffness than poorly crystalline C-A-S-H and provides a model for concrete strength and durability in the future.

Finally, microscopic studies at ALS beamline 12.3.2 identified the other minerals in the Roman samples. Integration of the results from the various beamlines revealed the minerals' potential applications for high-performance concretes, including the encapsulation of hazardous wastes.

Lessons for the future

Environmentally friendly modern concretes already include volcanic ash or fly ash from coal-burning power plants as partial substitutes for Portland cement, with good results. These blended cements also produce C-A-S-H, but their long-term performance could not be determined until the Monteiro team analyzed Roman concrete. Their analyses showed that the Roman recipe needed less than 10 percent lime by weight, made at two-thirds or less the temperature required by Portland cement. Lime reacting with aluminum-rich pozzolan ash and seawater formed highly stable C A-S-H and Al-tobermorite, insuring strength and longevity. Both the materials and the way the Romans used them hold lessons for the future.

"For us, pozzolan is important for its practical applications," says Monteiro. "It could replace 40 percent of the world's demand for Portland cement. And there are sources of pozzolan all over the world. Saudi Arabia doesn't have any fly ash, but it has mountains of pozzolan."

Stronger, longer-lasting modern concrete, made with less fuel and less release of carbon into the atmosphere, may be the legacy of a deeper understanding of how the Romans made their incomparable concrete.

This work was supported by King Abdullah University of Science and Technology, the Loeb Classical Library Foundation at Harvard University, and DOE's Office of Science, which also supports the Advanced Light Source. Samples of Roman maritime concrete were provided by Marie Jackson and by the ROMACONS drilling program, sponsored by CTG Italcementi of Bergamo, Italy.
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For more information, read the UC Berkeley press release at http://newscenter.berkeley.edu/2013/06/04/roman-concrete/.
"Material and elastic properties of Al-torbermotite in ancient Roman seawater concrete," by Marie D. Jackson, Juhyuk Moon, Emanuele Gotti, Rae Taylor, Abdul-Hamid Emwas, Cagla Meral, Peter Guttmann, Pierre Levitz, Hans-Rudolf Wenk, and Paulo J. M. Monteiro, appears in the Journal of the American Ceramic Society.
"Unlocking the secrets of Al-tobermorite in Roman seawater concrete," by Marie D. Jackson, Sejung Rosie Chae, Sean R. Mulcahy, Cagla Meral, Rae Taylor, Penghui Li, Abdul-Hamid Emwas, Juhyuk Moon, Seyoon Yoon, Gabriele Vola, Hans-Rudolf Wenk, and Paulo J. M. Monteiro, will appear in American Mineralogist.

http://www.eurekalert.org/pub_releases/2013-06/uosf-url060413.php

USF researchers: Life-producing phosphorus carried to Earth by meteorites

New PNAS publication sheds light on 3.5 billion-year-old mystery

TAMPA, Fla. – Scientists may not know for certain whether life exists in outer space, but new research from a team of scientists led by a University of South Florida astrobiologist now shows that one key element that produced life on Earth was carried here on meteorites.

In an article published in the new edition of the Proceedings of the National Academies of Sciences, USF Assistant Professor of Geology Matthew Pasek and researchers from the University of Washington and the Edinburg Centre for Carbon Innovation, revealed new findings that explain how the reactive phosphorus that was an essential component for creating the earliest life forms came to Earth.

The scientists found that during the Hadean and Archean eons – the first of the four principal eons of the Earth's earliest history – the heavy bombardment of meteorites provided reactive phosphorus that when released in water could be incorporated into prebiotic molecules. The scientists documented the phosphorus in early Archean limestone, showing it was abundant some 3.5 billion years ago.

The scientists concluded that the meteorites delivered phosphorus in minerals that are not seen on the surface of the earth, and these minerals corroded in water to release phosphorus in a form seen only on the early earth.

The discovery answers one of the key questions for scientists trying to unlock the processes that gave rise to early life forms: Why don't we see new life forms today?

"Meteorite phosphorus may have been a fuel that provided the energy and phosphorus necessary for the onset of life," said Pasek, who studies the chemical composition of space and how it might have contributed to the origins of life. "If this meteoritic phosphorus is added to simple organic compounds, it can generate phosphorus biomolecules identical to those seen in life today."

Pasek said the research provides a plausible answer: The conditions under which life arose on the earth billions of years ago are no longer present today. "The present research shows that this is indeed the case: Phosphorus chemistry on the early earth was substantially different billions of years ago than it is today," he added.

The research team reached their conclusion after examining earth core samples from Australia, Zimbabwe, West Virginia, Wyoming and in Avon Park, Florida

Previous research had showed that before the emergence of modern DNA-RNA-protein life that is known today, the earliest biological forms evolved from RNA alone. What has stumped scientists, however, was understanding how those early RNA –based life forms synthesized environmental phosphorus, which in its current form is relatively insoluble and unreactive. Meteorites would have provided reactive phosphorus in the form of the iron–nickel phosphide mineral schreibersite, which in water released soluble and reactive phosphite. Phosphite is the salt scientists believe could have been incorporated into prebiotic molecules.

Of all of the samples analyzed, only the oldest, the Coonterunah carbonate samples from the early Archean of Australia, showed the presence of phosphite, Other natural sources of phosphite include lightning strikes, geothermal fluids and possibly microbial activity under extremely anaerobic condition, but no other terrestrial sources of phosphite have been identified and none could have produced the quantities of phosphite needed to be dissolved in early Earth oceans that gave rise to life, the researchers concluded.

The scientists said meteorite phosphite would have been abundant enough to adjust the chemistry of the oceans, with its chemical signature later becoming trapped in marine carbonate where it was preserved.

It is still possible, the researchers noted, that other natural sources of phosphite could be identified, such as in hydrothermal systems. While that might lead to reducing the total meteoric mass necessary to provide enough phosphite, the researchers said more work would need to be done to determine the exact contribution of separate sources to what they are certain was an essential ingredient to early life.

http://www.eurekalert.org/pub_releases/2013-06/tum-cwa060413.php

Cheerful women are not associated with leadership qualities -- but proud ones are

Male and female stereotypes influence HR management

To increase their share of leadership positions, women are expected to tick a range of boxes – usually demonstrating improved negotiation skills, networking strengths and the ability to develop a strategic career ladder. "But even these skills are not enough," maintains Professor Isabell Welpe of TUM's Chair for Strategy and Organization. "They ignore the fact that there are stereotypes that on a subconscious level play a decisive role in the assessment of high achievers. Leaders should be assertive, dominant and hard-lined; women are seen as mediators, friendly, social."

Economic researchers from TUM decided to investigate the mechanisms behind the selection and assessment of leaders in business and academia and ways to challenge stereotypes. They presented their initial findings at a symposium yesterday. In a number of studies, researchers presented a variety of scenarios with (potential) leaders and their employees to randomly selected individuals. They then asked the study participants about their perceptions and expectations. It emerged that the same behavior exhibited by women and men in leadership positions is assessed in different ways. If employees were assigned a task in a certain scenario, the study participants expected better performance if a man had delegated the work.

In another scenario, managers varied the extent of decision-making power accompanying tasks delegated to employees. From the viewpoint of the employees, all study participants preferred leaders who allowed a greater degree of freedom. Unlike the male study participants, however, the women made a distinction according to the bosses' gender: Female managers who did not delegate decision-making power were viewed less favorably than male bosses who behaved the same way.

"There is still the belief that men in leadership positions show more assertiveness towards their staff," comments Professor Welpe. "The surprising thing is that some female stereotypes are more reinforced in the minds of women themselves – for example their tendency to accept a dominant leadership style in men."

The researchers have also discovered possible ways for women to challenge the stereotypes:

Previous studies have shown that individuals who are seen as willing to lead do in fact have a greater chance of being appointed to a leadership position. This puts women at a disadvantage because they are, on average, perceived as being less interested in management roles. The TUM researchers wanted to find out how emotions play a role in this perception. The study participants saw scenarios in which men and women were either cheerful or proud of their personal performance, or else showing no emotion at all. Those who came across as proud were assessed as having greater leadership willingness. This effect was significantly more pronounced in the case of the women in the study. "Women who looked cheerful were judged to less willing to lead," explains Welpe. "Pride, on the other hand, is positively associated with leadership qualities."

The researchers hope to develop training programs based on their findings. These will be aimed at helping companies and scientific organizations assess the potential and performance of men and women beyond the limitations of stereotypes.

Two TUM chairs are taking part in the project "Selection and assessment of leaders in academia and business – how do men and women differ?" – the Chair for Strategy and Organization (Prof. Isabell Welpe) and the Chair for Research and Science Management (Prof. Claudia Peus). The project is funded by the German Federal Ministry of Education and Research and the European Social Fund of the European Union.

Further information: Project homepage: http://www.abf.wi.tum.de/en/homepage/

Diversity at TUM: http://www.diversity.tum.de/en/start/

http://www.eurekalert.org/pub_releases/2013-06/plos-sil053013.php

Serum iron levels may be causally associated with Parkinson's disease risk

Increased iron levels may be causally associated with a decreased risk of developing Parkinson's disease

Increased iron levels may be causally associated with a decreased risk of developing Parkinson's disease, says a new paper published this week in PLOS Medicine. Irene Pichler from EURAC in Italy and a group of international colleagues investigated whether there was any evidence of an association between serum iron levels and the risk of Parkinson's disease. While the causes of Parkinson's disease are currently unknown, a combination of genetic and environmental factors are said to be attributed to the disease.

Because previous studies have shown a possible association between lower blood levels of iron in people with Parkinson's disease compared with controls, the researchers used a Mendelian randomization approach to investigate this link. The researchers estimated the effect of blood iron levels on the risk of Parkinson´s disease using three polymorphisms in two genes, HFE and TMPRSS6. For each polymorphism, they performed a meta-analysis combining the results of studies investigating the genetic effect on iron levels, which included almost 22,000 people from Europe and Australia, and a meta-analysis of studies investigating the genetic effect on the

risk of Parkinson´s disease, which included a total of 20,809 people with Parkinson's disease and 88,892 controls from Europe and North America. They then performed three separate Mendelian randomization analyses to estimate the effect of iron on Parkinson disease for the three polymorphisms. By combining the three estimates, they obtained a statistically significant odds ratio of 0.97 for Parkinson´s disease per 10 µg/dl increase in iron, corresponding to a 3% reduction in the risk of Parkinson´s disease for every 10 µg/dl increase in blood iron. Since genotype influences on blood iron levels represent differences that generally persist throughout adult life, the combined Mendelian randomization estimate reflects an effect of iron over the course of a lifetime.

These findings suggest that increased iron levels in the blood are associated with a 3% relative reduction in the risk of Parkinson's disease for every 10 µg/dL increase in iron. This finding is important as it suggests that increased blood iron levels may have a protective effect against Parkinson's disease, say the authors, although the underlying mechanism remains unclear. Another limitation to this study is that there may be remaining sources of bias associated with the Mendelian randomization approach, which may influence the interpretation of this study. Further studies on the underlying mechanisms are needed before any specific treatment recommendations can be proposed, say the authors.

Citation: Pichler I, Del Greco M. F, Go¨gele M, Lill CM, Bertram L, et al. (2013) Serum Iron Levels and the Risk of Parkinson Disease: A Mendelian Randomization Study. PLoS Med 10(6): e1001462. doi:10.1371/journal.pmed.1001462
http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1001462

http://bit.ly/18Q7pYz

Mind-controlled exoskeleton lets paralysed people walk

MindWalker – world's first exoskeleton to enable paralysed people to walk using only their mind

Updated 14:09 05 June 2013 by Helen Thomson

TWO years ago, Antonio Melillo was in a car crash that completely severed his spinal cord. He has not been able to move or feel his legs since. And yet here I am, in a lab at the Santa Lucia Foundation hospital in Rome, Italy, watching him walk.

Melillo is one of the first people with lower limb paralysis to try out MindWalker – the world's first exoskeleton that aims to enable paralysed and locked-in people to walk using only their mind.

Five people have been involved in the clinical trial of MindWalker over the past eight weeks. The trial culminates this week with a review by the European Commission, which funded the work; the project has been carried out by a consortium of several major universities and companies.

It's the end of a three-year development period for the project, which has three main elements. There is the exoskeleton itself, a contraption that holds a person's body weight and moves their legs when instructed. People learn how to use it in the second element: a virtual-reality environment. And then there's the mind-reading component.

Over in the corner of the lab, Thomas Hoellinger of the Free University of Brussels (ULB) in Belgium is wearing an EEG cap, which measures electrical activity at various points across his scalp. There are several ways he can use it to control the exoskeleton through thought alone – at the moment, the most promising involves wearing a pair of glasses with flickering diodes attached to each lens.

Each set of diodes flashes at a different frequency in the wearer's peripheral vision. The light is processed by an area of the brain called the occipital cortex. Measurements from this part of the brain can detect whether Hoellinger is concentrating on the left diode or the right. He shows me how concentrating on the left starts the exoskeleton walking, while concentrating on the right stops it. All this happens in under a second.

Melillo isn't wearing the cap right now, because the team has hit a snag. When the exoskeleton moves, its motors induce electrical noise in the EEG signal, making the readings unreliable.

So instead of mind control, Melillo is walking by moving his upper body. As he leans left, a pressure sensor just above his buttock registers the movement and moves the opposite leg of the exoskeleton. He repeats the process on the other side to begin walking. "It's great, such an amazing sensation," he says. "Not just walking but even being able to stand upright."

Two days after my visit, the team identified flickering frequencies that are less affected by the mechanical noise and filmed a researcher controlling the exoskeleton with his mind alone.

The team plans to spend another five years refining MindWalker with an eye towards building a commercial product. "We're going to make it more lightweight and smooth out the movements," says Jeremi Gancet of Space Application Services in Zaventem, Belgium, a deputy coordinator on the project, "and possibly even incorporate it all into a pair of pants to make it a little less 'Robocop'."

They also want to ditch the glasses with the flashing diodes. A team led by Guy Chéron at ULB has identified the brain activity that corresponds with the intention of walking. This activity occurs about a second before you

actually move and can be identified by EEG signals from the motor cortex. The team can even distinguish between the intention to walk quickly or slowly.
The creation of an algorithm that can recognise these signals reliably opens up the tantalising possibility that much more intuitive walking control could be given both to people who are paralysed and to those who are completely locked-in, unable to move even their eyes.
After some tentative first steps, Melillo is looking more confident. He won't be swapping his wheelchair for a MindWalker just yet, but hopefully one day. "It's great finally being able to look people in the eye," he says.
Clarification: Since this article was first published on 4 June 2013, a reference to the MindWalker consortium has been added. This article appeared in print under the headline "Get your move on"

http://phys.org/news/2013-06-scientists-fukushima-derived-radioactivity-seafood-poses.html

Scientists find that Fukushima-derived radioactivity in seafood poses minimal health risk

Scientists find that Fukushima-derived radioactivity in seafood poses minimal health risk

Phys.org -In 2012, Nicholas Fisher a distinguished professor in the School of Marine and Atmospheric Sciences (SoMAS) at Stony Brook University and postdoctoral scholar Zosia Baumann, working with a colleague at Stanford University's Hopkins Marine Station, reported that they had detected radioactivity in Pacific bluefin tuna swimming off the California coast.
The source of the radioactivity was Japan's Fukushima Dai-ichi powerplants, which were damaged by the strong earthquake and subsequent tsunami on 11 March 2011 and released large quantities of radioactivity into the Pacific Ocean. The news prompted widespread media interest and speculation as to the possible risks to seafood consumers posed by the levels of radioactivity found in the tuna.
Now, Fisher, Baumann and colleagues at Stanford and the French Institute for Radiological Protection and Nuclear Safety (IRSN) report in a paper entitled " Evaluation of Radiation Doses and Associated Risk from the Fukushima Nuclear Accident to Marine Biota and Human Consumers of Seafood," published in the Proceedings of the National Academy of Sciences of the US, that the likely doses of radioactivity ingested by humans consuming the contaminated fish, even in large quantities, is comparable to, or less than, the radiological dosages associated with other commonly consumed foods, many medical treatments, air travel and other background sources. The authors also conclude that contamination of Pacific bluefin tuna and other marine animals from Fukushima poses little risk to these animals.

Migration track of a tagged Pacific Bluefin Tuna.

Fisher and colleagues found that the sampled tuna contained elevated levels of radioactive cesium-134 and cesium-137, important components of the radionuclide mix released at Fukushima. Pacific bluefin tuna spawn in the western Pacific off Japan and reach the eastern Pacific, off the California coast, after a transoceanic migration.
In the original paper, the authors presented data on the radionuclide concentrations in the tissues of the bluefin, but did not estimate doses or health risks to marine biota or human seafood consumers that these concentrations might represent. The new works takes this next step.
The levels of Fukushima-derived radionuclides in marine biota, including Pacific bluefin tuna, were compared with the radiation doses from naturally-occurring radionuclides in the same organisms. The principal radionuclide found in all samples is polonium (specifically the isotope 210Po), a naturally-occurring isotope that is an alpha-emitter, which causes greater biological damage.
"For American and Japanese seafood consumers, the doses attributable to Fukushima-derived radiation were typically 600 and 40 times lower, respectively, than the dose from polonium," said Professor Fisher.
"In estimating human doses of the Fukushima-derived radioactive cesium in Bluefin tuna, we found that heavy seafood consumers – those who ingest 124 kg/year, or 273 lbs., which is five times the US national average – even if they ate nothing but the Cs-contaminated bluefin tuna off California, would receive radiation doses approximately equivalent to that from one dental x-ray and about half that received by the average person over the course of a normal day from a variety of natural and human sources. The resulting increased incidence of cancers would be expected to be essentially undetectable."
More information: www.pnas.org/content/early/2013/05/30/1221834110.full.pdf+html

http://bit.ly/10VMpeU

Thyroid cancer found in 12 minors in Fukushima

Ongoing study on the impact of radiation on Fukushima residents has found 12 minors with confirmed thyroid cancer diagnoses

Fukushima – An ongoing study on the impact of radiation on Fukushima residents from the crippled atomic power plant has found 12 minors with confirmed thyroid cancer diagnoses, up from three in a report in February, with 15 other suspected cases, up from seven, researchers announced Wednesday.

The figures were taken from about 174,000 people aged 18 or younger whose initial thyroid screening results have been confirmed.

Researchers at Fukushima Medical University, which has been taking the leading role in the study, have said they do not believe the most recent cases are related to the nuclear crisis. They point out that thyroid cancer cases were not found among children hit by the 1986 Chernobyl nuclear accident until four to five years later.

The prefecture's thyroid screenings target 360,000 people who were aged 18 or younger when the March 2011 mega-quake and tsunami triggered the meltdown crisis at Tokyo Electric Power Co.'s Fukushima No. 1 nuclear plant.

The initial-phase checks looked at lumps and other possible thyroid cancer symptoms and categorized possible cases into four groups depending on the degree of seriousness. Those in the two most serious groups were picked for secondary exams.

In fiscal 2011, after confirming test results from about 40,000 minors, the prefecture sent 205 for secondary testing. Of the 205, seven were diagnosed with thyroid cancer, four came out with suspected cases, and another had surgery but the tumor was found to be benign.

In fiscal 2012, of about 134,000 minors with confirmed initial screening results, the prefecture sent 935 to secondary testing. Among them, five were confirmed with thyroid cancer, while there were 11 suspected cases.

In the Chernobyl catastrophe, thyroid cancer was reported in more than 6,000 children. The U.N. Scientific Committee attributed many of the cases to consumption of milk contaminated with radioactive iodine immediately after the crisis started.

Last month, U.N. scientists assessing the health impact of the Fukushima nuclear crisis said the radiation dose for residents in the region was much lower than Chernobyl and that they do not expect to see any increase in cancer in the future. Among those aged 10 to 14 in Japan, thyroid cancer strikes about 1 to 2 in a million.

http://www.sciencedaily.com/releases/2013/06/130604112730.htm

Not Really 'Bath Salts': Update On 'Designer Stimulants'

Review and update on "designer stimulants," "designer stimulants"

The last few years have seen the emergence of a new drug problem in so-called "bath salts" -- actually "designer stimulants," packaged and sold in ways that skirt drug laws. A review and update on these designer drugs is presented in the June Journal of Addiction Medicine, the official journal of the American Society of Addiction Medicine.

Recent high-profile incidents have drawn attention to "bath salts" as a new and potentially hazardous type of recreational drug. Addiction medicine specialist Dr Erik W. Gunderson of University of Virginia, Charlottesville, and colleagues, review available data on the use and effects of these designer drugs in this issue of JAM. The paper provides a timely update including implications for medical management and drug policy.

Rapid Rise in Abuse of 'Designer Stimulants'

Over the last few years, products containing "substituted cathinone stimulants" have become widely available for sale on the Internet and elsewhere. To evade legal controls, the stimulants are sold as bath salts, stain removers, or other household products. Although packages are conspicuously labeled "not for human consumption," they are clearly intended for "use as psychoactive substances," according to Dr Gunderson and coauthors.

Initially more prominent in Europe, designer stimulants have become a problem in the United States over the last few years. The number of calls to U.S. poison control centers regarding substituted cathinone stimulants increased from zero in 2009, to about 300 calls in 2010, to more than 6,000 in 2011. The chemical components of these products vary widely, and the mechanisms of their effects in humans are still unclear. As of yet, standardized testing to detect their use is not easily accessible.

The effects are generally similar to those of cocaine, amphetamine, and other stimulants but vary with compound, dose, and route of administration. Users may sniff or swallow the drugs, or even inject them. Reported symptoms in patients treated for acute toxicity include agitation, fast heart rate, and combative or violent behavior, potentially accompanied by delusions or hallucinations. The picture is often complicated by

use of other drugs and underlying mental illness. Serious acute (short-term) toxic effects of substituted cathinone stimulants have been reported -- including deaths resulting from medical complications and suicide. Chronic (long-term) toxicity has also been observed, with evidence of tolerance, withdrawal, and dependence.

More Study Needed to Guide Drug Treatment and Regulation

To illustrate the dangers, Dr Gunderson and colleagues present a case report of a patient who developed hallucinations, delusions, and potentially violent behavior after a three-week "bath salt binge." The findings suggest a possible interaction with the antihistamine diphenhydramine (Benadryl) -- which users commonly take to manage insomnia caused by the drugs' stimulant effect.

Substituted cathinone products are still new, so there are no formal guidelines for medical treatment of acute toxicity. Experience suggests that physical symptoms resolve after a few days, with supportive care. However, psychotic effects such as hallucinations may persist for a longer time. Intoxicated patients need close psychiatric observation and monitoring to keep them from harming themselves or others.

Treatment following acute care, according to Dr Gunderson and coauthors, should follow guidelines for treatment of other stimulant use disorders. In theory, substituted cathinone stimulants are controlled substances under current U.S. law. However, because of Internet distribution and the "forensic challenges" in identifying these substances, they have been difficult to police and regulate.

Dr Gunderson and coauthors highlight the need for further research on the "epidemiology, behavioral pharmacology, clinical effects and management" of substituted cathinone products. They write, "It is hoped that such research and coordinated public health efforts will help prevent and mitigate the rising harm associated with designer stimulant use."

The above story is reprinted from materials provided by Wolters Kluwer Health: Lippincott Williams & Wilkins, via Newswise. Journal Reference: Erik W. Gunderson, Matthew G. Kirkpatrick, Laura M. Willing, Christopher P. Holstege. Substituted Cathinone Products. Journal of Addiction Medicine, 2013; 7 (3): 153 DOI: 10.1097/ADM.0b013e31829084b7

http://scitechdaily.com/study-points-to-a-way-to-treat-wounds-and-grow-hair/

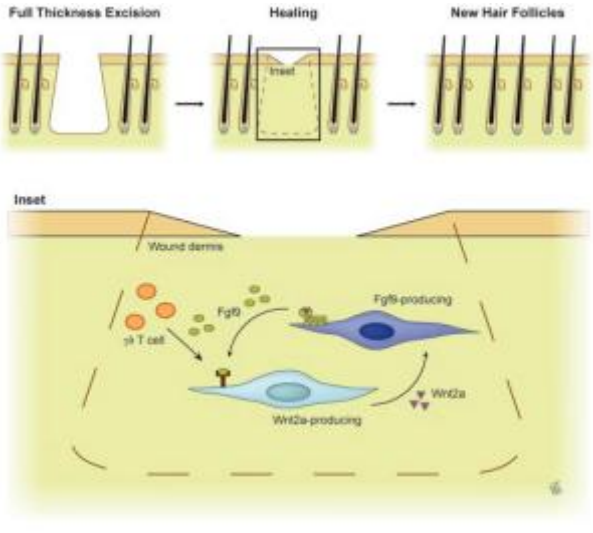
Study Points to a Way to Treat Wounds and Grow Hair

A newly published study reveals that the overexpression of growth factor Fgf9 in a mouse model increases the number of new hair follicles produced during the wound healing process, providing a better understanding of hair regeneration and the potential therapeutic uses for people with hair disorders.

Philadelphia – Researchers in the Perelman School of Medicine at the University of Pennsylvania have determined the role of a key growth factor, found in skin cells of limited quantities in humans, which helps hair follicles form and regenerate during the wound healing process.

When this growth factor, called Fgf9, was overexpressed in a mouse model, there was a two- to three-fold increase in the number of new hair follicles produced.

Researchers believe that this growth factor could be used therapeutically for people with various hair and scalp disorders. The study appears in an advance online publication of Nature Medicine.



Model Depicting Fgf9-driven Wnt Activation Feedback Loop

"The findings help explain why humans don't regenerate their hair after wounding," said senior author George Cotsarelis, MD, professor and chair of Dermatology. "The study also points us to a way to treat wounds and grow hair."

Following up on earlier work, which showed that increased signaling from the Wnt pathway doubled the number of new hair follicles, the Penn team looked further upstream in the pathway and identified an important cascade of signals that prompt further expression, as well as perpetuate and amplify signals sent during a crucial phase of hair-follicle regeneration.

Fgf9 is initially secreted from gd T cells, an unconventional, rare subset of T cells involved in the immune response. Once released, Fgf9 serves as the catalyst for a signal sent via the dermal Wnt pathway. The signal prompts further expression of Fgf9 in structural cells called fibroblasts, and adds to the generation of new hair follicles.

When a wound occurs in an adult person, hair follicle growth is blocked and the skin heals with a scar. However, hair does regenerate to a great extent in the wound-healing process in mice. The team compared how the process works in adult mice versus humans. Humans have low numbers of gd T cells in their skin compared to mice, and this may explain why human skin scars but does not regenerate hair follicles.

In adult mice, the amount of Fgf9 secreted modulates hair-follicle regeneration after wounding. When Fgf9 was reduced, there was a decrease in wound-induced hair follicle growth.
Conversely, when Fgf9 was increased, there was a two- to three-fold increase in the number of new hair follicles, equal to the amount seen in the mice expressing Wnt. Importantly, when the investigators added Fgf9 back to the wounds that do not normally regenerate, FGF9 triggered the molecular cascade of events necessary for skin and hair regeneration; thus, leaving the door open for using Fgf9 to treat wounds and hair loss in people.
The Penn team suggests that, given the differences in skin development and regeneration in response to wounding, treatments intended to compensate for the lack of Fgf9 may be most effective if timed with a wounding response. "Testing activators of Fgf9 or Wnt pathways during the wound healing process may be warranted," they stated.
The study was funded by the National Institutes of Health (R01AR46837, P30AR057217, RO1AR055309, R01HL105732, T32AR007465), the Edwin and Fannie Gray Hall Center for Human Appearance at Penn Medicine, and The Dermatology Foundation.
Additional collaborators on the research include co-lead authors Denise Gay and Ohsang Kwon, Zhikun Zhang, Michelle Spata, Maksim V Plikus, Phillip D. Holler, Zaixin Yang, Elsa Treffeisen, Arben Nace, X Zhang, Sheena Baratono and Sarah E. Millar from Penn's Department of Dermatology, along with collaborators from New York University Langone Medical Center (Mayumi Ito), Seoul National University College of Medicine, Chungnam National University in Daejeon, Korea, Texas A&M University Health Science Center, and Washington University School of Medicine.
Notes: Cotsarelis, Ito and Kwon are listed as inventors on patent applications related to hair-follicle neogenesis, Wnt and FGF9, which are owned by the University of Pennsylvania. Cotsarelis also serves on the scientific advisory board and has equity in Follica, a start-up company that has licensed related patents from the University of Pennsylvania starting in 2007. Cotsarelis was also a co-founder of Follica.
Publication: Denise Gay, et al., "Fgf9 from dermal γδ T cells induces hair follicle neogenesis after wounding," Nature Medicine (2013); doi:10.1038/nm.3181
Source: Penn Medicine

http://bit.ly/11VJO65

Marijuana legalisation creates new hurdle for drivers

New provision affecting drivers who use marijuana

17:03 04 June 2013 by Sara Reardon

As of 28 May, anyone in Colorado over the age of 21 can legally grow, buy and use marijuana recreationally. But a major victory for proponents of the legalisation has been accompanied by a new provision affecting drivers who use marijuana, including people who have long had legal access to the drug for medicinal purposes.
In the wake of the drug's legalisation, Colorado has, for the first time, set a limit on the amount of THC – the active ingredient in marijuana – acceptable in a driver's blood.
Until now, Colorado drivers could only be convicted of driving under the influence of marijuana if prosecutors could prove that the THC in their system was recently taken and was impairing their faculties. The new law quantifies that: anyone with more than 5 nanograms of THC per millilitre of blood is deemed under the influence.
Few would dispute that marijuana can affect driving skills by making it difficult to judge timing, for instance. What's more, there are also scientific studies that suggest THC levels above the 5-nanogram limit increase the risk of fatal car accidents. But Franjo Grotenhermen, who chairs the German Association for Cannabis as Medicine, says that this is only a partial reading of the science; other studies have found different levels – both higher and lower – to be hazardous. "There is no optimal or absolute solution," he says, although he accepts that some sort of standard would be useful for lawmakers.

Hard to quantify

One problem is that the effects of marijuana on driving ability are more difficult to quantify than the effects of alcohol – a drug already widely restricted among drivers. While alcohol impairment increases fairly predictably with the amount consumed, marijuana's effects vary wildly between individuals, says Grotenhermen. Factors such as body weight, previous experience of marijuana use, and mode of delivery determine whether someone's driving is impaired – and how long THC will linger in their blood. "One person may be impaired with 5 nanograms, and one not even at 10 nanograms," he says.
"Nanogram level isn't representative of impairment. It's representative of blood level," says Ann Toney, an attorney in Denver, Colorado. State authorities settled on a simple blood test primarily because it offers an easy standard, which makes it attractive to officers and prosecutors, according to Jeremy Rosenthal, another Denver attorney.
Interviews and medical tests administered by a officers specifically trained to recognise the biological and behavioural signs of drug use detect impairment more accurately, but the tests are time-consuming.

People who are prescribed marijuana for health conditions may face particular problems under the new regulations. Blood tests will pick up THC traces a day after the drug is consumed, even though the high – and driving impairment – associated with marijuana dissipates in little more than three hours. That means someone who uses the drug regularly for medicinal reasons might always have more than 5 nanograms of THC in his or her blood and still be sober, says Grotenhermen.

In recognition of some of the issues with the science, Colorado's new regulations allows people arrested for driving under the influence of marijuana a chance to prove in court that their faculties were not impaired as a result. Nevertheless, organisations such as NORML, which campaigned to have marijuana legalised in Colorado, say that the new legal standard for impairment is an "inadvisable" move.

Marijuana users elsewhere in the US face even tougher driving restrictions. In 15 states – including Washington, which also recently legalised marijuana – any level of THC in a driver's blood automatically constitutes a crime. In Washington's case, the drug's legalisation has not led to this strict limit being revised.

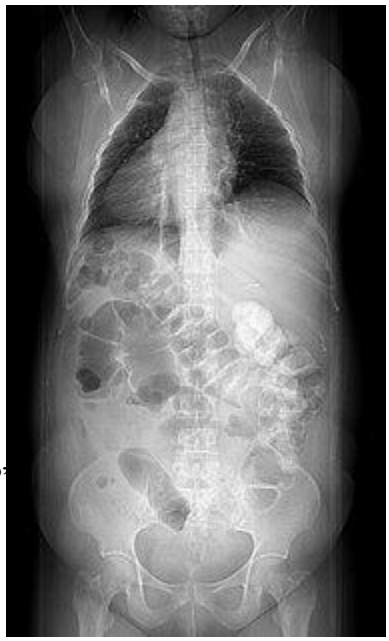
http://nyti.ms/16EH0qI

Growing Left, Growing Right

Situs inversus, a condition in which the major organs are on the reverse side of what is normal

By CARL ZIMMER

One day in 1788, students at the Hunterian School of Medicine in London were opening a cadaver when they discovered something startling. The dead man's anatomy was a mirror image of normal. His liver was on his left side instead of the right. His heart had beaten on his right side, not his left.



The students had never seen anything like it, and they rushed to find their teacher, the Scottish physician Matthew Baillie, who was just as stunned as they were. "It is so extraordinary as scarcely to have been seen by any of the most celebrated anatomists," he later wrote.

His report was the first detailed description of the condition, which came to be known as situs inversus and is thought to occur in about 1 in 20,000 people. Baillie argued that if doctors could figure out how this strange condition came to be, they might come to understand how our bodies normally tell the right side from the left.

Over two centuries later, the mystery of left and right still captivates scientists. "I know what it is, you know what it is, but how does the embryo learn what it is?" asked Dominic P. Norris, a developmental biologist at the Medical Research Council in Harwell, England.

Now Dr. Norris and other scientists are beginning to answer that question. They have pinpointed some of the steps by which embryos' organs develop on the left or right. And their research may do more than simply solve an old puzzle.

Situs inversus, a condition in which the major organs are on the reverse side of what is normal, as seen in an X-ray. Though it is the most dramatic of the left-right disorders, it is not harmful.

Mutations that cause situs inversus can lead to a number of serious disorders, including congenital heart defects. Deciphering the effects of mutated genes could lead to diagnoses and treatments for those conditions. "Understanding how you put this axis together has a lot of implications for understanding congenital heart disease," said Rebecca Burdine, a molecular biologist at Princeton.

Our bodies start out symmetrical, the left side a perfect reflection of the right. "Visible signs of left-right asymmetry in the human body are apparent around six weeks," said Sudipto Roy of the Institute of Molecular and Cell Biology in Singapore, an author of a review of left-right asymmetry that was published last week in the journal Open Biology.

The heart shows the first visible asymmetry. Starting out as a simple tube, it loops to the left. The heart then starts to grow different structures on each side, producing the chambers and vessels required to pump blood. Meanwhile, other organs start moving. The stomach and liver each move clockwise away from the midline of the embryo. The large intestines sprout an appendix on the right. The right lung grows three lobes, the left only two. But these visible changes arise long after the embryo has developed differences on its left and right. Experiments have revealed that the early embryo produces different proteins on each side while it still looks symmetrical.

Biologists have pinpointed a single spot where this symmetry breaking starts: a tiny pit called the node, on the embryo's midline. The interior of the node is lined with hundreds of tiny hairs, called cilia, which whirl round and round at a rate of 10 times a second.

These whirling cilia are tilted, pointing away from the head. The tilt is essential to their ability to divide the body into left and right. Recently Kathryn V. Anderson and her colleagues at Memorial Sloan-Kettering Cancer Center disabled genes required to tip the cilia in the node. As they report in the journal Development, that mutation led to some mouse embryos' developing a mirror-image anatomy.

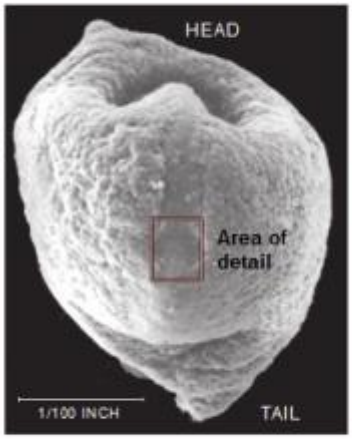
The tilt of the cilia is so important because the embryo is bathed in a thin film of fluid; if they were upright, they would push the fluid in all directions, creating no flow at all. "It's like a blender," Dr. Norris said. "It just goes round and round." Tilted, they all push the fluid in one direction, from right to left. When scientists reversed that flow in mouse embryos, it resulted in reversed organs.

It takes only a very weak flow to the left side to start an embryo on its proper development: Last year, scientists at Osaka University in Japan reported that the whirling of just two cilia were enough to get the job done.

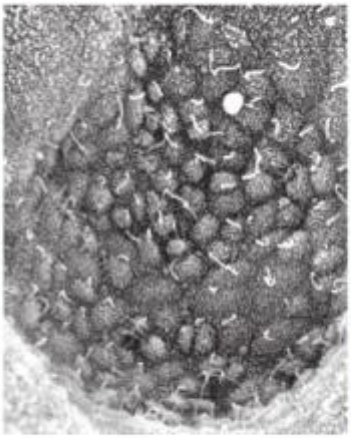
And that raises another question: "What on earth are we doing with all those cilia if we don't need them?" as Dr. Norris put it. "We don't know."

Breaking Symmetry

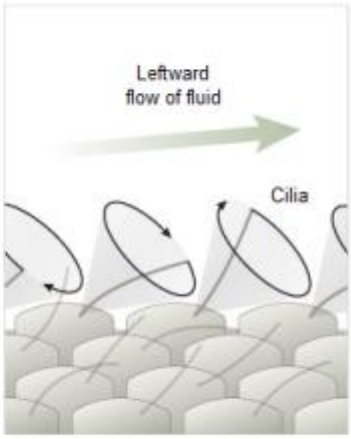
A tiny pit lined with cilia helps the developing embryo distinguish left from right, a necessary distinction for organs like the heart. Related Article »



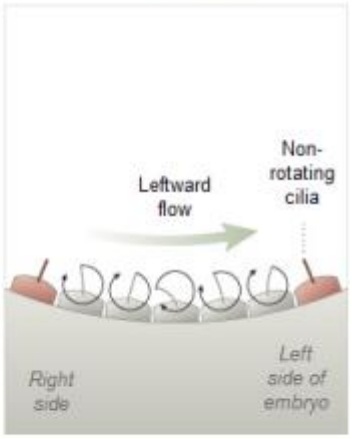
EMBRYO Above, an image of a week-old mouse embryo shows a small depression or pit on one side, called the node.



NODE The fluid-filled pit is lined with cells like cobblestones, each with a protruding cilium angled down, toward the mouse's tail.



CILIA The cilia rotate clockwise roughly 10 times a second. The angle of the spinning cilia creates a leftward flow of fluid.



SIGNAL Special cilia on the edge of the node respond to the flow, triggering a cascade of signaling proteins on the mouse's left side.

Sources: Cold Spring Harbor Perspectives in Biology; Cell; Open Biology; Dominic Norris, MRC Harwell. Images from Cell

Once the fluid starts flowing, it takes only three or four hours for the left and right sides to be determined. Scientists have only a patchy understanding of the steps in between.

In the first step, the fluid flows across the node until it reaches the left side of the rim. The rim is ringed by cilia that do not spin. Somehow, they respond to the flow. They may physically bend, or the flow may deliver some protein to them. "We don't know the nitty-gritty," Dr. Norris said. "We don't know the actual mechanics in these cells of what is happening."

Regardless of those details, the cilia on the rim of the node respond to the flow - possibly by releasing calcium atoms that then spread to surrounding cells. Those cells respond by spewing out a protein called Nodal, which spreads through the left side of the embryo, in turn spurring other cells to spew out Nodal of their own in a kind of feedback loop that leaves the left side loaded with Nodal and the right with almost none. "Nodal begets Nodal, and then we're off," Dr. Norris said.

Scientists are still working out how Nodal helps determine the anatomy on each side of the body. In recent years, many researchers have focused not on mice but on zebra fish, which have the advantage of having transparent embryos; cells in the embryos can be engineered to glow so the organs can be observed taking shape. Dr. Burdine, at Princeton, studies how Nodal shapes the anatomy of the zebra fish heart as embryonic cells migrate around the organ. "Nodal seems to be directly telling the cells on the left side to move faster than the ones on the right," she said.

As she and her colleagues reported in the January issue of PLoS Genetics, the fast-moving cells on the left side drag the entire heart clockwise. From that initial twist, the heart then develops its distinctive left and right sides.

Some studies suggest that these early signals also influence brain development. Scientists have long known that the two sides of the human brain have some important differences. The right hemisphere, for example, plays a big role in understanding the mental lives of other people; the left hemisphere is important for focusing attention. Other vertebrates also have left-right brain differences, but the origins of the imbalance are mostly a mystery.

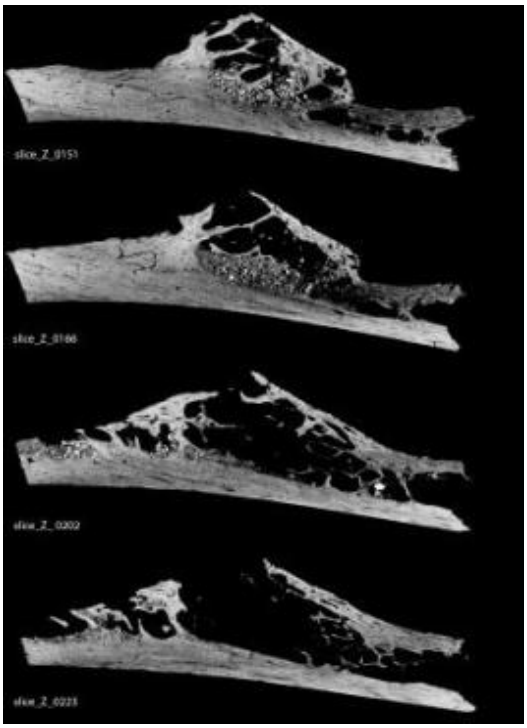
"I think that in vertebrates, it is zebra fish where we know the most details," said Joshua T. Gamse, a biologist at Vanderbilt University. Dr. Gamse and other researchers have found that Nodal prompts a small part of the fish's brain to grow differently on the left and right sides. That difference then radiates outward to other parts of the brain. But it is not clear whether humans and other mammals develop in a similar fashion.
As they look at these biological signals, scientists are also studying disorders that may be tied to their disruption. Situs inversus, the complete flip of the organs that Baillie described in 1788, may be the most dramatic of these disorders, but it is also one of the most harmless. "People can walk around with their axis completely inverted, and no one knows until your doctor figures out your heart's not where it should be," Dr. Burdine said.
The reversal is relatively safe because all the organs line up with one another. "You look at yourself in the mirror, and you look perfectly normal," Dr. Norris said. "You don't stop looking like a human being just because you see yourself backward." The real danger, it appears, is in incomplete reversals - "when you get a confusion, when you get things not quite meeting," as Dr. Norris put it.
Most worrisome are cases in which the heart is affected. "If you put the heart in the wrong place, and everything else is correct," Dr. Burdine said, "that's almost always fatal."
In other cases, the heart grows correctly on the left side of the body, but the structures inside the heart - the valves and chambers - grow on the wrong side. These disorders may not be immediately fatal, but they can become dangerous later in life, requiring complex surgery to rearrange the heart.
Dr. Burdine hopes that research on left-right disorders will lead to genetic tests that can predict the risk of these hidden heart defects. She even sees an application to attempts to rebuild damaged hearts with stem cells.
"It's going to be more than just making the right cells," she said, adding that they would need to be placed in the proper three-dimensional structure and given the correct signals on where to go.
"And one of those signals," she said, "is the left-right signal."

http://phys.org/news/2013-06-year-old-bone-tumor-neandertal-specimen.html

Over 120,000-year-old bone tumor in Neandertal specimen found

Croatian rib of a Neandertal reveals ancient example of now-common bone tumor

The first-known definitive case of a benign bone tumor has been discovered in the rib of a young Neandertal who lived about 120,000 years ago in what is now present-day Croatia. The bone fragment, which comes from the famous archaeological cave site of Krapina, contains by far the earliest bone tumor ever identified in the archaeological record. Details of the tumor confirmation, announced by an international research team led by Penn Museum Associate Curator and Paleoanthropologist Janet Monge, is available in a research paper, "Fibrous dysplasia in a 120,000+ year old Neandertal from Krapina, Croatia," in the online scientific journal PLOS ONE.
Joining Dr. Monge on the research team were Morrie Kricun, Department of Radiology, University of Pennsylvania; Jakov Radovcic and Davorka Radovcic, Croatian Natural History Museum; Alan Mann, Department of Anthropology, Princeton University; and David Frayer, Department of Anthropology, University of Kansas.
Bone tumors are exceptionally rare finds in the evolutionary fossil and archaeological records of human prehistory, with the earliest known instances, before now, dating to 1,000 to 4,000 years ago. Primary bone tumors are rare in modern populations, thus, finding a tumor in a fossil so old is a unique discovery.



This is a microCT scan of Krapina 120.71 -- the rib of a 120,000-year-old Neandertal found at a site in present-day Croatia. It shows the deterioration of the bone inside the rib neck due to a benign tumor. **Credit: High resolution CT scans courtesy GW Weber / University of Vienna, Austria**

From a u-CT scan and an X-ray, researchers identified a fibrous dysplastic neoplasm -today, the most common form of benign bone tumor in humans -located on a Neandertal left rib fragment that measured 30 mm (4 ½ inches) long. Judging by the size of the rib fragment, at the end of the rib that joins to the vertebrae, the rib belonged to a young male Neandertal, probably in his teens. Though he died young, and fibrous displasia is a developmental disorder of bone, there are no other known fossils that can be attributed to this individual, and there is not enough evidence to determine if this was or contributed to the cause of his death, according to Dr. Monge.

The confirmation of this tumor, Dr. Monge believes, may have implications for scholars studying the relationship between Neandertals and modern humans. "This tumor may provide another link between Neandertals and modern peoples, links currently being reinforced with genetic and archaeological evidence. Part of our ancestry is indeed with Neandertals -we grow the same way in our bones and teeth and share the same diseases."

About the Kaprina Archaeological Record and Past Research

Paleoanthropologists continue to debate the exact relationship between Homo sapiens, or humans today, and Neandertals -an extinct species who lived throughout Eurasia from as early as 600,000 years to as late as 30,000 years ago. One of the most important early Neandertal sites was discovered in modern-day Croatia in 1899, when Dragutin Gorjanovic-Kramberger, Director of the Geology and Paleontology Department of the National Museum and Professor of Paleontology and Geology at Zagreb University, alerted by a local schoolteacher, first visited the Krapina cave and noted cave deposits, including a chipped stone tool, bits of animal bones, and a single human molar. Beginning that year, and continuing through six years, Gorjanovic-Kramberger and his associates completely, and for that era, carefully, excavated the cave. By 1905, Krapina had yielded more hominid remains than any other site known at the time.

In the 1990s, the Penn Museum was invited to study the radiographic images of the famous Krapina Neandertal fossil bone collection. The team identified 874 human remains, representing more than 75 individuals -the largest such collection of Neandertal remains from one locale. Looking for signs of pathology, disease, and weakness in a group of hominids long thought by many to have "died out" in classic Darwinian survival-of-the-fittest style, the team's ultimate diagnosis was surprising: these Neandertals were in large part a robust, healthy people. The researchers, Janet Monge among them, shared the results of their studies in a 1999 book, The Krapina Hominids: A Radiographic Atlas of the Skeletal Collection, published by the Republic of Croatia.

Not among the skeletal fossils, however, was the rib now identified as having the bone tumor. At the time of the Krapina excavations, it was mistakenly identified and placed in a faunal collection. In 1986, it was discovered by TD White (University of California, Berkeley) and N Toth (Indiana University, Bloomington) and preliminarily identified as a pathological specimen by M Kricun and J Monge in 1999. It was not until scholars could employ u-CT scans and analysis that the exact nature of the pathology was identified.

More information: Monge J, Kricun M, Radovc˘ic´ J, Radovc˘ic´ D, Mann A, et al. (2013) Fibrous Dysplasia in a 120,000+ Year Old Neandertal from Krapina, Croatia. PLoS ONE 8(6): e64539. doi:10.1371/journal.pone.0064539

http://www.sciencedaily.com/releases/2013/06/130605130118.htm

Cheese May Prevent Cavities

Consuming cheese and other dairy products may help protect teeth against cavities

Consuming dairy products is vital to maintaining good overall health, and it's especially important to bone health. But there has been little research about how dairy products affect oral health in particular. However, according to a new study published in the May/June 2013 issue of General Dentistry, the peer-reviewed clinical journal of the Academy of General Dentistry (AGD), consuming cheese and other dairy products may help protect teeth against cavities.

The study sampled 68 subjects ranging in age from 12 to 15, and the authors looked at the dental plaque pH in the subjects' mouths before and after they consumed cheese, milk, or sugar-free yogurt. A pH level lower than 5.5 puts a person at risk for tooth erosion, which is a process that wears away the enamel (or protective outside layer) of teeth. "The higher the pH level is above 5.5, the lower the chance of developing cavities," explains Vipul Yadav, MDS, lead author of the study.

The subjects were assigned into groups randomly. Researchers instructed the first group to eat cheddar cheese, the second group to drink milk, and the third group to eat sugar-free yogurt. Each group consumed their product for three minutes and then swished with water. Researchers measured the pH level of each subject's mouth at 10, 20, and 30 minutes after consumption. The groups who consumed milk and sugar-free yogurt experienced no changes in the pH levels in their mouths. Subjects who ate cheese, however, showed a rapid increase in pH levels at each time interval, suggesting that cheese has anti-cavity properties.

The study indicated that the rising pH levels from eating cheese may have occurred due to increased saliva production (the mouth's natural way to maintain a baseline acidity level), which could be caused by the action of chewing. Additionally, various compounds found in cheese may adhere to tooth enamel and help further protect teeth from acid. "It looks like dairy does the mouth good," says AGD spokesperson Seung-Hee Rhee, DDS, FAGD. "Not only are dairy products a healthy alternative to carb- or sugar-filled snacks, they also may be considered as a preventive measure against cavities."

Ravishankar Lingesha Telgi, Vipul Yadav, Chaitra Ravishankar Telgi, Naveen Boppana. In vivo dental plaque pH after consumption of dairy products. General Dentistry, 2013 May;61(3):56-59

http://www.sciencedaily.com/releases/2013/06/130605144312.htm

Multiple Sclerosis: Phase 1 Trial Safely Resets Patients' Immune Systems, Reduces Attack On Myelin Protein

Dramatically reduced patients' immune systems' reactivity to myelin by 50 to 75 percent

A phase 1 clinical trial for the first treatment to reset the immune system of multiple sclerosis (MS) patients showed the therapy was safe and dramatically reduced patients' immune systems' reactivity to myelin by 50 to 75 percent, according to new Northwestern Medicine research.

In MS, the immune system attacks and destroys myelin, the insulating layer that forms around nerves in the spinal cord, brain and optic nerve. When the insulation is destroyed, electrical signals can't be effectively conducted, resulting in symptoms that range from mild limb numbness to paralysis or blindness.

"The therapy stops autoimmune responses that are already activated and prevents the activation of new autoimmune cells," said Stephen Miller, the Judy Gugenheim Research Professor of Microbiology-Immunology at Northwestern University Feinberg School of Medicine. "Our approach leaves the function of the normal immune system intact. That's the holy grail."

Miller is the co-senior author of a paper on the study, which will be published June 5 in the journal Science Translational Medicine. The study is a collaboration between Northwestern's Feinberg School, University Hospital Zurich in Switzerland and University Medical Center Hamburg-Eppendorf in Germany.

The human trial is the translation of more than 30 years of preclinical research in Miller's lab.

In the trial, the MS patients' own specially processed white blood cells were used to stealthily deliver billions of myelin antigens into their bodies so their immune systems would recognize them as harmless and develop tolerance to them. Current therapies for MS suppress the entire immune system, making patients more susceptible to everyday infections and higher rates of cancer.

While the trial's nine patients -- who were treated in Hamburg, Germany -- were too few to statistically determine the treatment's ability to prevent the progression of MS, the study did show patients who received the highest dose of white blood cells had the greatest reduction in myelin reactivity.

The primary aim of the study was to demonstrate the treatment's safety and tolerability. It showed the intravenous injection of up to 3 billion white blood cells with myelin antigens caused no adverse affects in MS patients. Most importantly, it did not reactivate the patients' disease and did not affect their healthy immunity to real pathogens. As part of the study, researchers tested patients' immunity to tetanus because all had received tetanus shots in their lifetime. One month after the treatment, their immune responses to tetanus remained strong, showing the treatment's immune effect was specific only to myelin.

The human safety study sets the stage for a phase 2 trial to see if the new treatment can prevent the progression of MS in humans. Scientists are currently trying to raise $1.5 million to launch the trial, which has already been approved in Switzerland. Miller's preclinical research demonstrated the treatment stopped the progression of relapsing-remitting MS in mice.

"In the phase 2 trial we want to treat patients as early as possible in the disease before they have paralysis due to myelin damage." Miller said. "Once the myelin is destroyed, it's hard to repair that."

In the trial, patients' white blood cells were filtered out, specially processed and coupled with myelin antigens by a complex GMP manufacturing process developed by the study co-senior authors, Roland Martin, Mireia Sospedra, and Andreas Lutterotti and their team at the University Medical Center Hamburg-Eppendorf. Then billions of these dead cells secretly carrying the myelin antigens were injected intravenously into the patients. The cells entered the spleen, which filters the blood and helps the body dispose of aging and dying blood cells. During this process, the immune cells start to recognize myelin as a harmless and immune tolerance quickly develops. This was confirmed in the patients by immune assays developed and carried out by the research team in Hamburg.

This therapy, with further testing, may be useful for treating not only MS but also a host of other autoimmune and allergic diseases simply by switching the antigens attached to the cells. Previously published preclinical research by Miller showed the therapy's effectiveness for type 1 diabetes and airway allergy (asthma) and peanut allergy.

The MS human trial relates directly to Miller's recently published research in mice in which he used nanoparticles -- rather than a patient's white blood cells -- to deliver the myelin antigen. Using a patient's white blood cells is a costly and labor-intensive procedure. Miller's study showed the nanoparticles, which are potentially cheaper and more accessible to a general population, could be as effective as the white blood cells as delivery vehicles. This nanoparticle technology has been licensed to Cour Pharmaceutical Development Company and is in preclinical development.

Miller's research represents several pillars of Northwestern's Strategic Plan by discovering new ways to treat disease in the biomedical sciences and translating those discoveries into ideas and products that make the world a better place for everyone.

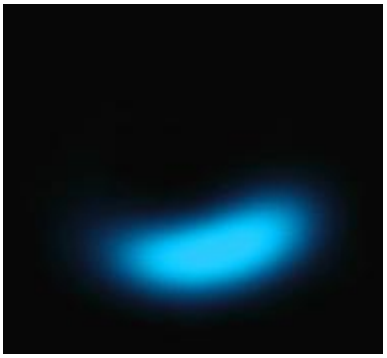
A. Lutterotti, S. Yousef, A. Sputtek, K. H. Sturner, J.-P. Stellmann, P. Breiden, S. Reinhardt, C. Schulze, M. Bester, C. Heesen, S. Schippling, S. D. Miller, M. Sospedra, R. Martin. Antigen-Specific Tolerance by Autologous Myelin Peptide-Coupled Cells: A Phase 1 Trial in Multiple Sclerosis. Science Translational Medicine, 2013; 5 (188): 188ra75 DOI: 10.1126/scitranslmed.3006168

http://www.eurekalert.org/pub_releases/2013-06/nrao-ta060413.php

'Dust trap' around distant star may solve planet formation mystery

Based on a treasure trove of recent discoveries, astronomers now know that planets are remarkably plentiful in our galaxy and may be common throughout the Universe.

Though planets appear to form readily, the actual process of planet formation remains a mystery and astronomers are searching for the missing pieces to this cosmic puzzle. An international team of researchers using the new Atacama Large Millimeter/submillimeter Array (ALMA) telescope has discovered an intriguing clue that could help explain how rocky planets are able to evolve out of a swirling disk of dust and gas.

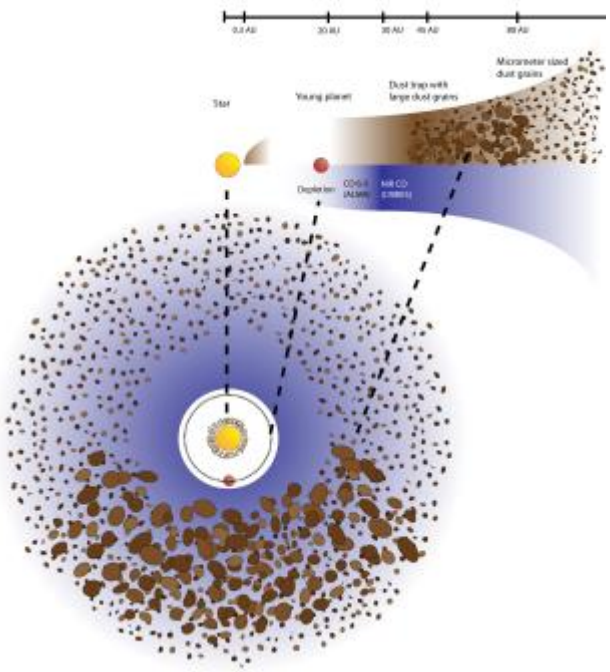


ALMA image of dust trap around Oph IRS 48.

By imaging the outer regions of a young solar system known as Oph IRS 48, which resides approximately 390 light-years from Earth in the constellation Ophiuchus, astronomers have discovered a crescent-shaped structure known as a "dust trap." The researchers speculate that this newly discovered feature is actually a protective cocoon where the critical early steps of planet, asteroid, and comet formation can take place.

When astronomers try to model the evolution of dust grains into pre-planetary bodies, such as pebbles and boulders, they run into a problem. Once dust grains grow to a certain size, they tend to self-destruct, either by colliding with other grains or by being drawn into their central star. To get past this vexing size limit, astronomers have theorized that swirling eddies in the disk could create dust traps, regions that enable dust particles to cling together, eventually setting the stage for the formation of larger and larger objects.

"There is a major hurdle in the long chain of events that leads from tiny dust grains to planet-sized objects," said Til Birnstiel, a researcher at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and co-author on the paper published in the journal Science. "In computer models of planet formation, dust grains must grow from submicron sizes to objects up to ten times the mass of the Earth in just a few million years. But once particles grow larger enough, they begin to pick up speed and either collide, sending them back to square one, or slowly drift inward, thwarting further growth."



The proposed disk structure of Oph IRS 48.

To save dust grains from this fate, astronomers have proposed that a vortex, essentially a "bump" in the disk, would produce an area of higher pressure and protect the growing dust grains.

Creating the dust trap, however, requires the helping hand of a very large object, such as a gas-giant planet or companion star. As this secondary object plows through the disk, it would clear a path around the star and produce the essential eddies and vortices in its wake.

Previous studies of Oph IRS 48 revealed a very uniform ring of carbon monoxide gas and small dust grains around the star, with no hints of a theorized dust trap. They did, however, detect a large gap between the inner and outer portions of the disk, which is a likely telltale sign that a very massive planet, on the order of 10 Jupiter masses, or a companion star was present. Such an object could produce the necessary conditions for a dust trap.

Using ALMA, the researchers were able to simultaneously observe both the gas and the much larger dust grains, revealing something the other telescopes could not: a lopsided bulge in the outer portion of the disk.
"At first the shape of the dust in the images was a complete surprise for us," said Nienke van der Marel, a Ph.D. student at Leiden Observatory in the Netherlands and lead author on the paper. "Instead of the ring we had expected to see, we found a very clear cashew-nut shape. We had to convince ourselves that this feature was real, but the strong signal and sharpness of the ALMA observations left no doubt about the structure."
Though the ALMA observations revealed only the outer structure of the disk, at more than 50 times the distance of the Earth to the Sun, the principle would still be the same closer to the star where rocky planets would form. "This structure we see with ALMA could be scaled down to represent what may be happening in the inner solar system where more Earth-like rocky planets would form," said Birnstiel. "In the case of these observations, however, we may be seeing something analogous to the formation of our Sun's Kuiper Belt or Oort Cloud, the region of our solar system where comets are believed to originate."
These observations were made with only a portion of ALMA's eventual full complement of 66 antennas. When the full array is in operation later this year, ALMA will have one of the sharpest visions of any astronomical observatory and will be an important tool in understanding the entire planet-formation process.

http://www.eurekalert.org/pub_releases/2013-06/dumc-sad060613.php

Surgeons at Duke University Hospital implant bioengineered vein

Kidney dialysis patient first in US to receive blood vessel grown in laboratory

DURHAM, N.C. – In a first-of-its-kind operation in the United States, a team of doctors at Duke University Hospital helped create a bioengineered blood vessel and implanted it into the arm of a patient with end-stage kidney disease.
The procedure, the first U.S. clinical trial to test the safety and effectiveness of the bioengineered blood vessel, is a milestone in the field of tissue engineering. The new vein is an off-the-shelf, human cell-based product with no biological properties that would cause organ rejection.
Using technology developed at Duke and at a spin-off company it started called Humacyte, the vein is engineered by cultivating donated human cells on a tubular scaffold to form a vessel. The vessel is then cleansed of the qualities that might trigger an immune response. In pre-clinical tests, the veins have performed better than other synthetic and animal-based implants.
"This is a pioneering event in medicine," said Jeffrey H. Lawson, M.D., PhD, a vascular surgeon and vascular biologist at Duke Medicine who helped develop the technology and performed the implantation. "It's exciting to see something you've worked on for so long become a reality. We talk about translational technology – developing ideas from the laboratory to clinical practice – and this only happens where there is the multi-disciplinary support and collaboration to cultivate it."
Clinical trials to test the new veins began in Poland in December with the first human implantations. The U.S. Food and Drug Administration recently approved a phase 1 trial involving 20 kidney dialysis patients in the United States, followed by a safety review. Duke researchers enrolled the first U.S. patient and serve as study leaders.
The initial trial focuses on implanting the vessels in an easily accessible site in the arms of kidney hemodialysis patients. More than 320,000 people in the United States require hemodialysis, which often necessitates a graft to connect an artery to a vein to speed blood flow during treatments. Current options have drawbacks. Synthetic vascular grafts are prone to clotting, leading to frequent hospitalizations, and harvesting veins from the patient's own body involves a separate procedure, with the risk of infection and other complications.
If the bioengineered veins prove beneficial for hemodialysis patients, the researchers ultimately aim to develop a readily available and durable graft for heart bypass surgeries, which are performed on nearly 400,000 people in the United States a year, and to treat blocked blood vessels in the limbs.
"We hope this sets the groundwork for how these things can be grown, how they can incorporate into the host, and how they can avoid being rejected immunologically," Lawson said. "A blood vessel is really an organ – it's complex tissue. We start with this, and one day we may be able to engineer a liver or a kidney or an eye."
The bioengineered vein is the product of a 15-year collaboration between Lawson and Laura Niklason, M.D., PhD, co-founder of Humacyte and a former faculty member at Duke who is now at Yale. Lawson and Niklason teamed up in the late 1990s after discovering they shared an interest in engineering blood vessels.
Building on work Niklason began as a bioengineering post-doctoral student, the duo worked to perfect the technology in animal models and eventually moved to develop veins for human implantation.
"The bioengineered blood vessel technology is a new paradigm in tissue engineering," said Niklason, professor and vice chair of anesthesia, professor of biomedical engineering, Yale University, and founder of Humacyte.

"This technology is a key step for patients with end-stage renal disease and can potentially avoid surgical interventions and hospitalizations. The fact that these vessels contain no living cells enables simple storage onsite at hospitals, making them the first off-the-shelf engineered grafts that have transitioned into clinical evaluation."
Overcoming setbacks and frustrations, the researchers notched numerous advancements, starting with the biodegradable mesh as the scaffolding for the veins. The mesh, easily manipulated into any shape, is formed into a blood vessel of varying lengths and widths.
When seeded with smooth muscle cells, the mesh gradually dissolves as the cells grow in a special medium of amino acids, vitamins and other nutrients. One key improvement, which strengthens the bioengineered tissue, is a pulsing force introduced during the growth process, in which the nutrients are pumped through the tube in a heartbeat rhythm to build the physical properties that are similar to native blood vessels.
After a couple of months, a life-like vein results.
Originally, the researchers sought to develop veins using a person's own cells to seed the scaffolding, reducing the risk that the patient's body would reject the implanted tissue. But growing personalized veins took too much time and ruled out mass production, so the researchers changed tack to develop a universal product.
Using donated human tissue to grow on the tubular matrix, they wash the resulting vein in a special solution to rinse out the cellular properties, leaving a collagen structure that does not trigger an immune response.
"At the end of the process, we have a non-living, immunologically silent graft that can be stored on the shelf and used in patients whenever they need it," Niklason said. "Unlike other synthetic replacements made of Teflon or Dacron, which tend to be stiff, our blood vessels mechanically match the arteries and veins they are being sewn to. We think this is an advantage."
When implanted in animals, the vein grafts actually adopt the cellular properties of a blood vessel. They don't just elude rejection; they become indistinguishable from living tissue as cells grow into the implant.
"They are functionally alive," Lawson said. "We won't know until we test it if it works this way in humans, but we know from the animal models that the blood travels through the blood vessels and they have the natural properties that keep the blood cells healthy."
Lawson's first patient, a 62-year-old man from Danville, Va., who has required kidney dialysis for years, received the bioengineered vein graft in a two-hour procedure on June 5, 2013.

http://www.eurekalert.org/pub_releases/2013-06/f-hsa060313.php

How similar are the gestures of apes and human infants? More than you might suspect

Remarkable similarities in gestures of chimpanzee, bonobo, and human infant

Psychologists who analyzed video footage of a female chimpanzee, a female bonobo and a female human infant in a study to compare different types of gestures at comparable stages of communicative development found remarkable similarities among the three species. This is the first time such data have been used to compare the development of gestures across species. The chimpanzee and bonobo, formerly called the "pygmy chimpanzee," are the two species most closely related to humans in the evolutionary tree.
"The similarity in the form and function of the gestures in a human infant, a baby chimpanzee and a baby bonobo was remarkable," said Patricia Greenfield, a Distinguished Professor of Psychology at UCLA and co-author of the study, published in the open-access journal Frontiers in Psychology.
Gestures made by all three species included reaching, pointing with fingers or the head, and raising the arms to ask to be picked up. The researchers called "striking" the finding that the gestures of all three species were "predominantly communicative," Greenfield said.
To be classified as communicative, a gesture had to include eye contact with the conversational partner, be accompanied by vocalization (non-speech sounds) or include a visible behavioral effort to elicit a response. The same standard was used for all three species. For all three, gestures were usually accompanied by one or more behavioral signs of an intention to communicate.
Charles Darwin showed in his 1872 book "The Expression of the Emotions in Man and Animals" that the same facial expressions and basic gestures occur in human populations worldwide, implying that these traits are innate. Greenfield and her colleagues have taken Darwin's conclusions a step further, providing new evidence that the origins of language can be found in gestures and new insights into the co-evolution of gestures and speech.
The apes included in the study were named Panpanzee, a female chimpanzee (Pan troglodytes), and Panbanisha, a female bonobo (Pan paniscus). They were raised together at the Language Research Center in Atlanta, which is co-directed by Sue Savage-Rumbaugh, a co-author of the study. There, the apes learned to communicate with caregivers using gestures, vocalizations and visual symbols (mainly geometric shapes) called lexigrams.

"Lexigrams were learned, as human language is, during meaningful social interactions, not from behavioral training," said the study's lead author, Kristen Gillespie-Lynch, an Assistant Professor of Psychology at the City University of New York and a former UCLA graduate student in Greenfield's laboratory.
The human girl grew up in her parents' home, along with her older brother. Where the apes' symbols were visual, the girl's symbols took the form of spoken words. Video analysis for her began at 11 months of age and continued until she was 18 months old; video analysis for the two apes began at 12 months of age and continued until they were 26 months old. An hour of video was analyzed each month for the girl, the chimpanzee and the bonobo.
Overall, the findings support the "gestures first" theory of the evolution of language. During the first half of the study, communicating with gestures was dominant in all three species. During the second half, all three species increased their symbol production - words for the child and lexigrams for the apes.
"Gesture appeared to help all three species develop symbolic skills when they were raised in environments rich in language and communication," said Gillespie-Lynch, who conducted the research while she was at UCLA. This pattern, she said, suggests that gesture plays a role in the evolution, as well as the development, of language.
At the beginning stage of communication development, gesture was the primary mode of communication for human infant, baby chimpanzee and baby bonobo. The child progressed much more rapidly in the development of symbols. Words began to dominate her communication in the second half of the study, while the two apes continued to rely predominantly on gesture.
"This was the first indication of a distinctive human pathway to language," Greenfield said.
All three species increased their use of symbols, as opposed to gestures, as they grew older, but this change was far more pronounced for the human child. The child's transition from gesture to symbol could be a developmental model of the evolutionary pathway to human language and thus evidence for the "gestural origins of human language," Greenfield said.
While gesture may be the first step in language evolution, the psychologists also found evidence that the evolutionary pathway from gesture to human language included the "co-evolution of gestural and vocal communication." Most of the child's gestures were accompanied by vocalization (non-language sounds); the apes' gestures rarely were. "This finding suggests that the ability to combine gesture and vocalization may have been important for the evolution of language," Greenfield said.
The researchers conclude that humans inherited a language of gestures and a latent capacity for learning symbolic language from the last ancestor we share with our chimpanzee and bonobo relatives - an ancestor that lived approximately 6 million years ago. The evolution of human language built on capacities that were already present in the common ancestor of the three species, the psychologists report. "Our cross-species comparison provides insights into the communicative potential of our common ancestor," Gillespie-Lynch said.
Note to editors: Color images of child and ape gestures from the video are available within the research paper. The article is available on request.
Frontiers in Psychologyhttp://www.frontiersin.org/Comparative _Psychology/10.3389/fpsyg.2013.00160/abstract

http://www.eurekalert.org/pub_releases/2013-06/uorm-scb060313.php

Scientists coax brain to regenerate cells lost in Huntington's disease

Researchers have been able to mobilize the brain's native stem cells to replenish a type of neuron lost in Huntington's disease.

In the study, which appears today in the journal Cell Stem Cell, the scientists were able to both trigger the production of new neurons in mice with the disease and show that the new cells successfully integrated into the brain's existing neural networks, dramatically extending the survival of the treated mice.
"This study demonstrates the feasibility of a completely new concept to treat Huntington's disease, by recruiting the brain's endogenous neural stem cells to regenerate cells lost to the disease," said University of Rochester Medical Center (URMC) neurologist Steve Goldman, M.D., Ph.D., co-director of Rochester's Center for Translational Neuromedicine.
Huntington's disease is an inherited neurodegenerative disease characterized by the loss of a specific cell type called the medium spiny neuron, a cell that is critical to motor control. The disease, which affects some 30,000 people in the U.S., results in involuntary movements, problems with coordination, and, ultimately, in cognitive decline and depression. There is currently no way to slow or modify this fatal disease.
For Goldman, the idea behind his strategy to treat the disease emerged from his decades-long study of neural plasticity in canaries. Songbirds like canaries have intrigued biologists because of their ability – unique in the animal kingdom – to lay down new neurons in the adult brain. This process, called adult neurogenesis, was first discovered by Goldman and Fernando Nottebohm of the Rockefeller University in the early 1980s, when the

two realized that when learning new songs new neurons were added to regions of the bird's brain responsible for vocal control. "Our work with canaries essentially provided us with the information we needed to understand how to add new neurons to adult brain tissue," said Goldman. "Once we mastered how this happened in birds, we set about how to replicate the process in the adult mammalian brain."

Humans already possess the ability to create new neurons. Goldman's lab demonstrated in the 1990s that a font of neuronal precursor cells exist in the lining of the ventricles, structures found in the core of the human brain. In early development, these cells are actively producing neurons. However, shortly after birth the neural stem cells stop generating neurons and instead produce glia, a family of support cells that pervade the central nervous system. Some parts of the human brain continue to produce neurons into adulthood, the most prominent example is the hippocampus where memories are formed and stored. But in the striatum, the region of the brain that is devastated by Huntington's disease, this capability is "switched off" in adulthood.

Goldman and his team spent the past decade attempting to unravel the precise chemical signaling responsible for instructing neural stem cells when to create neurons and when to create glia cells. One of the most critical clues came directly from the earlier research with canaries. In the part of the bird's brain were new songs are acquired and neurons added, the scientists observed the regulated expression of a protein called brain derived neurotrophic factor, or BDNF. When the production of this protein is triggered, the local neural stem cells are instructed to produce neurons.

At the same time, the scientists also realized that they had to simultaneously suppress the bias of these stem cells to produce glia. They found that when BDNF was combined with another molecule called noggin – a protein that inhibits the chemical pathway that dictates the creation of glial cells – they could successfully switch the stem cell's molecular machinery over to the production of neurons.

The next challenge was how to deliver these two proteins – BDNF and noggin – precisely and in a sustained fashion to the area of the brain involved in Huntington's disease. To do so, they partnered with scientists at the University of Iowa to modify a viral gene therapeutic, called an adeno-associated virus, to deliver the necessary molecular instructions to the neural stem cells.

The virus infected the target cells in the brains of mice with Huntington's disease and triggered the sustained over-expression of both BDNF and noggin. This, in turn, activated the neighboring neural stem cells which began to produce medium spiny motor neurons. The new neurons were continuously generated and migrated to the striatum, the region of the brain impacted by Huntington's disease, where they then integrated into the existing neuronal networks.

The researchers were able to significantly extend the survival of the treated mice, in some cases doubling their life expectancy. The researchers also devised a way to tag the new neurons and observed that the cells extended fibers to distant targets within the brain and establish electrical communication.

After having established the ability to generate new replacement neurons in mouse models of Huntington's disease, the researchers also demonstrated that they could replicate this technique in the brains of normal squirrel monkeys, a step that brings the research much closer to tests in humans.

"The sustained delivery of BDNF and noggin into the adult brain was clearly associated with both increased neurogenesis and delayed disease progression," said Goldman. "We believe that our data suggest the feasibility of this process as a viable therapeutic strategy for Huntington's disease."

Additional co-authors of the study included its first author, Abdellatif Benraiss, with whom Goldman has collaborated for over a decade on these studies. Working with Benraiss and Goldman were Michael Toner, Qiwu Xu, Elodie Bruel-Jungerman, Eloise Rogers, Fushun Wang, and Maiken Nedergaard with URMC, Aris Economides with Regeneron Pharmaceuticals, Beverly Davidson with the University of Iowa, and Ryoichiro Kageyama with Kyoto University in Japan. The study was funded by the National Institute of Neurological Disorders and Stroke, the Hereditary Disease Foundation, the CHDI Foundation, and the New York State Stem Cell Research Program.

http://www.eurekalert.org/pub_releases/2013-06/uoma-uom060613.php

U of M researchers find novel gene correction model for epidermolysis bullosa

Remarkable new way to repair genetic defects in the skin cells of patients with the skin disease epidermolysis bullosa

Minneapolis/St. Paul – A research team led by pediatric blood and marrow transplantation experts Mark Osborn, Ph.D. and Jakub Tolar, M.D., Ph.D. from the Masonic Cancer Center, University of Minnesota, have discovered a remarkable new way to repair genetic defects in the skin cells of patients with the skin disease epidermolysis bullosa.

The findings, published today in the journal Molecular Therapy and highlighted in the most recent issue of Nature, represent the first time researchers been able to correct a disease-causing gene in its natural location in the human genome using engineered transcription activator-like effector nucleases.

Epidermolysis bullosa (EB) is a skin disease caused by genetic mutations. Patients suffering from EB – primarily children - lack the proteins that hold the epidermis and dermis together, which leads to painful blistering and sores. The condition is often deadly. The University of Minnesota is an international leader in the treatment of EB and the research that has led to new treatment approaches.

In their latest work, Osborn and Tolar's team collaborated with genomic engineer Daniel Voytas, Ph.D., of the University of Minnesota's College of Biological Sciences, to engineer transcription activator-like effector nucleases (TALENs) that target the mutation and correct the error in the skin cells of patients with the disease. Researchers then reprogrammed these cells to make pluripotent stem cells that can create many different kinds of tissues. These amended cells were then able to produce the missing protein when placed in living skin models.

"These results provide proof of principle for TALEN-based precision gene correction, and it could open the door for more individualized therapeutics," said Osborn, an assistant professor in the University of Minnesota Medical School's Department of Pediatrics Division of Blood and Marrow Transplantation.

By using an unbiased screening method, researchers were able to take a comprehensive approach to TALEN-mapping. This strategy helped identify three other possible locations for future research and potential therapies.

"This is the first time we've been able to seamlessly correct a disease-causing gene in its natural location in the human genome using the TALEN-based approach. This opened up options we did not have before when considering future therapies," said Tolar, director of the University's Stem Cell Institute and an associate professor in the Department of Pediatrics Division of Blood and Marrow Transplantation.

The University of Minnesota Pediatric Blood and Marrow Transplant team, led by John Wagner, M.D. and Bruce Blazar, M.D., has pioneered bone marrow transplantation as the standard of care for severe EB. Tolar and Osborn hope that the individualized "genome editing" of patient cells will provide the next generation of therapies for EB and other genetic diseases.

Funding for this research was supported by grants from the Epidermolysis Bullosa Research Fund, the Jackson Gabriel Silver Foundation, DebRA International, the University of Minnesota Academic Health Center, Pioneering Unique Cures for Kids Foundation, Children's Cancer Research Fund, and the United States of America Department of Defense. The National Institutes of Health supports several authors through grant R01 GM098861 and the Director's Pioneer Award DP1 OD006862.

http://www.sciencedaily.com/releases/2013/06/130606102037.htm

Autism Discovery Paves Way for Early Blood Test and Therapeutic Options

Individuals with autism spectrum disorders showed significantly decreased metabolism of L-tryptophan when compared to typical controls

Researchers at the JC Self Research Institute of the Greenwood Genetic Center (GGC), along with collaborators from Biolog, Inc. in California, have reported an important discovery in the understanding of autism which was published this week in Molecular Autism.

The study, led by GGC's Director of Research, Charles Schwartz, PhD, and Staff Scientist, Luigi Boccuto, MD, found that individuals with autism spectrum disorders (ASDs) showed significantly decreased metabolism of the amino acid L-tryptophan when compared to both typical controls and individuals with other neurodevelopmental disorders. Cells from individuals with autism metabolized L-tryptophan at a decreased rate whereas cells from individuals without autism did not show this change.

Researchers also measured the expression of genes that are known to be involved in L-tryptophan metabolism in a small subset of patients with autism and found they also expressed some of the genes at lower levels than those without autism.

"The important and immediate implication of this work is the development of a simple, early blood screening test for autism by measuring the metabolism of L-tryptophan using Biolog's technology," shared Dr. Boccuto. Biolog's assay method, called Phenotype MicroArray technology, allows researchers to measure the ability of cells to generate energy from various biochemical nutrients, including L-tryptophan.

Currently there are no laboratory tests that can accurately diagnose ASDs, which are estimated to affect 1 in 50 school-aged children in the US. Current diagnosis depends upon a developmental evaluation and parent interviews and can often not be made prior to 2-3 years of age. "A screening, and eventually, a diagnostic blood test for autism would be of immense value to families," explained Dr. Schwartz. "An early, accurate diagnosis is key to providing effective and timely therapies for these patients and their families."

Dr. Boccuto added, "We also see tremendous potential that these findings will aid in our understanding of the molecular and metabolic bases of autism. Once we have a clear vision of what has gone awry within the tryptophan metabolism pathways, we can develop therapies to target and correct those problems at the biochemical level."

L-tryptophan is one of twenty amino acids used by cells to make protein. It is one of eight amino acids that cannot be made by the body, so it must be obtained from the diet. More importantly, L-tryptophan plays an important role in brain development and function as it is the precursor of key neurochemicals such as serotonin and melatonin which have already been linked to behavioral and neurodevelopmental problems.

"This discovery leads us toward a possible unifying biochemical mechanism for ASDs which could ultimately lead to a treatment," shared Dr. Schwartz. "Now that we have additional evidence that the features of ASDs may be related to the metabolic pathways involving L-tryptophan, we can focus further studies on determining at what point along those pathways the disruption occurs, which may vary from one patient to another. With treatments that target various points along the pathway, a modality that works for one patient may not work for another."

GGC's autism research has been supported by funds from the South Carolina Department of Disabilities and Special Needs. Additional funding has been obtained from the National Institutes of Health to explore transitioning the research finding into a simple blood test for autism. Drs. Schwartz and Boccuto are currently evaluating the tryptophan metabolism in fresh blood samples from patients with ASDs and controls, utilizing customized Biolog plates.

"We are thrilled that Biolog's technology helped Dr. Schwartz in his pioneering research and that it has led to this breakthrough discovery," said Barry Bochner, PhD, CEO at Biolog, Inc.

Luigi Boccuto, Chin-Fu Chen, Ayla R Pittman, Cindy D Skinner, Heather J McCartney, Kelly Jones, Barry R Bochner, Roger E Stevenson, Charles E Schwartz. Decreased tryptophan metabolism in patients with autism spectrum disorders. Molecular Autism, 2013; 4 (1): 16 DOI: 10.1186/2040-2392-4-16

http://phys.org/news/2013-06-infrared-photosynthesis-potential-power-source.html

Infrared photosynthesis: A potential power source for alien life in sunless places

New study explores potential for photosynthetic life to persist in sun-starved conditions

Photosynthesis -the harvesting of sunlight to produce energy -is the ultimate driver of virtually all life on the surface of our planet. Most photosynthetic creatures rely on optical light, the kind we see, to energize their biological machinery. Yet some can make use of lower-energy (and invisible to our eyes) infrared light. And in the case of one kind of bacteria -discovered years ago, deep underwater near a hydrothermal vent -this light need not even come from the Sun.

A new study explores the potential for photosynthetic life to persist in such sun-starved conditions. The research aims to shed light, as it were, on how organisms could live off of the dim infrared emissions from hydrothermal vents on alien worlds. Tantalizingly, such vents are theorized to exist beneath the surface of Jupiter's ice-covered, oceanic moon Europa.

"When we became aware of bacteria using infrared light to photosynthesize, we felt very curious about checking the photosynthetic potential with this light because this is one measure of whether life could thrive around hydrothermal vents," said Rolando Cardenas, a physicist at Central University "Marta Abreu" de Las Villas in Santa Clara, Cuba and a coauthor of the paper published in the May issue of Astrophysics and Space Science.

The new findings suggest that photosynthetic life as we know it would struggle to flourish given the small amount of available light in hydrothermal vent environments. But organisms that could make use of lower-energy infrared light might find themselves with plenty to get by on in sunless circumstances.

Life blooming in the deep dark

In the oceans, hydrothermal vents form near underwater volcanoes where tectonic plates are moving apart at mid-ocean ridges. Hot magma that burbles up into the seabed superheats passing water that then spews out of the ocean floor, laden with minerals. The minerals precipitate out of the plume, building up chimney-like structures known as black smokers. Although these deep-sea hydrothermal vents do not sound like particularly hospitable places, the scalding billows are actually biological hot spots.

Various kinds of bacteria dine on the materials such as iron, hydrogen sulfide and ammonia belched out by the vents. These bacteria in turn support whole ecosystems around black smokers, most famously characterized by tube worms, but also home to strange snails, crabs and much more.

Eight years ago, researchers led by J. Thomas Beatty of the University of British Columbia discovered a hydrothermal vent bacterium whose livelihood requires more than just ensnaring vent-water chemicals. The bacterium, identified as belonging to the green sulfur family, needs light in order to obtain energy through a chemical reaction with sulfur. This green sulfur bacteria species, however, was found in waters some 2,400 meters (7,875 feet) deep in the Pacific Ocean, off of the coast of Mexico. Photons of sunlight cannot beam down much past about 200 meters (660 feet) in the water column before being completely absorbed. Therefore, the bacterium must use the measly portion of geothermal light generated by hydrothermal vents to survive. This

geothermal light is emitted when the erupting superheated waters rapidly cool in the surrounding, barely-above-freezing sea floor aquatic environment.
The bacterial species possesses an antenna-like structure that enables it to efficiently capture light. "It's the only example of an organism found that is thought to live off geothermal light," said Robert Blankenship, a professor of biology and chemistry at Washington University in St. Louis who was involved in the 2005 study. "The organism uses a giant antenna complex that allows it to live under extremely low-light conditions -it's about the best candidate you could come up with for living off of a hydrothermal vent through the absorption of photons."

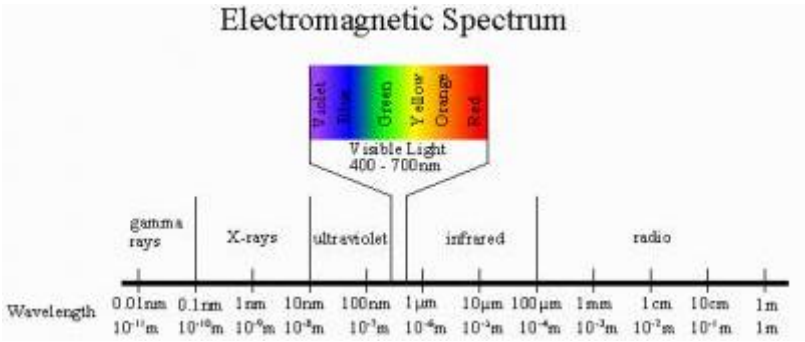
An example of a species of green sulfur bacteria growing in a nutrient-filled container. **Credit: kOchstudiO/Wikipedia**

Follow the light

Studying the hardy, sun-deprived life in remote areas such as hydrothermal vents is unfortunately a tricky and costly endeavor -the bacterium in question has not been re-isolated since. The new study by Cardenas and colleagues therefore turns to a mathematical model to assess the photosynthetic potential around the vents.
The researchers started with a concept vent that emits a similar amount of light as those described in the Beatty paper. A negligible amount of this light comes in the form of higher-energy, optical wavelengths; well over ninety-nine percent of the available light instead streams forth as lower-energy infrared light.
"The higher-energy photons do not contribute in a meaningful way to the overall energy-reaping budget for deep-sea photosynthetic organisms," said paper coauthor Osmel Martin Gonzalez, also of Central University "Marta Abreu" de Las Villas.
The research team plugged in equations describing photosynthesis rates for surface water phytoplankton, tweaking them because ultraviolet light that can damage the plankton, and thus hinder photosynthesis, does not reach oceanic depths. A range of irradiance levels was modeled, as well as water temperatures spanning about 390 degrees Fahrenheit (200 degrees Celsius) to around 750 degrees Fahrenheit (400 degrees Celsius), consistent with black smoker outpourings.

Not an easy living

Overall, the calculated photosynthesis rates for infrared light-harvesting creatures were not very high, meaning that relatively little usable energy was extractable from the hydrothermal vent's emissions.
The results in this way jibe with the Beatty and Blankenship finding in that the green sulfur bacterium did not seem to be a dominant member of its community or a particularly robust species.
"The organisms that we found in the vents on Earth, I'm convinced they were hanging on by their fingernails and just squeaking out a living," said Blankenship.



The optical portion of the electromagnetic spectrum visible to our eyes runs from approximately 400 nanometers to 700 nanometers in photon wavelength. Some bacteria can make use of long-wavelength, lower-energy light in the infrared portion of the spectrum. **Credit: NOAA**

Indeed, for subterranean or submerged alien life to draw enough energy through infrared photosynthesis might require fundamentally different means, or at the very least a significant expansion of the wavelengths known to be usable.
Cardenas and colleagues pushed the envelope by considering hypothetical organisms that could absorb light with a wavelength as long as 1300 nanometers (billionths of a meter). That wavelength is considerably longer (and thus less energetic) than the light that Earthly species can accommodate. The infrared range is considered to start at 700 nanometers, and organisms have been documented reaping this invisible light out to about 1000 nanometers, Blankenship said.
Still, Cardenas said that in going a bit beyond terrestrial biology, he thinks that photosynthetic microbes could manage a living by the light from underwater hydrothermal vents. "Even with photosynthesis only until 1100 nanometers, green sulfur bacteria could do photosynthesis to some extent in a similar environment in Europa or other planetary bodies," said Cardenas.
Blankenship is a bit more skeptical. He pointed out that the water around hydrothermal vents would probably absorb much of the infrared light available, leaving only a very narrow patch of real estate for photosynthetic creatures to occupy, and one that would put them perilously close to the superheated water itself.

"The amount of light that comes out of the vents at least here on Earth is very, very low," said Blankenship. "Still, it's always good to think about these things."
Under the Europan ice
At this point, the characteristics of hydrothermal vents on Europa and their attendant heat and light output are pure speculation. "Detailed internal models of Europa are still under some controversy," said Cardenas.
Europa has a thick, icy crust that scientists are pretty sure covers an ocean kept liquid by tidal flexing as Jupiter's gravity squishes and squeezes the moon. This flexing could also spur tectonic-like processes in Europa's mantle, leading to hydrothermal vents on its subsurface ocean's floor.
"If that holds true," said Cardenas, "then we can expect hydrothermal vents there and -why not? -forms of life relying on principles similar to those in Earth's hydrothermal vents."
For now, infrared photosynthesis as a sole or complementary means of energy production by extraterrestrial microbes around alien hydrothermal vents looks like a long shot; the use of minerals, as practiced with great success in our oceanic abysses, makes more sense. Then again, no one had expected to find an abundance of life teeming around black smokers when they were discovered in 1977.
"Life does seem to find a way," said Cardenas. "We look forward to further studying infrared photosynthesis and its implications for life in less conventionally terrestrial habitats." *Provided by Astrobio.net*

http://nyti.ms/188R6Xu

An Experimental Drug's Bitter End

Setback is a blow in the effort to treat autism

By ANDREW POLLACK

Holly Usrey-Roos will never forget when her son, Parker, then 10, accidentally broke a drinking glass and said, "I'm sorry, Mom. I love you."
It was the first time she had ever heard her son say he loved her — or say much of anything for that matter. Parker, now 14, has fragile X syndrome, which causes intellectual disability and autistic behavior.
Ms. Usrey-Roos is certain that Parker's new verbal ability resulted from an experimental drug he was taking in a clinical trial, and has continued to take for three years since then. She said she no longer had to wear sweaters to cover up the bruises on her arms she used to get from Parker hitting or biting her.
Now, however, the drug is being taken away. It has not met the goals set for it in clinical trials testing it as a treatment for either autism or fragile X syndrome. And Seaside Therapeutics, the company developing it, is running out of money and says it can no longer afford to supply the drug to former participants in its trials.
The setback is a blow in the effort to treat autism since the drug, arbaclofen, was one of the furthest along in clinical trials. And the company's decision has caused both heartbreak and outrage among some parents.
"I waited 10 and a half years for him to tell me he loved me," said Ms. Usrey-Roos, who lives in Canton, Ill. "With fragile X, you're like living in a box and someone is holding the lid down. The medication opened the lid and let Parker out." "I don't want to go back to the way life was," she added.
The situation raises questions about what, if anything, drug companies owe to patients participating in their clinical trials. It also points out the difficulties in developing drugs to treat autism and fragile X syndrome. If the drug worked so well in some patients, why has it not succeeded so far in clinical trials?
One reason is that the symptoms and behaviors associated with autism and fragile X vary widely among individuals, making it hard to capture the effects of a drug by looking at any one measure, like irritability or social withdrawal. Seaside and doctors who participated in the trials said that there were improvements in some aspects of behavior in some studies, just not those considered critical to a trial's overall success.
But could it also be that the parents are deluding themselves into seeing changes that are not there? Could improvements be the result of the children simply growing older?
"It's kind of hard to make the argument that the company should keep providing it if it's not working," said Dr. Michael R. Tranfaglia, medical director of the Fraxa Research Foundation, of Newburyport, Mass., which provides money for research on fragile X syndrome.
Dr. Tranfaglia, whose son has fragile X but was not in a Seaside trial, said arbaclofen appeared to significantly help about a third of patients. It also made some patients worse. Without being able to tell in advance which patients would benefit, it would be hard for the drug to succeed in a clinical trial and win approval, he said.
Similar situations have risen occasionally in the past. In 2004, patients with Parkinson's disease protested when Amgen stopped providing an experimental drug that some patients said had restored their lives. Amgen said the drug had failed in a clinical trial and might even be dangerous. Two patients even sued, but a court ruled the company had no obligation to continue to supply the drug to participants in its trials.
In the case of arbaclofen, parents are appealing to Congress and have started an online petition hoping to find financing for the drug's development. They are also organizing through social media.

Seaside executives declined to be interviewed.
Until recently, Seaside, one of the few companies pursuing autism drugs, was considered a shining light by family members of those with the condition. The company, in Cambridge, Mass., grew out of the research of Mark F. Bear, a neuroscience professor at the M.I.T. Its co-founder and chief executive, Dr. Randall L. Carpenter, has a sister with an intellectual disability. As of a year ago, privately held Seaside had raised about $90 million. Most of it had come from the Barony Trust, run by the family of Peter Whipp, a wealthy Briton. But it apparently never was the plan for Mr. Whipp to carry the company indefinitely.
Last year, Seaside entered a partnership with Roche, the Swiss pharmaceutical giant, which provided an undisclosed amount of money in exchange for intellectual property rights covering a different class of autism drug and an option to license arbaclofen. But given the failures in the clinical trials, Roche says it has decided not to license arbaclofen, apparently ending financial support for studies of the drug.
“We concluded that arbaclofen wasn’t going to provide that real difference for patients,” Luca Santarelli, head of neuroscience research at Roche, said in an interview.
Dr. Bear of M.I.T. said he was hopeful new financing could be found. He said the company was started to help families, “not a play to make money.”
He added, “I think the signs are sufficiently encouraging. It would be really tragic if we abandon this now.”
On May 1, Seaside announced that arbaclofen, which is also known as STX209, had not met the main goal of reducing social withdrawal in a 150-patient midstage study of children and young adults with autism. But the drug did succeed on a different measure — the clinicians’ assessment of the patients.
The drug had previously failed in a Phase 2 trial for fragile X, which is caused by a mutation in a gene on the X chromosome and affects about 100,000 Americans. In that trial, the main goal was to reduce irritability. While it did not do that, it appeared to ease social withdrawal. So Seaside began two Phase 3 trials for fragile X, one for young children and one for adolescents and adults. This time, social withdrawal was the main measure. But the company said recently in a letter to parents that the trial in adolescents and adults had not succeeded. Results from the trial of children should be known this summer.
In the middle of May, Seaside told doctors and patients that because of “resource limitations” it could no longer supply the drug. “We know that this termination will be disruptive and disappointing for many families,” executives said in a letter to parents.
That is putting it mildly. Christina Murphy of Holton, Kan., wrote on the Web site stx209stories set up by families wanting the drug back, that her 11-year-old son Rhett, who has fragile X, made friends for the first time ever once he started taking the drug and sang in the school talent show, overcoming his usual fear of crowds and getting a standing ovation.
“I had never in my life witnessed something like that,” she wrote. “There was hardly a dry eye among the adults in the room. I have never seen him so happy in his entire life as when he finished that song and looked out at the crowd.” Only a few hours later, she learned that the drug would be taken away. “I am sad, I am hurt and my heart is breaking,” she wrote.
Parents and patient advocates say there could be 300 patients or more taking the drugs. Some say they were promised the drug would be available until it reached the market or was totally abandoned as ineffective.
“When I found out, I went upstairs to my husband. I was crying so hard he thought someone had died,” said Cortney AbouElSeoud of Holt, Mich.
Ms. AbouElSeoud said her 5-year-old son Ayden, who has fragile X, spoke only a few words before entering the trial last October. Now he is up to 50 words. “He talks to us and answers us,” she said. “It’s crazy and awesome to see him emerging into a little person.”
Some parents say that they feel betrayed by Seaside and that the company has not communicated enough.
“I believe I, along with many others, are entitled to a better explanation of why our lives are being turned upside down,” Lori Armer of Newport News, Va., wrote on a Facebook page for families weaning their children off arbaclofen. She and other parents wrote on the site that behavioral problems were returning as the drug dosage was reduced.
There are some options. Arbaclofen is a derivative of baclofen, a generic muscle relaxer that is already on the market as a treatment for spasticity. While there is some evidence that arbaclofen is more potent, some parents are turning to baclofen.
Others hope to enroll their children into trials of other drugs for fragile X and autism being run by Roche and Novartis. Ms. Usrey-Roos, who works for the National Fragile X Foundation, based in Walnut Creek, Calif., said she was hopeful that if one drug worked, another might, too.
While sad that the study ended, she said, “I’m still thankful for this experience. It has given me such hope.”

http://www.eurekalert.org/pub_releases/2013-06/uosc-cgd060613.php

Common genetic disease linked to father's age

Genetic mutation of a testis stem cell actually gives the disease an edge, making older fathers more likely to pass it along to their children

Scientists at USC have unlocked the mystery of why new cases of the genetic disease Noonan Syndrome are so common: a mutation that causes the disease disproportionately increases a normal father's production of sperm carrying the disease trait.

When this Noonan syndrome mutation arises in a normal sperm stem cell it makes that cell more likely to reproduce itself than stem cells lacking the mutation. The father then is more likely to have an affected child because more mutant stem cells result in more mutant sperm. The longer the man waits to have children the greater the chance of having a child with Noonan syndrome.

Noonan Syndrome is among the most common genetic diseases with a simple inheritance pattern. About one of every 4,000 live births is a child with a new disease mutation. The disease can cause craniofacial abnormalities, short stature, heart defects, intellectual disability and sometimes blood cancers.

By examining the testes from 15 unaffected men, a team led by USC molecular and computational biologists Norman Arnheim and Peter Calabrese found that the new mutations were highly clustered in the testis, and that the overall proportion of mutated stem cells increased with age. Their computational analysis indicated that the mutation gave a selective edge over non-mutated cells.

"There is competition between stem cells with and without the mutation in each individual testis," said Arnheim, who has joint appointments at the USC Dornsife College of Letters, Arts and Sciences and the Keck School of Medicine of USC. "But what is also unusual in this case is that the mutation which confers the advantage to testis stem cells is disadvantageous to any offspring that inherits it."

The new findings also suggest an important new molecular mechanism to explain how certain genetic disease mutations can alter sperm stem cell function leading to exceptionally high frequencies of new cases every generation.

The Arnheim and Calabrese team included USC postdoctoral research associates Song-Ro Yoon, and Soo-Kung Choi, graduate student Jordan Eboreime and Dr. Bruce D. Gelb of the Icahn School of Medicine at Mount Sinai in New York City. A paper detailing their research will be published on June 6 in The American Journal of Human Genetics.

This research was supported by the National Institute of General Medical Sciences grant number R01GM36745 and the National Heart, Lung and Blood Institute (National Institutes of Health) grant number HL071207.

http://www.bbc.co.uk/news/health-22805748#sa-ns_mchannel=rss&ns_source=PublicRSS20-sa

Using your 'inner bat' to help navigate

Bats are famous for using sound to navigate successfully, and new research suggests we could all use our "inner bat" to get around.

By Paula McGrath Health Check, BBC World Service

Blind people are aware of this technique. Some click their tongue or tap their cane on the floor and use the resulting echoes to help them move around safely. Researchers in Southampton have found that we could all make use of the soundscapes that surround us, whether we can see or not. The new study, which involved both sighted people wearing blindfolds and blind people, looked at the types of sound that were best to locate an object.

Lead researcher Dr Daniel Rowan, a lecturer in audiology at the University of Southampton, said in one test the longer sounds, lasting around half a second, made things easier. "What the experiment showed is that as the duration of the sound got shorter and shorter, people's ability to tell whether an object was to the left or right got worse. Having a longer duration signal appears better than a short one."

But if you want to know something different about an object - like how close it is - it may be that a shorter duration, of just 10 milliseconds, could be better. "Some bats that use echolocation. If they're hunting prey, they change their call as they get closer to the prey to reveal different sorts of information."

Never crash

Claire Randall, who has been virtually blind from birth, uses echolocation. "I think the first time I was aware of it was when I was about five. I used to ride a bike and I developed the ability to swerve past a lamp post and miss it by millimetres, too regularly for it to be a coincidence."

Her mother marvelled at her ability to miss obstacles. "One day my mum asked me how I always managed to miss the lamp post, and the only way I could explain it was, 'It goes dark past my ears.' "

The history of echolocation is fascinating. Back in the 1940s and 50s there was an idea that we had a separate sense on the face specially for detecting echoes. Now we know it's the hearing system that does it and, although blind people seem to have honed their skills, we are all capable of navigating using sound.

One reason sighted people may not exploit this ability so much is that their world is dominated by vision.
This is seen in the "ventriloquism effect", where sounds are attributed to a dummy because its mouth is moving, overriding where the sound is really coming from, the poker-faced ventriloquist.
Previous research has involved real-life locations. But this study used "virtual obstacles", represented by sounds mimicking echoes from those imaginary objects in headphones worn by the study participants.

Extraordinary feats

Dr Rowan said: "In using virtual objects there were no other clues that someone might use: for instance, the creaking as you move an object around or the wafting of air across their face as you move something around."
He has heard the reports of extraordinary feats. "There are some expert echolocators who are able to do some fairly amazing things, such as ride a bike or play basketball, and World Access for the Blind trains people to do this. "But we know less about how blind people in general use echoes."
The findings have just been published in the journal Hearing Research. Dr Rowan hopes that they will help to improve echolocation skills. He said: "One of the things we wanted to try to contribute to with our research is to provide some underpinning science that may help the development of training programmes, to help blind people use echoes that arrive at their ears more effectively.

Damon Rose BBC News, Ouch

A month after losing my sight at 13, I had my first mobility lesson using a white cane.

While tapping down a school corridor I felt a strange pressure in my head and ears. Slightly confused, I told my instructor: "I think I can hear the walls."

"Let's try something," she said, grabbing my arm and pushing me forward. "We're walking towards the end of the corridor now… you tell me when to stop before we bang into it." As we got closer, the pressure built until it felt we couldn't go any further. When I said 'Stop', we were just an inch from the end wall.

Though we seem to call it echolocation now, my instructor told me I had good "obstacle sense". And it does feel like a sixth sense rather than just interpreting echoes.

For lots of blind people, echolocation is the most important "sense" they use when walking round their own house and in other environments. Many of us have been using it for years but rarely mention it because it's so everyday.

http://news.discovery.com/human/health/soy-sauce-sends-man-into-coma-130607.htm#mkcpgn=rssnws1

Soy Sauce Overdose Sends Man into Coma

A young man who drank a quart of soy sauce went into a coma and nearly died from an excess of salt in his body, according to a recent case report.

Jun 7, 2013 12:30 PM ET // by Tia Ghose, LiveScience

The 19-year-old, who drank the soy sauce after being dared by friends, is the first person known to have deliberately overdosed on such a high amount of salt and survived with no lasting neurological problems, according to the doctors in Virginia who reported his case. The case report was published online June 4 in the Journal of Emergency Medicine.
Too much salt in the blood, a condition called hypernatremia, is usually seen in people with psychiatric conditions who develop a strong appetite for the condiment, said Dr. David J. Carlberg, who treated the young man and works as an emergency medicine physician at MedStar Georgetown University Hospital in Washington, D.C.
Hypernatremia is dangerous because it causes the brain to lose water. When there is too much salt in the bloodstream, water moves out of the body tissues and into the blood by the process of osmosis, to try to equalize the salt concentration between the two. As water the leaves the brain, the organ can shrink and bleed, Carlberg said.
After the man drank the soy sauce, he began twitching and having seizures, and the friends took him to an emergency room. That hospital administered anti-seizure medication, and he was already in a coma when he was taken to the hospital where Carlberg was working, the University of Virginia Medical Center, nearly four hours after the event.
"He didn't respond to any of the stimuli that we gave him," Carlberg said. "He had some clonus, which is just elevated reflexes. It's a sign that basically the nervous system wasn't working very well."
The team immediately began flushing the salt out of his system by administering a solution of water and the sugar dextrose through a nasal tube. When they placed the tube, streaks of brown material came out. Within a half hour, they pumped 1.5 gallons (6 liters) of sugar water into the man's body.
The man's sodium levels returned to normal after about five hours. He remained in a coma for three days, but woke up on his own.

For several days afterward, a part of his brain called the hippocampus showed residual effects from the seizures. But a month after the event, he showed no sign of the overdose: He was back at college, and doing well on his exams, doctors reported.
A typical quart of soy sauce has more than 0.35 pounds (0.16 kilograms) of salt, the researchers said.
Most cases of sodium overdose happen more gradually. In the 1960s and 1970s, doctors actually gave salt to patients suffering from poisoning, to initiate vomiting, until they realized its harmful effects.
Though it's rare in the United States, consuming excess salt was a traditional method for suicide in ancient China, according to the case report.
Carlberg said he believes the young man survived because the team got his sodium levels down so quickly. "We were more aggressive than had been reported before in terms of bringing his sodium back down to a safer range," Carlberg told LiveScience. Reducing sodium levels more slowly has had poor or mixed results in the past, he said.

http://bit.ly/11mlK6p

China's Alzheimer's time bomb revealed

In 2010, China had the most people with Alzheimer's in the world –twice as many cases of Alzheimer's and other dementia as the WHO thought

18:42 07 June 2013 by Debora MacKenzie

In 2010, China had more people living with Alzheimer's disease than any other country in the world – and twice as many cases of Alzheimer's and other kinds of dementia as the World Health Organization thought.
Cases of all kinds of age-related dementia in the country rose from 3.7 million in 1990 to 9.2 million in 2010. This is the finding of the first comprehensive analysis of Chinese epidemiological research, made possible by the recent digitisation of Chinese-language research papers. Previous estimates, based on English-language papers, seem to have under-reported the number of cases by half.
"We are now only beginning to comprehend the enormous value in this 'parallel universe' of information," says Igor Rutan of the University of Edinburgh, UK, who was part of the team that carried out the research.
The figures are bad news for a country where 90 per cent of the elderly must be cared for by their families – old people who still have family members living are not allowed to be admitted to a nursing home – even as widespread migration to cities has disrupted the traditional family structure.

Population bulge

The findings are a reflection of China's ageing population, and its policies.
As countries modernise, death rates fall, and later on birth rates fall as more people take up birth control. Between the two events, though, there is a "bulge" of births, the source of the modern world's population explosion. Eventually birth and death rates roughly equalise, but the birth bulge remains as an age bulge in the population.
This reached an extreme in China, where a surge in births in the 1950s and 1960s was followed by plummeting birth rates in the 1970s, later reinforced by China's one-child policy. "Family planning policy means China is becoming an ageing country much faster than other middle-income countries such as India," says co-author Wei Wang of Edith Cowan University in Perth, Australia.
In its youth, the bulge underpinned China's economic development. But by 2033, it is predicted that working-age people will be outnumbered by dependents, mostly the elderly.
The new research shows that they will need more care than China was expecting. Dementia rises in an ageing population: cases increased from 4.9 to 6.3 million in the greying European Union between 2004 and 2010.

Unhealthy lifestyle

"The rates in China are similar or even higher than rates in Europe and the US," says Wang.
And they are rising. In 1990, the team estimates, 1.8 per cent of Chinese aged 65 to 69, and 42.1 per cent aged 95 to 99, had dementia. In 2010 those figures were 2.6 and 60.5 per cent, respectively. If similar rates hold in other middle-income countries, there might be 20 per cent more cases of Alzheimer's worldwide – five million more – than now estimated, the authors calculate.
The increase in China might reflect better diagnosis, but an urbanising lifestyle could also be causing more dementia. "Obesity, diabetes and suboptimal health contribute," says Wang.
Martin Prince of King's College London, who is organising another survey for dementia in China, says that if midlife obesity is a risk factor for dementia, then future rates in China could be 20 per cent higher than estimated.
Journal reference: The Lancet, doi.org/msp

http://bit.ly/13qGbDm

Saudi Silence on Deadly MERS Virus Outbreak Frustrates World Health Experts

Middle East respiratory syndrome, a cousin of SARS, has sparked global concern for its pandemic potential, but Saudi Arabia has yet to release information that could help protect the rest of the world

By Helen Branswell | Friday, June 7, 2013 | 13

Over the next few weeks officials at the World Health Organization (WHO) face a tough and politically charged call. The Muslim month of fasting, Ramadan, begins July 9 and could draw as many as two million people from around the globe to the holy sites of Saudi Arabia in a pilgrimage called umrah. But a new disease, called Middle Eastern respiratory syndrome, or MERS, could threaten them.

Infectious disease control at mass gatherings is always a challenge, but this year even more so. Saudi Arabia is currently waging battle with MERS, yet it has released only the barest of details that scientists or public health officials could use to try to prevent its spread within Saudi Arabia or around the globe. In early May Saudi officials startled the world by announcing 13 new cases over the course of a few days. Since the start of May there have been 38 new cases worldwide—31 of them in Saudi Arabia—and 20 of the victims have died. With virtually no clues to draw on about where the virus lives in nature and how people contract it, WHO is trying to figure out what guidance to give those pilgrims, and the countries they will return to, about how to avoid infection and the international dissemination of a devastating new illness.

MERS triggers severe pneumonia and kidney failure in some cases. It is a cousin of SARS, severe acute respiratory syndrome, which broke out in mainland China in late 2002, spread from there to Hong Kong in 2003, and was then transported in the lungs of international travelers to Singapore, Hanoi, Toronto and other cities. Health officials do not want to pull out the big hammers used during the SARS outbreak, such as WHO travel advisories that urged the world's citizens to avoid infected hubs such as Hong Kong and Toronto. On the other hand, no one wants umrah and the even larger hajj pilgrimage that will follow in October to trigger a pandemic.

The new virus was first isolated in June 2012. But its existence came to the world's attention only weeks before last October's hajj, when an Egyptian infectious diseases specialist who had been working in Saudi Arabia's second largest city, Jeddah, reported that he had treated a man who died from an infection caused by a new coronavirus. Whether MERS has or can gain the capacity for sustained person-to-person spread is unknown.

Kamran Khan, an infectious diseases physician who researches global flight patterns as a means of predicting disease spread, has had a worried eye on the Muslim religious calendar for some time. "We still don't have a good idea where this (virus) is coming from, so taking measures to mitigate risks are constrained," says Khan, who works at the Saint Michael's Hospital Keenan Research Center in Toronto.

Coronaviruses such as MERS, SARS and numerous others are named for the hallmark halo, or crown, they appear to sport in their outer shells. Many infect bats; the few that infect people cause illnesses ranging from the common cold to the severe lung devastation seen with many MERS cases, forcing patients to undergo mechanical ventilation. MERS has not yet evolved to spread as well as SARS can. And SARS, which was no wimp, killed about 11 percent of cases before it disappeared in 2004.

Last fall and in the early part of 2013 MERS infections popped up sporadically in a variety of places. Testing of samples from an April 2012 outbreak in Jordan revealed the virus had killed two nurses there. Three men in a family in the Saudi capital, Riyadh, appeared to have passed the virus to one another. Sick people from Qatar and the United Arab Emirates were medivacked to the U.K. and Germany. And more recently tourists have taken the infection to the U.K., France, Tunisia and Italy.

The affected Arabian Peninsula countries have not been particularly forthcoming with information, and global health experts have yet to hit on the right strategy for persuading officials to get serious about finding the source of the infections or the scope of the illness in people. An outbreak of H7N9 bird flu virus in China at the beginning of April also distracted attention from MERS.

The latter virus, however, would not be ignored for long. The 13 new infections in early May were linked, arising in dialysis patients treated in Al Moosa Hospital at the Al-Ahsa oasis in the kingdom's Eastern Province. Infection in hospitals is how SARS took off, so word that an institution—or as sources suggest, several institutions—were epicenters of the outbreak raises the level of concern.

Donald Low, a microbiologist at Mount Sinai Hospital in Toronto who became a SARS expert in 2003, expressed hope that the Al-Ahsa outbreak would "put their feet to the fire to get serious about this." Low has been worried about the possibility that superspreaders will emerge, as they did during SARS. Most people who contracted SARS passed the virus to at most one other person. But some SARS patients infected large numbers of people. One patient in Singapore infected 62 others; a woman who fell ill in the early days of the Toronto

outbreak infected 44. With SARS, superspreaders turned a virus that likely would have burned itself out into a global outbreak that claimed 916 lives.
Has there been a superspreader in Saudi Arabia? If so, Saudi authorities have not revealed it. But it is evident that infections are being detected at a more rapid pace. At WHO's annual meeting—the World Health Assembly—in late May, the Saudi delegation was given what amounts to a diplomatic dressing down, with Director General Margaret Chan lauding China for its handling of the H7N9 outbreak and demanding that countries with MERS cases act as good global citizens and share information in a timely, complete manner. The next day Saudi Arabia announced five more cases in a three-line statement, which revealed only that victims ranged in age from 73 and 85; all had chronic diseases and lived in the Eastern Province.
Infectious disease experts are aghast that this late into MERS's spread the world still has no idea what puts people at risk of infection, how long the incubation period is, when people are contagious or whether there are mild cases that are being missed because surveillance is focused on finding sick people in hospitals. They put the problem squarely at the feet of the Kingdom of Saudi Arabia (KSA), which accounts for 41 of the 55 infections to date. Says Michael Osterholm, director of the Center for Infectious Diseases Research and Policy at the University of Minnesota: "The European countries have largely done an exemplary job of investigating and following up on the cases [that have been exported there]. Now, either the Middle Eastern countries, particularly KSA, have not, or they're just withholding information, for whatever reason. And in a situation where this represents a potential global pandemic, that is inexcusable."
Scientists also have no sense of whether the virus has changed over time. Genetic sequences of only four viral isolates have been placed in GenBank, the open-access sequence database run by the National Institutes of Health's National Center for Biotechnology Information. The most recent of the genetic blueprints dates to an infection that occurred in February. No sequences from the flurry of recent cases have been released. In fact, except for the sequence of the first spotted case—the man from Jeddah—no Saudi sequences have been placed in the public domain. The kingdom's deputy minister of health, Ziad Memish, has promised that sequences will be shared.
This week an international team of experts convened by WHO has gathered in Saudi Arabia to make headway in prying information out of the country. With the clock counting down to Ramadan, they have little time in which to answer key questions about the disease—answers needed to help safeguard the umrah pilgrims, and the rest of the world.

http://www.sciencedaily.com/releases/2013/06/130607222855.htm

Vegetable Oil Is Good for You, Experts Say

Researchers find that no link exists between vegetable oil consumption and circulating indicators of inflammation

A typical American consumes approximately 3 or more tablespoons of vegetable oil each day. Vegetable oils, like those from soy, corn and canola, are a significant source of calories and are rich in linoleic acid (LA), which is an essential nutrient. Since the 1970s, researchers have known that LA helps reduce blood cholesterol levels, and for decades, scientists have known that consuming LA can help lower the risk of heart disease. However, some experts have been claiming recently that Americans might be getting too much of a good thing. A new study from the University of Missouri contradicts that claim.
In the study, "Effect of Dietary Linoleic Acid on Markers of Inflammation in Healthy Persons: A Systematic Review of Randomized Controlled Trials," researchers at the University of Missouri and the University of Illinois found that no link exists between vegetable oil consumption and circulating indicators of inflammation that are often associated with diseases such as heart disease, cancer, asthma and arthritis. While earlier animal studies have shown that a diet rich in LA can promote inflammation, MU animal sciences researcher Kevin Fritsche says that humans respond to LA differently.
"In the field of nutrition and health, animals aren't people," said Fritsche, an MU professor of animal science and nutrition in the Division of Animal Sciences. "We're not saying that you should just go out and consume vegetable oil freely. However, our evidence does suggest that you can achieve a heart-healthy diet by using soybean, canola, corn and sunflower oils instead of animal-based fats when cooking."
Linoleic acid is an omega-6 fatty acid that is a major component of most vegetable oils. This fatty acid is an essential nutrient and comprising 50 percent or more of most vegetable oils.
Fritsche, along with Guy Johnson, an adjunct professor of food and human nutrition at the University of Illinois, conducted one of the most thorough studies on LA questioning whether this fatty acid promotes inflammation in humans. When the evidence from numerous clinical trials was gathered and examined, Fritsche said it was clear that LA consumption did not promote inflammation in healthy people.

"Some previous studies have shown that inflammation, which is an immune response in the body, can occur when certain fats are consumed," Fritsche said. "We've come to realize that this inflammation, which can occur anywhere in the body, can cause or promote chronic diseases. We know that animal fats can encourage inflammation, but in this study, we've been able to rule out vegetable oil as a cause."
Fritsche and Johnson reviewed 15 clinical trials that studied nearly 500 adults as they consumed various forms of fats, including vegetable oils. The researchers could find no evidence that a diet high in linoleic acid had any links to inflammation in the body. Due to this discovery, the researchers say that it is important to continue following the current recommendations from the Institute of Medicine and the American Heart Association to use vegetable oil when cooking and consume between two and four tablespoons of vegetable oil daily to reach the necessary amount of linoleic acid needed for a heart-healthy diet.
"Consumers are regularly bombarded with warnings about what foods they should avoid," Fritsche said. "While limiting the overall fat intake is also part of the current nutrition recommendations, we hope people will feel comfortable cooking with vegetable oils."
Guy H. Johnson, Kevin Fritsche. Effect of Dietary Linoleic Acid on Markers of Inflammation in Healthy Persons: A Systematic Review of Randomized Controlled Trials. Journal of the Academy of Nutrition and Dietetics, 2012; 112 (7): 1029 DOI: 10.1016/j.jand.2012.03.029

http://www.eurekalert.org/pub_releases/2013-06/esoh-rmm060613.php

Rare mitochondrial mutations -- maybe not so rare?

Comprehensive analysis of mitochondrial DNA will aid early diagnosis

Paris, France: French scientists have discovered that supposedly rare mutations in the mitochondria, the 'power plants' of human cells responsible for creating energy, account for more than 7% of patients with a mitochondrial disease manifesting itself as a respiratory deficiency.
Their data emphasise the need for comprehensive analysis of all the mitochondrial DNA (mtDNA) in patients suspected as having a mitochondrial disease, and this should include children, a researcher will tell the annual conference of the European Society of Human Genetics today (Sunday).
Dr. Sylvie Bannwarth and Professor Véronique Paquis, from the Hôpital Archet 2, Nice, France, together with colleagues from the ten diagnostic centres that make up the French Mitochondrial Disease Network, investigated 743 patients who were suspected of having a respiratory chain disorder caused by defective mitochondria, but who did not carry a common mtDNA mutation. Mitochondrial diseases, which can be very severe, are estimated to affect one child in every 5000, and are usually untreatable.
However, prompt diagnosis can help clinicians to prescribe treatment to alleviate secondary symptoms.
"We examined the relationship between clinical presentation of disease, age at onset, and the localisations of mutations. Our results showed that, in the French population, clinical presentations that are not associated with common mtDA mutations begin mainly before adulthood, and that neuromuscular problems are the most common manifestation of such mutations", says Dr. Bannwarth.
"We found that early onset disease was significantly associated with mutations in genes that code for proteins, while late onset disorder were associated with mutations in tRNA genes, and that two genes represent 'hotspots' for disease-causing mutations. Knowing the prevalence of these rare mutations is essential if we are to be able to improve the diagnosis of these diseases."
There are very many mitochondrial diseases, and they manifest themselves in a large number of different ways. They can involve muscle weakness, neurological disease, respiratory, gastrointestinal and cardiac problems, and strokes. Many are degenerative, while some are relatively static.
One of the two techniques used for screening the entirety of an individual's mtDNA was developed by Dr. Bannwarth. The use of such techniques can aid not just in diagnosis, but also in genetic counselling and prenatal diagnosis for mitochondrial disease.
Up to now the study of mtDNA mutations has usually been restricted to the detection of deletions and a few common mutations, but without any data about the prevalence of rare mutations and their associated phenotypes (characteristics or traits).
"With the advent of Next Generation Sequencing techniques, screening all mtDNA is now feasible, and this means that we can detect both common and rare mutations as well as deletions. For example, in the patients we studied we found that Leigh syndrome – a rare disorder that affects the central nervous system – was found in 41% of patients with rare mtDNA mutations.
Had we not screened all of the mtDNA, including the rare mutations, we would not have known this", says Dr. Bannwarth. "This is clearly a big aid to accurate diagnosis and we hope that our results will underline the importance of comprehensive mtDNA screening."

http://bit.ly/15NjTfe

'Nuclear pasta' may stabilise pulsars' spins

Pasta helps marathon runners keep the pace – and maybe some spinning stars too.

18:00 09 June 2013 by Maggie McKee

The key to neutron stars' steady rotation may be spaghetti-shaped groupings of atomic nuclei that form lumps in the stellar crust.

A neutron star is the ultra-dense remnant of a stellar explosion, made up of a solid crust of atomic nuclei and a liquid core of free neutrons. These stars are born spinning rapidly, sometimes making multiple rotations per second. Some neutron stars also emit beams of radiation from their magnetic poles. If the beams sweep past Earth, we can detect the regular pulses of light and time the star's spin.

Without any outside influences, a neutron star will slow down over time as it radiates away energy. Curiously, X-ray pulsars, which are brighter and easier to observe than other types, appear to stop slowing down when they reach a rate of about 12 seconds per rotation.

The explanation may lie in the star's surface. José Pons at the University of Alicante in Spain and his colleagues ran computer simulations of neutron stars with different crust configurations. After just 100,000 years, the spins of stars with lumpy crusts slowed to between 10 and 20 seconds and then stayed steady for the next million years or so, roughly the amount of time it takes for the stars to cool so much they stop emitting X-rays. Stars with smoother crusts kept slowing down over time, getting as slow as 100 seconds per rotation.

Lumpy crust

This makes sense, the team says, because the lumpier the crust, the worse it is at conducting the electrical currents that maintain the star's magnetic field. With a lower magnetic field, the star radiates less energy into space and its spin remains stable for longer.

So what can make neutron stars lumpy? Pons and colleagues think that their crusts might be full of "nuclear pasta". Because neutron stars are so dense, atomic nuclei are packed together tightly in the crust. The particles in these compacted nuclei could be forced into exotic groupings that resemble spaghetti, macaroni and layers of lasagna. Mixing these shapes together in the crust would make it bumpier than one that only contains regular nuclei arranged in orderly crystals.

But those hoping for a taste of pulsar pasta are out of luck. "There is probably no other place in the universe where such conditions are reached," says Pons. Instead, more sensitive X-ray telescopes could increase the number of pulsars known and check whether some manage to get slower than the 12-second spins. If so, the star crusts may be more orderly after all, potentially putting the pasta theory down the drain.

Journal reference: Nature Physics, DOI: 10.1038/nphys2640

http://www.sciencedaily.com/releases/2013/06/130609195709.htm

3-D Map of Blood Vessels in Cerebral Cortex Holds Suprises

Blood vessels within a sensory area of the mammalian brain loop and connect in unexpected ways, a new map has revealed.

The study, published June 9 in the early online edition of Nature Neuroscience, describes vascular architecture within a well-known region of the cerebral cortex and explores what that structure means for functional imaging of the brain and the onset of a kind of dementia.

David Kleinfeld, professor of physics and neurobiology at the University of California, San Diego, and colleagues mapped blood vessels in an area of the mouse brain that receives sensory signals from the whiskers. The organization of neural cells in this brain region is well-understood, as was a pattern of blood vessels that plunge from the surface of the brain and return from the depths, but the network in between was uncharted. Yet these tiny arterioles and venules deliver oxygen and nutrients to energy-hungry brain cells and carry away wastes.

The team traced this fine network by filling the vessels with a fluorescent gel. Then, using an automated system, developed by co-author Philbert Tsai, that removes thin layers of tissue with a laser while capturing a series of images to reconstructed the three-dimensional network of tiny vessels.

The project focused on a region of the cerebral cortex in which the nerve cells are so well known that they can be traced to individual whiskers. These neurons cluster in "barrels," one per whisker, a pattern of organization seen in other sensory areas as well.

The scientists expected each whisker barrel to match up with its own blood supply, but that was not the case. The blood vessels don't line up with the functional structure of the neurons they feed.

"This was a surprise, because the blood vessels develop in tandem with neural tissue," Kleinfeld said. Instead, microvessels beneath the surface loop and connect in patterns that don't obviously correspond to the barrels.

To search for patterns, they turned to a branch of mathematics called graph theory, which describes systems as interconnected nodes. Using this approach, no hidden subunits emerged, demonstrating that the mesh indeed forms a continous network they call the "angiome."
The vascular maps traced in this study raise a question of what we're actually seeing in a widely used kind of brain imaging called functional MRI, which in one form measures brain activity by recording changes in oxygen levels in the blood. The idea is that activity will locally deplete oxygen. So they wiggled whiskers on individual mice and found that optical signals associated with depleted oxygen centered on the barrels, where electrical recordings confirmed neural activity. Thus brain mapping does not depend on a modular arrangement of blood vessels.
The researchers also went a step further to calculate patterns of blood flow based on the diameters and connections of the vessels and asked how this would change if a feeder arteriole were blocked. The map allowed them to identify "perfusion domains," which predict the volumes of lesions that result when a clot occludes a vessel. Critically, they were able to build a physical model of how these lesions form, as may occur in cases of human dementia.
Pablo Blinder, Philbert S Tsai, John P Kaufhold, Per M Knutsen, Harry Suhl, David Kleinfeld. The cortical angiome: an interconnected vascular network with noncolumnar patterns of blood flow. Nature Neuroscience, 2013; DOI: 10.1038/nn.3426

http://www.bbc.co.uk/news/science-environment-22832673

Old Opportunity Mars rover makes rock discovery

Nasa's ageing Opportunity rover on Mars has just made what may be one of its most significant discoveries to date.

By Jonathan Amos Science correspondent, BBC News

The nine-year-old robot has identified rock laden with what scientists believe to be clay minerals. Their presence is an indication that the rock, dubbed Esperance, has been altered at some point in the past through prolonged contact with water.
Opportunity has seen a clay-bearing outcrop before but scientists say this is by far the best example to date.
"It's very rich," said Steve Squyres, the rover's principal investigator. "We've been discovering evidence for water on Mars since we first landed back in 2004. What's different here?
"If you look at all of the water-related discoveries that have been made by Opportunity, the vast majority of them point to water that was a very low pH - it was acid. "We run around talking about water on Mars. In fact, what Opportunity has mostly discovered, or found evidence for, was sulphuric acid. "Clay minerals only tend to form at a more neutral pH. This is water you could drink. This is water that was much more favourable for things like pre-biotic chemistry - the kind of chemistry that could lead to the origin of life."
Prof Squyres, who is affiliated to Cornell University, Ithaca, New York, said he was inclined to put Esperance in his personal top five discoveries made on the Red Planet by Opportunity and her twin rover, Spirit, which stopped working in 2011. The clays are aluminium-rich, possibly of the type montmorillonite. However, because Opportunity's X-ray spectrometer can only discern the atomic elements in a rock, and not their mineralogical arrangement, no-one can say for sure.
Nonetheless, the mere occurrence of clays is further proof that Mars was much warmer and wetter billions of years ago; a very different place to the cold, desiccated world it has become. And these results complement nicely those of Nasa's newer rover Curiosity, which has also identified clays at its landing site almost half-way around the planet's equator. The old robot made its find at a location called Cape York, which is sited on the rim of a 22km-wide crater known as Endurance. Mission managers have now commanded it to start moving along the ridge to a destination dubbed Solander Point.
There is an expectation that Opportunity will find a deeper stack of rocks at the new location to follow up the Esperance water story. "Maybe [we can] try to reconstruct the actual depositional environment of these materials and whether they were lacustrine - that is, formed by a lake - or fluvial (river) or an alluvial fan (network of streams), or whatever," said deputy principal investigator Ray Arvidson, of Washington University, St Louis.

'Daily gift'

Opportunity is now operating well beyond its expected lifetime. When it landed at Eagle Crater in January 2004, Nasa hoped to get at least 90 working Martian days (sols) from the machine. Remarkably, it continues to roll beyond 3,300 sols. It has an "arthritic" robotic arm, its solar panels are losing efficiency, and it drives backwards to save wear on its locomotion system. It is also now having to contend with glitchy flash memory. But the US space agency is determined to keep pushing the vehicle for as long as possible.
"Remember, the rover continues in a very hostile environment on Mars," said John Callas, Nasa's Opportunity project manager. "The rover could have a catastrophic failure at any moment. So, each day is a gift."