http://www.eurekalert.org/pub_releases/2011-08/esoc-hf082711.php

'Smelling' heart failure

Evaluation of an electronic nose

A German team has developed a completely new non-invasive method to identify heart failure. It consists of an "electronic nose" which could make the "smelling" of heart failure possible. The project was presented at the ESC Congress 2011 today. "The early detection of chronic heart failure (CHF) through periodical screening facilitates early treatment application" said investigator Vasileios Kechagias from the University Hospital Jena.

Heart failure is a common, costly, disabling and potentially deadly condition. In developed countries, around 2% of adults suffer from heart failure, but in those over the age of 65, this increases to 6%. Mostly due to costs of hospitalisation, it is associated with high health expenditure. Heart failure is associated with significantly reduced physical and mental health, resulting in a markedly decreased quality of life. Although some people survive many years, progressive disease is associated with an overall increased mortality and morbidity.

"We conducted a daily screening of patients with different degrees of heart failure. For the study, eligible patients were enrolled after informed consent, and the collected data was anonymous. Measurements were made in collaboration with the University of Applied Sciences, Jena. The participating physicians of the Department of Internal Medicine I, University Hospital of Jena, were responsible for patient recruitment and analysis of clinical data," explained Kechagias.

In particular, the relevant laboratory parameters for heart failure (BNP, minerals, creatinine, blood gas analysis) were collected and a clinical assessment of heart failure based on the available parameters (clinical history, laboratory, echocardiography, and exercise stress test) was performed. In 2010, we screened a total of 250 patients and included 126 in the clinical study. In the course of the study, testing was optimized through a standardized skin preparation. The assignment of patients to the different groups (no heart failure vs moderate heart failure vs. decompensated heart failure) was performed by physicians blinded for the measured values through the electronic nose.

Two groups were formed with CHF patients: one with decompensated (n=27) heart failure and one with compensated (n=25) heart failure. As clinical manifestation of the decompensated heart failure investigators evaluated the marked limitation of any activity where the patient is comfortable only at rest (Class III) or the state in which any physical activity brings on discomfort and symptoms occur at rest (Class IV). Furthermore they screened a control group of patients without heart failure symptoms (n=28). Then the measurement with the "electronic nose" randomly took place, from 10 cycles of 3 min. each and a subsequent offline-data-analysis.

The "electronic nose" system consists of an array of three thick-film metal oxide based gas sensors with heater elements. Each of the sensors has a slightly different sensitivity to various odorant molecular types. Interactions between molecules and the sensor are caused by reactions with oxygen on the heated sensor surface leading to a change of the free charge carrier concentrations and thus to a change in conductivity in the metal oxide layer. The odour components are divided by a statistical analysis into two principal components.

In all patients, data acquisition was possible. The patients with decompensated heart failure could be divided from compensated heart failure with 89% sensitivity and 88% specificity. Cardiovascular drug use was not different in these groups. On the other hand, patients without heart failure (control group) were different from the patients with heart failure in the principal-component analysis (89% sensitivity and 84% specificity).

Further work is in progress to identify the responsible components. Our primary objective is to create and establish a minimal invasive method, which will help to rapidly screen, diagnose, group and monitor the CHF.

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http://www.eurekalert.org/pub_releases/2011-08/esoc-io082811.php

It's official - chocolate linked to heart health

Chocolate consumption and cardiometabolic disorders: systematic review and meta-analysis

High levels of chocolate consumption might be associated with a one third reduction in the risk of developing heart disease, finds a study published on bmj.com today.

The findings confirm results of existing studies that generally agree on a potential beneficial link between chocolate consumption and heart health. However, the authors stress that further studies are now needed to test whether chocolate actually causes this reduction or if it can be explained by some other unmeasured (confounding) factor. The findings will be presented at the European Society of Cardiology Congress in Paris at 10:10 hrs (Paris time) / 09:10 hrs (UK time) Monday 29 August 2011.

The World Health Organisation predicts that by 2030, nearly 23.6 million people will die from heart disease. However, lifestyle and diet are key factors in preventing heart disease, says the paper.

A number of recent studies have shown that eating chocolate has a positive influence on human health due to its antioxidant and anti-inflammatory properties. This includes reducing blood pressure and improving insulin sensitivity (a stage in the development of diabetes).

However, the evidence about how eating chocolate affects your heart still remains unclear. So, Dr Oscar Franco and colleagues from the University of Cambridge carried out a large scale review of the existing evidence to evaluate the effects of eating chocolate on cardiovascular events like heart attack and stroke.

They analysed the results of seven studies, involving over 100,000 participants with and without existing heart disease. For each study, they compared the group with the highest chocolate consumption against the group with the lowest consumption. Differences in study design and quality were also taken into account to minimise bias.

Five studies reported a beneficial link between higher levels of chocolate consumption and the risk of cardiovascular events and they found that the "highest levels of chocolate consumption were associated with a 37% reduction in cardiovascular disease and a 29% reduction in stroke compared with lowest levels." No significant reduction was found in relation to heart failure. The studies did not differentiate between dark or milk chocolate and included consumption of chocolate bars, drinks, biscuits and desserts.

The authors say the findings need to be interpreted with caution, in particular because commercially available chocolate is very calorific (around 500 calories for every 100 grams) and eating too much of it could in itself lead to weight gain, risk of diabetes and heart disease. However, they conclude that, given the health benefits of eating chocolate, initiatives to reduce the current fat and sugar content in most chocolate products should be explored.

http://news.discovery.com/animals/animals-humans-brain-response-110829.html

Humans Hardwired to Tune Into Animals

The response likely evolved from when we had to run after - or from - animals for survival.

By Jennifer Viegas | Mon Aug 29, 2011 08:35 AM ET

Years of either running from or running after animals left its mark in the human brain - even just looking at a photo of an animal jolts our brains into action. No matter how high tech and urban we may become, animals continue to affect our brains like no other person, place or thing, shows new research in the latest issue of Nature Neuroscience.

Co-author Ralph Adolphs explained to Discovery News "that it is important for the brain to be able to rapidly detect animals. The reasons for this are probably several, but would likely include the need to avoid predators and catch prey." "These abilities are at once critically important to survival and yet very difficult to do," added Adolphs, a professor of psychology, neuroscience and biology at the California Institute of Technology. "Both predator and prey detection requires fast, real-time detection of shapes that are often camouflaged in a cluttered environment."

Adolphs, project leader Florian Mormann, and their colleagues recorded how the brains of 41 neurosurgical patients undergoing epilepsy monitoring responded to images of people, landmarks, animals, or objects. During 111 experimental sessions, the researchers monitored the subjects' brain activity as they sat in bed while viewing about 100 images per session. The monitoring was quite precise, showing how even individual neurons reacted.

The scientists found that neurons in the right amygdala responded preferentially to pictures of animals, whether they were of cute little critters or threatening big beasts. The amygdalae are two almond-shaped groups of neurons located deep within the brain.

Mormann told Discovery News that the right amygdala "has previously been implicated in the processing both of stimuli that are aversive and of stimuli that are rewarding. During our evolutionary past, animals could have represented either predator (aversive) or prey (rewarding). In either case, their behavioral relevance was pretty high."

Outside of an experimental setting, humans, of course, don't just see animals. We hear them and they affect our other senses too. Although the study just involved photographs, the researchers suspect the amygdala would have also been jolted into action by animal calls. Even though we may not feel particularly moved by animal images, the researchers say the resulting brain activity occurs at a conscious level. The researchers stop short of saying that animals inherently trigger our emotions, but it's possible that they do affect our fear and arousal responses in unique ways.

Prior studies have supported that early in vertebrate evolution, "the right brain hemisphere became specialized in dealing with unexpected and behaviorally relevant stimuli," Mormann said. This latest study strengthens that theory.

The level of specialization is intense, especially considering how the human brain springs into action after just seeing a photo of an animal. Animal images, Adolphs explained, "mobilize the brain's resources to process information about them. The amygdala helps us to detect that there is an animal out there, and we can then pay attention to it, encode it into memory, and mount a behavior response." For our early human ancestors, that response would likely have been to run for their lives, hide, admire, or go in for the dinner kill.

http://www.bbc.co.uk/news/world-asia-pacific-14709024

Bird flu fear as mutant strain hits China and Vietnam

Avian flu shows signs of a resurgence, while a mutant strain - able to sidestep vaccines - could be spreading in Asia, the United Nations has warned.

The variant appeared in Vietnam and China and its risk to humans cannot be predicted, veterinary officials said.

Virus circulation in Vietnam threatens Thailand, Malaysia and Cambodia, where eight people have died after becoming infected this year, they warned. The World Health Organization says bird flu has killed 331 people since 2003. It has also killed or provoked the culling of more than 400m domestic poultry worldwide and caused an estimated $20bn (£12.2bn) of economic damage.

Wild birds

The virus had been eliminated from most of the 63 countries infected at its 2006 peak, which saw 4,000 outbreaks across the globe, but remains endemic in Bangladesh, China, Egypt, India, Indonesia and Vietnam.

And the number of cases has been rising again since 2008, apparently because of migratory bird movements, said the UN's Food and Agriculture Organization (FAO) chief veterinary officer, Juan Lubroth.

"Wild birds may introduce the virus, but people's actions in poultry production and marketing spread it," he said.

Avian flu has in the past two years appeared in poultry or wild birds in countries that had been virus-free for several years: Israel and the Palestinian Territories, Bulgaria, Romania, Nepal and Mongolia are among those recently affected.

Mr Lubroth said the new strain had infected most parts of northern and central Vietnam and could also pose a risk to Japan and the Korean peninsula. South Korea began culling hundreds of thousands of chickens and ducks in December last year after confirming its first cases since 2008. The FAO is calling for countries to adopt "heightened readiness and surveillance" against a resurgence of the virus.

http://www.economist.com/node/21526321

How dead is dead?

Sometimes, those who have died seem more alive than those who have not

IN GENERAL, people are pretty good at differentiating between the quick and the dead. Modern medicine, however, has created a third option, the persistent vegetative state. People in such a state have serious brain damage as a result of an accident or stroke. This often means they have no hope of regaining consciousness. Yet because parts of their brains that run activities such as breathing are intact, their vital functions can be sustained indefinitely.

When, if ever, to withdraw medical support from such people, and thus let them die, is always a traumatic decision. It depends in part, though, on how the fully alive view the mental capacities of the vegetative - an area that has not been investigated much. To fill that gap Kurt Gray of the University of Maryland, and Annie Knickman and Dan Wegner of Harvard University, conducted an experiment designed to ascertain just how people perceive those in a persistent vegetative state. What they found astonished them.

They first asked 201 people stopped in public in New York and New England to answer questions after reading one of three short stories. In all three, a man called David was involved in a car accident and suffered serious injuries. In one, he recovered fully. In another, he died. In the third, his entire brain was destroyed except for one part that kept him breathing. Although he was technically alive, he would never again wake up.

After reading one of these stories, chosen at random, each participant was asked to rate David's mental capacities, including whether he could influence the outcome of events, know right from wrong, remember incidents from his life, be aware of his environment, possess a personality and have emotions. Participants used a seven-point scale to make these ratings, where 3 indicated that they strongly agreed that he could do such things, 0 indicated that they neither agreed nor disagreed, and -3 indicated that they strongly disagreed.

The results, reported in Cognition, were that the fully recovered David rated an average of 1.77 and the dead David -0.29. That score for the dead David was surprising enough, suggesting as it did a considerable amount of mental acuity in the dead. What was extraordinary, though, was the result for the vegetative David: -1.73. In

the view of the average New Yorker or New Englander, the vegetative David was more dead than the version who was dead.

The researchers' first hypothesis to explain this weird observation was that participants were seeing less mind in the vegetative than in the dead because they were focusing on the inert body of the individual hooked up to a life-support system. To investigate that, they ran a follow-up experiment which had two different descriptions of the dead David. One said he had simply passed away. The other directed the participant's attention to the corpse. It read, "After being embalmed at the morgue, he was buried in the local cemetery. David now lies in a coffin underground." No ambiguity there. In this follow-up study participants were also asked to rate how religious they were.

Once again, the vegetative David was seen to have less mind than the David who had "passed away". This was equally true, regardless of how religious a participant said he was. However, ratings of the dead David's mind in the story in which his corpse was embalmed and buried varied with the participant's religiosity.

Irreligious participants gave the buried corpse about the same mental ratings as the vegetative patient (-1.51 and -1.64 respectively). Religious participants, however, continued to ascribe less mind to the irretrievably unconscious David than they did to his buried corpse (-1.57 and 0.59).

That those who believe in an afterlife ascribe mental acuity to the dead is hardly surprising. That those who do not are inclined to do so unless heavily prompted not to is curious indeed.

http://medicalxpress.com/news/2011-08-virus-childhood-cancers.html

Virus attacks childhood cancers

Researchers from Yale University are looking to a virus from the same family as the rabies virus to fight a form of cancer primarily found in children and young adults.

Soft tissue sarcomas are cancers that develop in tissues which connect, support, or surround other structures and organs of the body. Muscles, tendons, fibrous tissues, fat, blood vessels, nerves, and synovial tissues are types of soft tissue. While relatively rare in adults, they represent approximately 15% of pediatric malignancies and result in death for approximately one-third of patients within 5 years of diagnosis.

Vesicular stomatitis virus (VSV) is a rhabdovirus, which is the same family of viruses as rabies, and causes a disease similar to foot and mouth disease in cattle. Recent research has discovered that this virus also is oncolytic, meaning it seeks out and destroys cancerous tumors. Previous studies have already shown VSV to be promising in treating brain tumors in mice. They report their findings in the September 2011 issue of the Journal of Virology.

In this study the researchers investigated the potential of VSV and an oncolytically enhanced version of the virus (VSV-rp30a) to effectively target and kill 13 different sarcomas. Both of the viruses efficiently infected and killed 12 of the sarcomas. The resistance of the one surviving sarcoma line was eventually overcome by pretreatment with compounds that antagonize interferon signaling.

Additionally they looked at the ability of VSV-rp30a to infect and arrest tumor growth in mice.

"A single intravenous injection of VSV-rp30a selectively infected all subcutaneous human sarcomas tested in mice and arrested the growth of tumors that otherwise grew 11-fold," say the researchers. "Overall, we find that the potential efficacy of VSV as an oncolytic agent extends to nonhematologic mesodermal tumors and that unusually strong resistance to VSV oncolysis can be overcome with interferon attenuators."

More information: *Paglino, J.C. and van den Pol, A.N. 2011. Vesicular stomatitis virus has extensive oncolytic activity against human sarcomas: Rare resistance is overcome by blocking interferon pathways. Journal of Virology. 85:9346-9358. Provided by American Society for Microbiology*

http://www.eurekalert.org/pub_releases/2011-08/nu-fmm082911.php

From mild-mannered to killer plague

Study explains plague's rapid evolution and sheds light on fighting deadly diseases

CHICAGO – In the evolutionary blink of an eye, a bacterium that causes mild stomach irritation evolved into a deadly assassin responsible for the most devastating pandemics in human history. How did the mild-mannered Yersinia pseudotuberculosis become Yersinia pestis, more commonly known as the Plague?

Now, scientists from Northwestern University Feinberg School of Medicine, with the use of new DNA sequencing techniques, offer long sought after evidence of how these two pathogens with virtually identical genetic matter could produce two such vastly different diseases. The Feinberg School team used the new DNA sequencing techniques to identify an unexpected source for these differences, which may help explain the Plague's rapid evolution. The findings, to be published Aug. 29 in the journal Proceedings of the National Academy of Sciences, offer a glimpse into how the new technology might aid in the development of therapeutics to fight deadly diseases, including the Plague.

"Most people think of the Plague as a historic disease, but it's still a public health issue today, both in the human population and in animals," said Wyndham Lathem, lead author of the study and assistant professor of microbiology-immunology at Northwestern's Feinberg School. "It's extremely dangerous and highly virulent. Without treatment, it can take as little as three to five days from infection to death."

Globally, the World Health Organization reports 1,000 to 3,000 cases of Plague every year, and Y. pestis exists on every continent except Antarctica. The United States Department of Homeland Security classifies Y. pestis as a Category A biological agent, a group that also includes anthrax, smallpox and Ebola. The Plague's ancestor, Y. pseudotuberculosis, still exists and infects humans, but it causes a mild gastrointestinal disease and most people don't show symptoms. Lathem and colleagues have discovered the differences in disease severity between these two subspecies may have arisen from changes in small, non-coding RNAs (sRNAs), complex molecules involved in controlling many cellular processes.

The Northwestern team is the first to show that sRNAs in Yersinia affect virulence, a finding that suggests the evolution of pathogens may also occur at the level of changes in RNA and in the way protein-coding genes are regulated. Lathem used advanced DNA sequencing technology - called high-throughput sequencing - to identify the complete set of sRNAs produced by Y. pseudotuberculosis. The technology enabled his team to study the diseases for the first time at a deeper genetic level.

"This technique enables us to really pick apart how pathogens evolve and how different species of bacteria are able to cause different types of disease," Lathem said. "It goes beyond looking at what proteins are produced by the bacteria. It's an additional layer of evolutionary analysis."

This detective work is important because if researchers can identify unique characteristics among deadly species such as Y. pestis, they may be able to generate new therapeutics or adapt current ones.
Unlike traditional "messenger" RNA, which is copied from DNA to create proteins and is well understood by scientists, these non-coding sRNA molecules are never translated into proteins. Hundreds of noncoding RNA molecules exist inside bacterial cells, but, until recently, scientists had not determined the function of many.

"Once we identified the complete set of sRNAs for Y. pseudotuberculosis, further analysis unlocked a number of surprising discoveries about their function," Lathem said.

Among these surprising discoveries, Lathem's team identified 150 sRNAs, a majority of which are specific to the Yersinia species, and six sRNAs unique to Y. pseudotuberculosis. Those six sRNAs are missing in Y. pestis, likely lost during its rapid evolution (somewhere between 1,500 and 20,000 years ago), and thereby potentially responsible for the Plague's virulence. Lathem's team developed this explanation because they could specify exactly which genes the sRNAs control.

First author Jovanka Koo, a postdoctoral fellow in Lathem's lab at Feinberg, noted, "An important lesson is that small changes can have big effects on sRNA functions. They can affect when an RNA is expressed or produced, the way that RNA folds, and the ability of that RNA to affect the regulated protein coding RNA." Over time, those small changes can become the difference between mild and deadly diseases.

http://www.eurekalert.org/pub_releases/2011-08/esoc-wdp082911.php

What do patients receiving optimal medical therapy after a heart attack die from?

Because of improved management at the acute stage, the risk of dying in hospital after a heart attack has decreased by about 50% in the past 10 years.

Likewise, the prescription of recommended medications when patients leave hospital, has resulted in improved survival and fewer recurrent heart attacks. One of the challenges is now to try and further decrease long-term mortality in patients who leave the hospital on "optimal" medical therapy (i.e. who are prescribed all the recommended medications).

The French registry of Acute ST-elevation and non-ST-elevation Myocardial Infarction (FAST-MI) is a nationwide survey of patients hospitalised for acute myocardial infarction in France at the end of 2005, during a one-month period. Patients included will be followed for a period of 10 years after the initial heart attack. At three years, fewer than 5% of the patients have been lost to follow-up.

Of a population of 3,670 patients included in the registry, 3,262 survived the initial hospitalization and had a complete prescription at discharge available. Among them, 1586 (49%) received optimal treatment (OMT). Three-year survival was 88% in optimally treated patients, compared with 77.5% in those who did not receive all recommended medications. After taking into account the initial profile of the patients and the severity of the heart attack, there was an 18% reduction in the risk of dying in patients receiving optimal medical therapy.

Analysis of the factors related with 3-year mortality in patients who received optimal treatment showed that the risk of death was related to older age (> 75 years), severity of the cardiac disease (larger infarction, more extensive disease of the coronary artery), associated conditions, such as diabetes mellitus, stroke, cancer or

persistent smoking; in contrast, patients who had had a coronary angiogram during the initial hospitalization had a markedly reduced risk of dying.

These findings suggest that there is still room for improvement in patients who receive the best possible medical treatment; of these patients, 12% still die during the 3 years that follow the initial heart attack.

A broader use of coronary angiography and myocardial revascularization during the initial hospitalisation is likely to have a favorable influence on long-term outcomes. In addition, additional efforts are needed and should concentrate on better management of larger infarctions to prevent and treat heart failure, and on associated conditions such as diabetes. Persistent smoking should also be fought relentlessly.

Contributors: *The FAST-MI registry is a registry of the French society of Cardiology supported by unrestricted grants from Pfizer and Servier, and an additional grant from the Caisse Nationale d'Assurance Maladie.*

http://www.bbc.co.uk/news/science-environment-14716106

Bed bugs protect their sperm from bacteria

By Jennifer Carpenter Science reporter, BBC News, Tuebingen, Germany

Bed bugs protect their sperm against sexually transmitted infections by producing germ-busting ejaculates, scientists have found.

Bacteria covering bed bugs' bodies are transmitted to the female, along with the sperm, during mating. The new work shows that without the protection of antibacterial agents in the bug's ejaculate, 40% of sperm die. The results were presented at the 13th Congress of the European Society for Evolutionary Biology. Bed bugs, and the related bat bugs that live in African caves, are renowned for their bizarre sex lives.

'Traumatic insemination'

Males, instead of penetrating the female's vagina, pierce her underside and deposit sperm inside the female, where it swims through the insect's blood system to the ovaries to fertilise the eggs. Female bed bugs protect themselves against the diseases that males transmit with a structure on their bellies that guides the penis into a mass of germ-fighting cells.

Males, it seems, have also evolved a way to fend off the effects of sexually transmitted infections, evolutionary biologist Oliver Otti from the University of Sheffield, UK, told conference attendees in Germany.

Suspecting that males load their ejaculates with proteins that protect sperm, Dr Otti carefully extracted sperm from a number of male bed bugs, being sure not to mix it with the seminal fluid that usually makes up the rest of the ejaculate. He then mixed the sperm with a "soup" of micro-organisms that he had collected from the outer skin of the bed bugs. To half of these samples he added lysozyme, a bacteria-killing enzyme known to be active in bed bugs, and saw that 40% more sperm survived in its presence. Females didn't gain any protection from these introduced bacteria-busting enzymes, he explained; the presence of lysozyme in the ejaculate seemed to be purely to protect sperm.

But other work by Dr Otti's colleague Michael Siva-Jothy, who is also based at the University of Sheffield, shows that females protect themselves from the infections introduced during sex with their own lysozymes.

In fact, females ramp up their lysozyme activity just before they are about to feed. Dr Siva-Jothy explained that this is probably because in the bed bug world, feeding is generally always followed by mating.

"Wounding is a very frequent event during and after copulation, and generally genitals are not that clean, " Dr Otti told BBC News. He explained that the research that has focused on human sexual transmitted diseases has tended to ignore the microbes that coexist with us on our skin; these microbes are likely also transferred during sex. "It is not clear what the cost of having them around is," Dr Otti added.

The advantage of studying bed bugs, he said, is that we share many components of our immune system. As a result, scientists can learn much from manipulating the bugs' sex lives to study the consequences on lifespan and offspring production - some of these trade-offs could be relevant to humans.

http://medicalxpress.com/news/2011-08-patient-lifesaving-donor-heart-experimental.html

Patient's lifesaving donor heart arrives 'warm and beating' inside experimental device

Medical Xpress - ***When Rob Evans' new donor heart arrived at Ronald Reagan UCLA Medical Center, the organ wasn't frozen on ice inside a cooler, as is typical.***

Instead, it was delivered in an experimental device that kept it warm and beating with oxygen and nutrient-rich blood during its journey from Northern California.

The special delivery was part of an ongoing national, multi-center phase 2 clinical study of an experimental organ-preservation system that allows donor hearts to continue functioning in a near-physiologic state outside the body during transport. The trial is being led by principal investigator Dr. Abbas Ardehali, surgical director of the heart and lung transplantation program at UCLA.

Evans, 61, the CEO of a nonprofit in Arizona, had been waiting nearly four years for a new heart. When asked if he was interested in enrolling in the research study, he said he thought the concept of a "warm, beating heart" sounded like common sense. His transplant surgery took place in June.

The Organ Care System (OCS), developed by a medical device company called TransMedics, works this way: After a heart is removed from a donor's body, it is placed in a high-tech OCS device and is immediately revived to a beating state, perfused with oxygen and nutrient-rich blood, and maintained at an appropriate temperature. The device also features monitors that display how the heart is functioning during transport.

According to Ardehali, the technology could also improve donor-heart function and could potentially help transplant teams better assess donor hearts - including identifying possible rejection factors that could complicate tissue-matching - since the organs can be tested in the device, over a longer period of time.

In addition, it could help expand the donor pool by allowing donor hearts to be safely transported across longer distances, he said.

UCLA's Heart Transplant Program is leading the nationwide study, which started in 2009. The randomized trial will enroll a total of 128 patients - half whose donor hearts will be transported the traditional way, and half who will receive hearts in the device. To date, UCLA has enrolled nine patients in the phase 2 trial. Columbia University and the Cleveland Clinic are also enrolling patients, and more centers are being added.

"There are not enough donor hearts to help all the patients who are waiting," Ardehali said. "If we can find ways to improve upon our limited supply of hearts, then more lives will be saved."

With his new, strong heart beating inside his chest, Evans says he is thankful to the donor family for his gift of life and that he is ready to get back to the things he loves, including riding horses, playing with his grandson, and his work. But first, he jokes, he plans on tackling his wife's "to do" list of chores.

The OCS clinical trial, called the "Prospective, Randomized, Multicenter Safety and Effectiveness Evaluation of the Organ Care System Device for Cardiac Use" (PROCEED II), is fully designed and sponsored by TransMedics. Ardehali has no financial ties to disclose. Provided by University of California Los Angeles

http://www.eurekalert.org/pub_releases/2011-08/uosc-bih083011.php

Breakthrough in hydrogen fuel cells

USC chemists develop way to safely store, extract hydrogen

A team of USC scientists has developed a robust, efficient method of using hydrogen as a fuel source.

Hydrogen makes a great fuel because of it can easily be converted to electricity in a fuel cell and because it is carbon free. The downside of hydrogen is that, because it is a gas, it can only be stored in high pressure or cryogenic tanks. In a vehicle with a tank full of hydrogen, "if you got into a wreck, you'd have a problem," said Travis Williams, assistant professor of chemistry at the USC Dornsife College.

A possible solution is to store hydrogen in a safe chemical form. Earlier this year, Williams and his team figured out a way to release hydrogen from an innocuous chemical material - a nitrogen-boron complex, ammonia borane - that can be stored as a stable solid.

Now the team has developed a catalyst system that releases enough hydrogen from its storage in ammonia borane to make it usable as a fuel source. Moreover, the system is air-stable and re-usable, unlike other systems for hydrogen storage on boron and metal hydrides. The research was published this month in the Journal of the American Chemical Society. "Ours is the first game in town for reusable, air stabile ammonia borane dehydrogenation," Williams said, adding that the USC Stevens Institute is in the process of patenting the system.

The system is sufficiently lightweight and efficient to have potential fuel applications ranging from motor-driven cycles to small aircraft, he said.

The research was funded by the Hydrocarbon Research Foundation and the National Science Foundation.

http://www.eurekalert.org/pub_releases/2011-08/uosc-nad083011.php

Natural anti-oxidant deserts aging body

Cell's reserve fighting force shrinks with age, new study finds.

When the body fights oxidative damage, it calls up a reservist enzyme that protects cells – but only if those cells are relatively young, a study has found. Biologists at USC discovered major declines in the availability of an enzyme, known as the Lon protease, as human cells grow older. The finding may help explain why humans lose energy with age and could point medicine toward new diets or pharmaceuticals to slow the aging process.

The researchers showed that when oxidative agents attack the power centers of young cells, the cells respond by calling up reinforcements of the enzyme, which breaks up and removes damaged proteins. As the cells age, they lose the ability to mobilize large numbers of Lon, the researchers reported in The Journals of Gerontology.

Senior author Kelvin J. A. Davies, a professor at the USC Leonard Davis School of Gerontology, used a war analogy to explain that no "standing army" of Lon protease can endure an attack by invading oxidants without

calling up reserves. "Once the war has started, what's your capacity to keep producing … to protect your vital resources and keep the fight going?" he asked. Since aging is the longest war, the USC study suggests a more important role for the reservist enzyme than previously known.

Lon protects the mitochondria – tiny organisms in the cell that convert oxygen into energy. The conversion is never perfect: Some oxygen leaks and combines with other elements to create damaging oxidants.

Oxidation is the process behind rust and food spoilage. In the body, oxidation can damage or destroy almost any tissue. Lon removes oxidized proteins from the mitochondria and also plays a vital role in helping to make new mitochondria. "We know that mitochondrial function declines with age, which is a major limitation to cells. One of the components of that decline is the loss of Lon. The ability of Lon to be induced by [oxidative] stress is a very important component of overall stress resistance," Davies said.

Davies and his team worked with a line of human lung cells. They exposed the cells to hydrogen peroxide, a powerful oxidant that is a byproduct of energy production and that also can result from metabolism of some drugs, toxins, pesticides and herbicides.

To fight the oxidant, young cells doubled the size of their Lon army within five hours and maintained it for a day. In some experiments, young cells increased their Lon army as much as seven-fold. Middle-aged cells took a full day to double their Lon army, during which time the cells were exposed to harmful levels of oxidized proteins. Older cells started with a standing Lon army only half as large and showed no statistically significant increase in Lon levels over 24 hours.

The Davies group, which discovered Lon in 2002, previously had shown that Lon's standing army gets smaller with age and that the anti-oxidant power of Lon depends more on its reserves than on enzymes present when stress first hits the body.

The latest study completes the picture of Lon's sluggish response as senescent cells – a technical term for cells that mimic several key features of the aging process – try to cope with stress. "In the senescent cells, the Lon levels are drastically low to begin with, and they don't increase" in response to stress, Davies said.

Scientists have known for decades that mitochondria become less efficient with age, contributing to the body's loss of energy. "It may well be that our ability to induce Lon synthesis and our loss of adaptability to stress may be an even more significant factor in the aging process," Davies said.

Davies and others are investigating potential treatments to boost the function of Lon. Costly enzyme supplements are useless, Davies noted, since the digestive system breaks down the enzyme to amino acids before it can reach its target. "It's a lot cheaper to buy a piece of meat and get the same amino acids," he said.

Davies holds the James E. Birren Chair in Gerontology, with a joint appointment in molecular biology at the USC Dornsife College of Letters, Arts and Sciences. His co-authors were USC postdoctoral fellow Jenny Ngo, undergraduate students Laura Pomatto and Alison Koop, and former graduate student Daniela Bota, now an assistant professor at the University of California, Irvine Medical Center.

Funding for the research came from the National Institute of Environmental Health Sciences, part of the National Institutes of Health.

http://www.eurekalert.org/pub_releases/2011-08/uok-nac083011.php

Novel alloy could produce hydrogen fuel from sunlight

Using advanced theoretical computations, a team of Kentucky scientists has derived a means to "tweak" an inexpensive semiconductor to function as photoelectrochemical catalyst.

Scientists from the University of Kentucky and the University of Louisville have determined that an inexpensive semiconductor material can be "tweaked" to generate hydrogen from water using sunlight.

The research, funded by the U.S. Department of Energy, was led by Professors Madhu Menon and R. Michael Sheetz at the UK Center for Computational Sciences, and Professor Mahendra Sunkara and graduate student Chandrashekhar Pendyala at the UofL Conn Center for Renewable Energy Research. Their findings were published Aug. 1 in the Physical Review Journal (Phys Rev B 84, 075304).

The researchers say their findings are a triumph for computational sciences, one that could potentially have profound implications for the future of solar energy.

Using state-of-the-art theoretical computations, the UK-UofL team demonstrated that an alloy formed by a 2 percent substitution of antimony (Sb) in gallium nitride (GaN) has the right electrical properties to enable solar light energy to split water molecules into hydrogen and oxygen, a process known as photoelectrochemical (PEC) water splitting. When the alloy is immersed in water and exposed to sunlight, the chemical bond between the hydrogen and oxygen molecules in water is broken. The hydrogen can then be collected.

"Previous research on PEC has focused on complex materials," Menon said. "We decided to go against the conventional wisdom and start with some easy-to-produce materials, even if they lacked the right arrangement

of electrons to meet PEC criteria. Our goal was to see if a minimal 'tweaking' of the electronic arrangement in these materials would accomplish the desired results."

Gallium nitride is a semiconductor that has been in widespread use to make bright-light LEDs since the 1990s. Antimony is a metalloid element that has been in increased demand in recent years for applications in microelectronics. The GaN-Sb alloy is the first simple, easy-to-produce material to be considered a candidate for PEC water splitting. The alloy functions as a catalyst in the PEC reaction, meaning that it is not consumed and may be reused indefinitely. UofL and UK researchers are currently working toward producing the alloy and testing its ability to convert solar energy to hydrogen.

Hydrogen has long been touted as a likely key component in the transition to cleaner energy sources. It can be used in fuel cells to generate electricity, burned to produce heat, and utilized in internal-combustion engines to power vehicles. When combusted, hydrogen combines with oxygen to form water vapor as its only waste product. Hydrogen also has wide-ranging applications in science and industry.

Because pure hydrogen gas is not found in free abundance on Earth, it must be manufactured by unlocking it from other compounds. Thus, hydrogen is not considered an energy source, but rather an "energy carrier." Currently, it takes a large amount of electricity to generate hydrogen by water splitting. As a consequence, most of the hydrogen manufactured today is derived from non-renewable sources such as coal and natural gas.

Sunkara says the GaN-Sb alloy has the potential to convert solar energy into an economical, carbon-free source for hydrogen. "Hydrogen production now involves a large amount of CO2 emissions," Sunkara said. "Once this alloy material is widely available, it could conceivably be used to make zero-emissions fuel for powering homes and cars and to heat homes."

Menon says the research should attract the interest of other scientists across a variety of disciplines.

"Photocatalysis is currently one of the hottest topics in science," Menon said. "We expect the present work to have a wide appeal in the community spanning chemistry, physics and engineering."

http://www.newscientist.com/article/dn20843-fukushima-media-coverage-may-be-harmful.html

Fukushima media coverage 'may be harmful'

17:12 30 August 2011 by Andy Coghlan

Alarmist predictions that the long-term health effects of the Fukushima nuclear accident in Japan will be worse than those following Chernobyl in 1986 are likely to aggravate harmful psychological effects of the incident.

That was the warning heard at an international conference on radiation research in Warsaw, Poland, this week.

One report, in UK newspaper The Independent, quoted a scientist who predicted more than a million would die, and that the prolonged release of radioactivity from Fukushima would make health effects worse than those from the sudden release experienced at the Chernobyl nuclear reactor in Ukraine.

"We've got to stop these sorts of reports coming out, because they are really upsetting the Japanese population," says Gerry Thomas at Imperial College London, who is attending the meeting. "The media has a hell of a lot of responsibility here, because the worst post-Chernobyl effects were the psychological consequences and this shouldn't happen again."

Japan's Nuclear and Industrial Safety Agency report that the release of radioactivity from Fukushima is about 10 per cent that of Chernobyl. "There's very little leakage now," says Thomas. "The Japanese did the right thing at the right time, providing stable iodine to ensure that doses of radioactive iodine to the thyroids of children were minimal," she says. Thomas said that Japanese researchers attending the meeting are upset too. "They're saying: 'Please tell the truth, because no one believes us'."

http://www.eurekalert.org/pub_releases/2011-08/nios-ia083111.php

Iron 'Veins' Are Secret of Promising New Hydrogen Storage Material

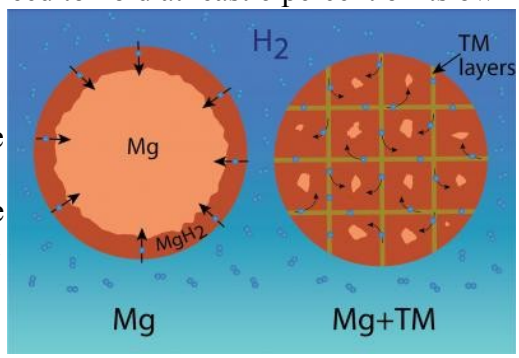
With a nod to biology, scientists at the National Institute of Standards and Technology (NIST) have a new approach to the problem of safely storing hydrogen in future fuel-cell-powered cars.

Their idea: molecular scale "veins" of iron permeating grains of magnesium like a network of capillaries. The iron veins may transform magnesium from a promising candidate for hydrogen storage into a real-world winner.

Hydrogen has been touted as a clean and efficient alternative to gasoline, but it has one big drawback: the lack of a safe, fast way to store it onboard a vehicle. According to NIST materials scientist Leo Bendersky, iron-veined magnesium could overcome this hurdle. The combination of lightweight magnesium laced with iron could rapidly absorb - and just as importantly, rapidly release - sufficient quantities of hydrogen so that grains made from the two metals could form the fuel tank for hydrogen-powered vehicles.

"Powder grains made of iron-doped magnesium can get saturated with hydrogen within 60 seconds," says Bendersky, "and they can do so at only 150 degrees Celsius and fairly low pressure, which are key factors for safety in commercial vehicles."

Grains of pure magnesium are reasonably effective at absorbing hydrogen gas, but only at unacceptably high temperatures and pressures can they store enough hydrogen to power a car for a few hundred kilometers - the minimum distance needed between fill-ups. A practical material would need to hold at least 6 percent of its own weight in hydrogen gas and be able to be charged safely with hydrogen in the same amount of time as required to fill a car with gasoline today.



The NIST team used a new measurement technique they devised that uses infrared light to explore what would happen if the magnesium were evaporated and mixed together with small quantities of other metals to form fine-scale mixtures. The team found that iron formed capillary-like channels within the grains, creating passageways for hydrogen transport within the metal grains that allow hydrogen to be drawn inside extremely fast. According to Bendersky, the magnesium-iron grains could hold up to 7 percent hydrogen by weight.

Particles of pure magnesium (left) can only collect a limited amount of hydrogen on their outer surfaces, and the process is slow. But when the magnesium is doped with iron (right), far more hydrogen is delivered through the iron layers, which also results in much faster charging. **Credit: NIST**

Bendersky adds that the measurement technique could be valuable more generally, as it can reveal details of how a material absorbs hydrogen more effectively than the more commonly employed technique of X-ray diffraction—a method that is limited to analyzing a material's averaged properties.

** Z. Tan, C. Chiu, E.J. Heilweil and L.A. Bendersky. Thermodynamics, kinetics and microstructural evolution during hydrogenation of iron-doped magnesium this films. International Journal of Hydrogen Energy, 36 (2011), pp. 9702-9713, DOI: 10.1016/j.ijhydene.2011.04.196*

http://www.eurekalert.org/pub_releases/2011-08/mu-rta082511.php

Resistance to antibiotics is ancient, McMaster study finds

Hamilton, ON – ***Scientists were surprised at how fast bacteria developed resistance to the miracle antibiotic drugs when they were developed less than a century ago.***

Now scientists at McMaster University have found that resistance has been around for at least 30,000 years.

Research findings published today in the science journal Nature show antibiotic resistance is a natural phenomenon that predates the modern clinical antibiotic use. Principal investigators for the study are Gerry Wright, scientific director of the Michael G. DeGroote Institute for Infectious Disease Research and Hendrik Poinar, McMaster evolutionary geneticist. "Antibiotic resistance is seen as a current problem and the fact that antibiotics are becoming less effective because of resistance spreading in hospitals is a known fact," said Wright. "The big question is where does all of this resistance come from?"

After years of studying bacterial DNA extracted from soil frozen in 30,000-year-old permafrost from the Yukon Territories, the researchers were able to develop methods to isolate DNA within McMaster's Ancient DNA Centre. Using state-of-the-art molecular biological techniques, methods were developed to tease out small stretches of ancient DNA.

Researchers discovered antibiotic resistant genes existed beside genes that encoded DNA for ancient life, such as mammoths, horse and bison as well as plants only found in that locality during the last interglacial period in the Pleistocene era, at least 30,000 years ago. They focused on a specific area of antibiotic resistance to the drug vancomycin, a significant clinical problem that emerged in 1980s and continues to be associated with outbreaks of hospital-acquired infections worldwide.

"We identified that these genes were present in the permafrost at depths consistent with the age of the other DNAs, such as the mammoth. Brian Golding of McMaster's Department of Biology showed that these were not contemporary, but formed part of the same family tree. We then recreated the gene product in the lab, purified its protein and showed that it had the same activity and structure then as it does now."

This is only the second time an ancient protein has been 'revived' in a laboratory setting.

Wright said the breakthrough will have important impact on the understanding of antibiotic resistance: "Antibiotics are part of the natural ecology of the planet so when we think that we have developed some drug that won't be susceptible to resistance or some new thing to use in medicine, we are completely kidding ourselves. These things are part of our natural world and therefore we need to be incredibly careful in how we use them. Microorganisms have figured out a way of how to get around them well before we even figured out how to use them."

Poinar says this discovery has opened doors for ancient antibiotic resistance research. "We can go back a million years in the permafrost, which is our next goal."

Funding for this project came from the Canada Research Chairs program, the Canadian Institutes of Health Research and the Natural Sciences and Engineering Research Council.

http://www.eurekalert.org/pub_releases/2011-08/ohri-wlc082611.php

World's largest cardiac arrest trial shows longer initial paramedic CPR provides no benefit

Study led by Ottawa Hospital researcher published in the New England Journal of Medicine

A study involving nearly 10,000 cardiac arrest patients from 10 North American regions has shown that extending the period of initial cardiopulmonary resuscitation (CPR) by paramedics and firefighters from one to three minutes provides no benefit. The study, led by Dr. Ian Stiell of the Ottawa Hospital Research Institute (OHRI), the University of Ottawa (uOttawa) and the Resuscitation Outcomes Consortium (ROC), resolves a worldwide controversy about cardiac arrest care. It is the largest randomized cardiac arrest trial in the world, published in the New England Journal of Medicine.

Every year, more than 350,000 people in Canada and the U.S. suffer a sudden cardiac arrest, and less than 10 per cent survive. Prompt CPR can increase blood flow to the brain and keep the body alive for a short time, but for patients with certain heart rhythms, the heart can only be restarted by providing electrical shocks with a defibrillator. Traditionally, paramedics and firefighters have analyzed heart rhythm as soon as possible, and provided only brief CPR while preparing a defibrillator. However, several recent studies have suggested it may be better to provide a longer period of initial CPR (up to three minutes) before analyzing heart rhythm. Clinical guidelines have not been able to provide clear guidance on which approach is better, and standard practice has varied around the world.

In the current study, paramedics and firefighters across Canada and the U.S. were randomly divided into groups (called clusters) and instructed to provide 30 to 60 seconds of initial CPR or three minutes of initial CPR. Part way through the study, the groups were switched. The primary analysis of data from 9,933 patients showed no difference between the groups, with 5.9 per cent of patients in both groups surviving to hospital discharge with satisfactory health. However, when the actual length of CPR was analyzed more closely, it was found that survival tended to decrease as the length of initial paramedic CPR increased in patients who also received bystander CPR and had a heart rhythm amenable to defibrillation. This subgroup represents approximately 10 per cent of all patients in the study. There were no differences in other subgroups analyzed.

"Our study definitively shows that there is no advantage to a longer period of initial CPR," said Dr. Ian Stiell, a Senior Scientist at OHRI, Chair of Emergency Medicine at uOttawa and Physician in The Ottawa Hospital Emergency Department. "The data also suggest that patients who received bystander CPR may fare better with the shorter period of paramedic CPR. While there is some debate about the significance of this result, I think it is better to be on the safe side and stick with the traditional shorter initial CPR approach."

This study was conducted through ROC, a large Canada-U.S. research collaboration aimed at improving survival for patients who suffer cardiac arrest and severe trauma in the community. ROC is funded by the Canadian Institutes of Health Research, Defence Research and Development Canada, the Heart and Stroke Foundation of Canada, the U.S. National Heart, Lung, and Blood Institute, the U.S. National Institute of Neurological Disorders and Stroke, the U.S. Department of Defense and the American Heart Association.

"The Canadian Institutes of Health Research are pleased to support this collaborative effort between Canada and the United States," said Dr. Jean Rouleau, Scientific Director of the Institute of Circulatory and Respiratory Health. "By clarifying the procedures which paramedics and firefighters should follow in cases of cardiac arrest, this study is a great example of putting health research directly into practice."

"The Resuscitation Outcomes Consortium studies are essential to refining the science of resuscitation and will help save more lives," said Manuel Arango, Director of Health Policy for the Heart and Stroke Foundation of Canada. "This knowledge furthers our understanding of optimal resuscitation techniques and will help inform the next Heart and Stroke Foundation Emergency Cardiac Care guidelines."

More than 60 per cent of patients in this study came from Canadian ROC sites, which include OHRI / uOttawa, the University of British Columbia and St. Michael's Hospital / University of Toronto. The OHRI / uOttawa site was a particularly large contributor, with seven emergency medical services and 13 fire departments in 13 Ontario cities participating.

"I would like to thank the thousands of paramedics and firefighters who made this study such a success." said Dr. Stiell. "The Ottawa Paramedic Service is proud to participate in important research," said Chief Anthony Di Monte, Ottawa Paramedic Service. "This allows us to add to the body of knowledge in paramedicine and continually maintain the best care for the patients and community we serve."

"Ottawa's paramedics have played a huge role in this research, again guiding the rest of the world in how to provide the best out of hospital care," said Dr. Justin Maloney, Medical Director of the Regional Paramedic Program For Eastern Ontario and Emergency Physician at The Ottawa Hospital. "They have earned a wonderful international reputation."

Another ROC study on an investigational device to improve blood flow during CPR is also published in the September 1, 2011 issue of the New England Journal of Medicine.

http://www.eurekalert.org/pub_releases/2011-08/uobc-urf082911.php

UBC researchers find a new culprit in Alzheimer's disease: Too many blood vessels

Discovery could highlight a new avenue for drug development to combat neurodegenerative disorder

University of British Columbia scientists may have uncovered a new explanation for how Alzheimer's disease destroys the brain – a profusion of blood vessels.

While the death of cells, whether they are in the walls of blood vessels or in brain tissue, has been a major focus of Alzheimer's disease research, a team led by Wilfred Jefferies, a professor in UBC's Michael Smith Laboratories, has shown that the neurodegenerative disease might in fact be caused by the propagation of cells in blood vessel walls.

Examining brain tissue from mouse models of Alzheimer's disease, Jefferies' team found nearly double the density of capillaries compared to normal mice. They also found a similarly higher density of capillaries in brain samples of people who had died of the disease, compared to samples from people who didn't have it.

Jefferies, in an article published online today by PLoS One, theorizes that the profusion of blood vessels is stimulated by amyloid beta, a protein fragment that has become a hallmark of Alzheimer's disease. The blood vessel growth, or "neo-angiogenesis," leads to a breakdown of the blood-brain barrier – the tightly interlocked network of cells that allows oxygen-carrying blood to reach brain tissue while blocking harmful substances, such as viruses.

"When the blood vessels grow, the cells of the vessel walls propagate by dividing," Jefferies says. "In the process of splitting into two new cells, they become temporarily rounded in shape, and that undermines the integrity of the blood-brain barrier, potentially allowing harmful elements from outside the brain to seep in."

The deterioration of the barrier might in turn allow the depositing of amyloid beta, which accumulates around neurons and eventually kills them.

Previous research had touched on the "leakiness" of the barrier, but it was assumed that it was caused by the death of blood vessels – not their growth.

Jefferies also sees an intriguing parallel with the "wet" form of age-related macular degeneration, in which blood vessels grow behind the retina and then leak blood and fluid, leading to hemorrhaging, swelling, and formation of scar tissue.

"Given the new link between both conditions, the next logical step in the treatment of Alzheimer's disease would be to look for treatments that specifically target blood vessel growth," says Jefferies, who holds appointments in the departments of microbiology and immunology, medical genetics and zoology, and is also a member of the Biomedical Research Centre and the Brain Research Centre.

Jefferies collaborated with Dara Dickstein, a professor in the department of neuroscience at the Mount Sinai School of Medicine, New York. The team at UBC included graduate student Kaan Biron and technician Rayshad Gopaul.

The research was supported by grants from the Canadian Stroke Network and the Canadian Institutes of Health Research.

http://www.eurekalert.org/pub_releases/2011-08/teia-hss082911.php

Humans shaped stone axes 1.8 million years ago, study says

Evidence pushes advanced tool-making methods back in time

A new study suggests that Homo erectus, a precursor to modern humans, was using advanced toolmaking methods in East Africa 1.8 million years ago, at least 300,000 years earlier than previously thought. The study, published this week in Nature, raises new questions about where these tall and slender early humans originated and how they developed sophisticated tool-making technology.

Homo erectus appeared about 2 million years ago, and ranged across Asia and Africa before hitting a possible evolutionary dead-end, about 70,000 years ago. Some researchers think Homo erectus evolved in East Africa, where many of the oldest fossils have been found, but the discovery in the 1990s of equally old Homo erectus fossils in the country of Georgia has led others to suggest an Asian origin. The study in Nature does not resolve the debate but adds new complexity. At 1.8 million years ago, Homo erectus in Dmanisi, Georgia was still using simple chopping tools while in West Turkana, Kenya, according to the study, the population had developed hand axes, picks and other innovative tools that anthropologists call "Acheulian."

"The Acheulian tools represent a great technological leap," said study co-author Dennis Kent, a geologist with joint appointments at Rutgers University and Columbia University's Lamont-Doherty Earth Observatory. "Why didn't Homo erectus take these tools with them to Asia?"

In the summer of 2007, a team of French and American researchers traveled to Kenya's Lake Turkana in Africa's Great Rift Valley, where earth's plates are tearing apart and some of the earliest humans first appear. Anthropologist Richard Leakey's famous find--Turkana Boy, a Homo erectus teenager who lived about 1.5 million years ago—was excavated on Lake Turkana's western shore and is still the most complete early human skeleton found so far.

Six miles from Turkana Boy, the researchers headed for Kokiselei, an archeological site where both Acheulian and simpler "Oldowan" tools had been found earlier. Their goal: to establish the age of the tools by dating the surrounding sediments. Past flooding in the area had left behind layers of silt and clay that hardened into mudstone, preserving the direction of Earth's magnetic field at the time in the stone's magnetite grains. The researchers chiseled away chunks of the mudstone at Kokiselei to later analyze the periodic polarity reversals and come up with ages. At Lamont-Doherty's Paleomagnetics Lab, they compared the magnetic intervals with other stratigraphic records to date the archeological site to 1.76 million years.

Early humans were using stone hand axes as far back as 1.8 million years ago. **Credit: Pierre-Jean Texier, National Center of Scientific Research, France**

"We suspected that Kokiselei was a rather old site, but I was taken aback when I realized that the geological data indicated it was the oldest Acheulian site in the world," said the study's lead author, Christopher Lepre, a geologist who also has joint appointments at Rutgers and Lamont-Doherty. The oldest Acheulian tools previously identified appear in Konso, Ethiopia, about 1.4 million years ago, and India, between 1.5 million and 1 million years ago.

The Acheulian tools at Kokiselei were found just above a sediment layer associated with a polarity interval called the "Olduvai Subchron." It is named after Tanzania's Olduvai Gorge, where pioneering work in the 1930s by Leakey's parents, Louis and Mary, uncovered a goldmine of early human fossils. In a study in Earth and Planetary Science Letters last year, Lepre and Kent found that a well-preserved Homo erectus skull found on east side of Lake Turkana, at Koobi Fora Ridge, also sat above the Olduvai Subchron interval, making the skull and Acheulian tools in West Turkana about the same age.

Anthropologists have yet to find an Acheulian hand axe gripped in a Homo erectus fist but most credit Homo erectus with developing the technology. Acheulian tools were larger and heavier than the pebble-choppers used previously and also had chiseled edges that would have helped Homo erectus butcher elephants and other scavenged game left behind by larger predators or even have allowed the early humans to hunt such prey themselves. "You could whack away at a joint and dislodge the shoulder from the arm, leg or hip," said Eric Delson, a paleoanthropologist at CUNY's Lehman College who was not involved in the study. "The tools allowed you to cut open and dismember an animal to eat it."

The skill involved in manufacturing such a tool suggests that Homo erectus was dexterous and able to think ahead. At Kokiselei, the presence of both tool-making methods—Oldowan and Acheulian-- could mean that Homo erectus and its more primitive cousin Homo habilis lived at the same time, with Homo erectus carrying the Acheulian technology to the Mediterranean region about a million years ago, the study authors hypothesize. Delson wonders if Homo erectus may have migrated to Dmanisi, Georgia, but "lost" the Acheulian technology on the way.

The East African landscape that Homo erectus walked from about 2 million to 1.5 million years ago was becoming progressively drier, with savanna grasslands spreading in response to changes in the monsoon rains. "We need to understand also the ancient environment because this gives us an insight into how processes of evolution work—how shifts in early human biology and behavior are potentially caused by changes in the climate, vegetation or animal life that is particular to a habitat," said Lepre. The team is currently excavating a more than 2 million year old site in Kenya to learn more about the early Oldowan period.

The study's other authors are: Helen Roche, Sonia Harmand, Jean-Philippe Brugal, Pierre-Jean Texier and Arnaud Lenoble at France's National Center of Scientific Research; Rhonda Quinn, Seton Hall University; and Craig Feibel, Rutgers University.

http://www.eurekalert.org/pub_releases/2011-08/e-tst082911.php

The star that should not exist

A faint star in the constellation of Leo (The Lion), called SDSS J102915+172927 [1], has been found to have the lowest amount of elements heavier than helium (what astronomers call "metals") of all stars yet studied.

It has a mass smaller than that of the Sun and is probably more than 13 billion years old.

"A widely accepted theory predicts that stars like this, with low mass and extremely low quantities of metals, shouldn't exist because the clouds of material from which they formed could never have condensed," [2] said Elisabetta Caffau (Zentrum fur Astronomie der Universitat Heidelberg, Germany and Observatoire de Paris, France), lead author of the paper. "It was surprising to find, for the first time, a star in this 'forbidden zone', and it means we may have to revisit some of the star formation models."

The team analysed the properties of the star using the X-shooter and UVES instruments on the VLT [3]. This allowed them to measure how abundant the various chemical elements were in the star. They found that the proportion of metals in SDSS J102915+172927 is more than 20 000 times smaller than that of the Sun [4][5].

"The star is faint, and so metal-poor that we could only detect the signature of one element heavier than helium — calcium — in our first observations," said Piercarlo Bonifacio (Observatoire de Paris, France), who supervised the project. "We had to ask for additional telescope time from ESO's Director General to study the star's light in even more detail, and with a long exposure time, to try to find other metals."

Cosmologists believe that the lightest chemical elements — hydrogen and helium — were created shortly after the Big Bang, together with some lithium [6], while almost all other elements were formed later in stars. Supernova explosions spread the stellar material into the interstellar medium, making it richer in metals. New stars form from this enriched medium so they have higher amounts of metals in their composition than the older stars. Therefore, the proportion of metals in a star tells us how old it is.

"The star we have studied is extremely metal-poor, meaning it is very primitive. It could be one of the oldest stars ever found," adds Lorenzo Monaco (ESO, Chile), also involved in the study.

Also very surprising was the lack of lithium in SDSS J102915+172927. Such an old star should have a composition similar to that of the Universe shortly after the Big Bang, with a few more metals in it. But the team found that the proportion of lithium in the star was at least fifty times less than expected in the material produced by the Big Bang. "It is a mystery how the lithium that formed just after the beginning of the Universe was destroyed in this star." Bonifacio added.

The researchers also point out that this freakish star is probably not unique. "We have identified several more candidate stars that might have metal levels similar to, or even lower than, those in SDSS J102915+172927. We are now planning to observe them with the VLT to see if this is the case," concludes Caffau.

Notes

[1] The star is catalogued in the Sloan Digital Sky Survey or SDSS. The numbers refer to the object's position in the sky.

[2] Widely accepted star formation theories state that stars with a mass as low as SDSS J102915+172927 (about 0.8 solar masses or less) could only have formed after supernova explosions enriched the interstellar medium above a critical value. This is because the heavier elements act as "cooling agents", helping to radiate away the heat of gas clouds in this medium, which can then collapse to form stars. Without these metals, the pressure due to heating would be too strong, and the gravity of the cloud would be too weak to overcome it and make the cloud collapse. One theory in particular identifies carbon and oxygen as the main cooling agents, and in SDSS J102915+172927 the amount of carbon is lower than the minimum deemed necessary for this cooling to be effective.

[3] X-shooter (http://www.eso.org/public/news/eso0920/) and UVES (http://www.eso.org/sci/facilities/paranal/instruments/uves/) are VLT spectrographs — instruments used to separate the light from celestial objects into its component colours and allow detailed analysis of the chemical composition. X-shooter can capture a very wide range of wavelengths in the spectrum of an object in one shot (from the ultraviolet to the near-infrared). UVES is the Ultraviolet and Visual Echelle Spectrograph, a high-resolution optical instrument.

[4] The star HE 1327-2326, discovered in 2005, has the lowest known iron abundance, but it is rich in carbon. The star now analysed has the lowest proportion of metals when all chemical elements heavier than helium are considered.

[5] ESO telescopes have been deeply involved in many of the discoveries of the most metal-poor stars. Some of the earlier results were reported in eso0228 (http://www.eso.org/public/news/eso0920/) and eso0723 (http://www.eso.org/public/news/eso0723/) and the new discovery shows that observations with ESO telescopes have let astronomers make a further step closer to finding the first generation of stars.

[6] Primordial nucleosynthesis refers to the production of chemical elements with more than one proton a few moments after the Big Bang. This production happened in a very short time, allowing only hydrogen, helium and lithium to form, but no heavier elements. The Big Bang theory predicts, and observations confirm, that the primordial matter was composed of about 75% (by mass) of hydrogen, 25% of helium, and trace amounts of lithium.

***Research paper**: http://www.eso.org/public/archives/releases/sciencepapers/eso1132/eso1132.pdf*

http://www.eurekalert.org/pub_releases/2011-08/bumc-bpo082911.php

BUSM professor outlines best practices for treating victims of sexual assault

The article utilizes a clinical vignette to illustrate evaluation and treatment protocols to educate primary care and emergency physicians about the best practice models of treating individuals presenting with sexual assault.

(BOSTON) – Judith A. Linden, MD, associate professor of emergency medicine at Boston University School of Medicine (BUSM) and vice chair for education in the department of emergency medicine at Boston Medical Center (BMC), has written an review article on the treatment of adult victims of sexual assault in an acute care setting that will run in the Sept. 1 issue of the New England Journal of Medicine. The article, which utilizes a clinical vignette to illustrate evaluation and treatment protocols, was written to educate primary care and emergency physicians about the best practice models of treating individuals presenting with sexual assault.

Linden, who has been a certified sexual assault examiner for the Commonwealth of Massachusetts for more than ten years, conducted an extensive analysis and assessment of literature on providing care to sexual assault victims. By incorporating national guidelines, as well as areas of controversy in the field, Linden presents a comprehensive educational tool that practitioners can reference in order to provide state of the art care for victims of sexual assault.

The clinical vignette depicted a 20 year-old woman who presents to the emergency department, where she gave her account of being sexually assaulted 24 hours earlier by a man she met at a campus party. She was vaginally assaulted and had not yet reported her assault to law enforcement.

To provide the most comprehensive care, Linden recommends that the woman first be evaluated for acute traumatic physical injuries by an emergency physician. The patient should then be evaluated and treated by a team, including a trained sexual assault examiner (if available at that center) and a social worker/rape crisis advocate. If the victim presents within the time limits for evidence collection (within 120 hours after vaginal assault and 24 hours after oral and rectal assault, per Massachusetts guidelines) and consents, she should be offered evidence collection. During the evaluation, which could take up to six hours, a trained sexual assault examiner should ask the woman to give a verbal account of what happened during the assault and collect evidence (both physical and DNA, which should be done in accordance with state protocols).

The examiner should document findings and take photographs (if appropriate) that could later be used in a court of law. The woman should be offered treatment for sexually transmitted infections (STIs) and pregnancy prevention (if appropriate). Throughout the process, the rape crisis advocate or social worker should provide the emotional support necessary to help the patient get through the evaluation. If the victim suspects that she was involved in an alcohol- or drug-facilitated sexual assault (AODFSA), a full toxicology screen may be sent to a crime lab. If the victim has not yet contacted the police, one of the health providers should offer to do so (with the patient's consent). In Massachusetts, a victim can have evidence collected, even if they do not want to report immediately to the police. They then have up to 6 months (longer if they are a minor) to decide if they want to report the assault.

Once all these steps are taken, the providers should ensure that the victim has medical and psychiatric follow-up appointments prior to discharge. According to the one major study, sexual assault survivors are at an increased lifetime risk for developing Post-Traumatic Stress Disorder, major depression (30 percent), and contemplating (33 percent) and attempting (13 percent) suicide.

While not as common, male sexual assault victims may also present to the emergency department and, in those cases, the same guidelines are applicable.

"Caring for a victim of sexual assault is truly complex and can involve a host of psychological, medical and legal issues," said Linden. "I hope that this article will help demystify and clarify the issues for emergency and primary care practitioners and help standardize care models so that we can deliver optimal care to victims of sexual assault."

Linden addressed areas of controversy, including the use of HIV Prophylaxis after sexual assault when the perpetrator is not known or suspected to be HIV positive. HIV Prophylaxis, with an antiretroviral agent, can be administered within 72 hours of the assault, but given the low risk of HIV transmission from sexual assault and the complex side effects of the treatment, this must be determined on a case by case basis. Linden also provided information for readers about where to find more information and guidelines on caring for victims of sexual assault, including the United States Department of Justice and the World Health Organization.

http://www.sciencenews.org/view/generic/id/333885/title/Mining_electronic_records_yields_connections_between_diseases

Mining electronic records yields connections between diseases

Data integration technique could help researchers find missing links among medical conditions

By Rachel Ehrenberg

Danish scientists have devised a new way to connect the dots between diseases. Integrating data mining that extracts information from clinicians' notes with protein and genetic information can reveal connections between health problems as seemingly unrelated as migraines and hair loss, or glaucoma and a hunching back, researchers report August 25 in PLoS Computational Biology.

Besides generating new leads about the molecular workings of disease, the approach is also revealing a much richer portrait of each patient, says study coauthor Søren Brunak of the Center for Biological Sequence Analysis at the Technical University of Denmark in Lyngby and the University of Copenhagen.

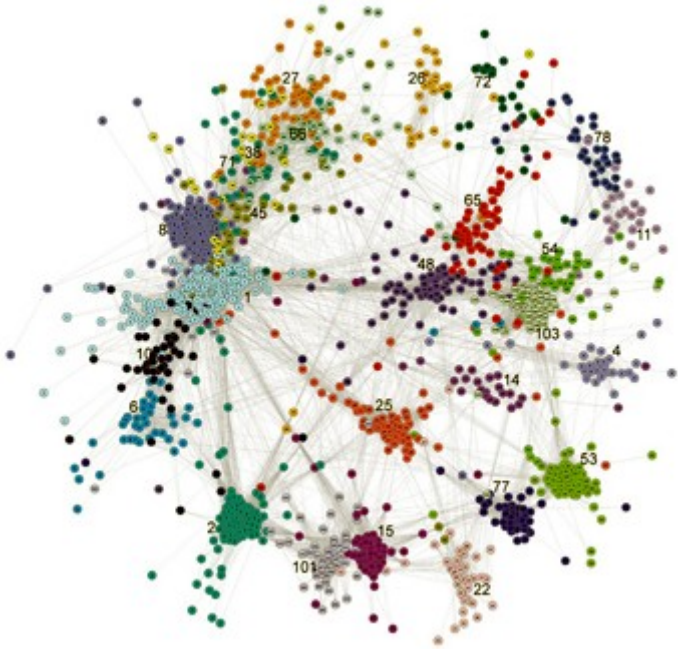
Using the World Health Organization's codes for classifying diseases, researchers generated a map that linked more than 4,700 patients at Denmark's largest psychiatric hospital by their diagnoses. The team integrated these data with information gleaned from a text mining algorithm that combed through 10 years' worth of clinicians' notes — an average of 25,000 words per patient.

More than 800 pairs of health problems turned up more than twice as often as expected by chance. Ninety-three of those pairs were then flagged by a doctor as being especially intriguing. Investigations into the genes and proteins associated with some of these unusual pairs revealed previously unknown connections, such as overlapping molecular machinery or pathways.

For example, the team identified nine patients diagnosed with both migraine and alopecia, or hair loss. The researchers discovered a potential cellular target of a protein that had already been implicated in hair loss by investigating the protein's connection to migraines. In addition, the scientists realized that the gluten allergy known as celiac disease has been associated with hair loss and migraines — and also has been linked to schizophrenia.

Brunak and his colleagues say they have yet to draw major conclusions about the implicated proteins and mechanisms.

In many places, including the United States, medical codes are used mostly for billing and reimbursement and they may relate only to the current hospital visit. The notes clinicians make are a much richer resource but might not be read by other clinicians pressed for time. Integrating these notes with the codes reveals much more about the patient's history and condition, says Brunak.



A network depicting patients' health problems (colored dots) reveals overlapping conditions, including known connections such as diabetes (light orange, numbered 26 at top) and hypertension (dark green, numbered 72, just to the right). **Credit: Roque et al/PLoS Computational Biology 2011**

"In a split second you get an idea about where that patient is in treatment," he says. As more individualized genetic data become available, that patient information will be even richer, further personalizing medicine, he adds. "In the end what we hope for is to approach it from both ends — the patient's records and genomic data."

Clinical notes are a huge source of information, says Stéphane Meystre, a specialist in biomedical Informatics at the University of Utah in Salt Lake City. "This approach clusters information in a much more detailed way."

It may be decades before a really personalized approach becomes the norm, Meystre says. Electronic record keeping hasn't been widely adopted, he says, and knowing about an underlying molecular link doesn't mean a treatment is available. But efforts like the current approach are already launching hypotheses about diseases and treatments.

http://www.physorg.com/news/2011-08-genetic-mutation-land-based.html

Genetic mutation may help explain first land-based plants

A graduate student working in the Judaean desert has discovered a gene that could provide some of the explanation of how water plants colonized dry land.

Guoxiong Chen, a doctoral student working at Haifa University's Institute of Evolution, found the gene in wild barley more than a decade ago, but now has identified a mutation of that gene that builds a cuticle, a hard protecting layer that helps the plant retain water. Without the cuticle, the plant would expel all its water and could not survive in the air. Chen named the mutation Eibi1 after his doctoral advisor at Haifa, Eviatar Nevo.

Eibi1 probably is one of many genes that could have contributed to the plant's ability to live out of the water, Nevo said.

"The Eibil gene is involved in the water-to-land evolution," Chen said. "Many genes are involved. But we do not know how many and what they are. This question is very interesting to be answered after further studies."

The first forms of life on Earth were blue-green algae which appeared about 3.5 billion years ago in the oceans. Plants that could produce oxygen through photosynthesis appeared a billion years ago and they produced the oxygen that made the Earth livable but that took hundreds of millions of years. About 600 million years ago, green algae plants with stick-like bodies began to move into the fresh water. They might have evolved onto dry land about 400 million years ago when some of the ponds evaporated. The plants with water-protecting genes would have made the transition easier than those without them.

Chen's curiosity was triggered when he discovered a form of wild barley in the desert that was significantly smaller than common wild barley found there. The gene he discovered in 2000 in the smaller cuticle-free plant was partly responsible for the plant's inability to retain water, which would explain why it wasn't doing very well in dry conditions. After earning his doctorate, Chen went to Japan to continue his work and mapped and cloned the Eibil gene there.

In the current Proceedings of the National Academy of Sciences, the team reported an alternative form of the gene -- an allele -- that helps the common plant build cutin, the substance secreted from the plant's skin cells. That cutin protects against water loss, something a plant needs if it is going to survive in the air.

Rafael Rubio de Casas, a scientist at the National Evolutionary Synthesis Center in Durham, N.C., said the gene could have played a role but it would have been one of many.

"Retaining water would be one of the attributes that aided plants in colonizing the land," Rubio de Casas said. "This mutation probably does contribute to the cuticle which may be relevant for water retention, although whether this specific gene was present and with the same function in ancient plants is of course unclear."

Barley evolved from a grass and was the first domesticated plant in the Middle East, which helps explain why an ancient form was found in the Judean desert. Writer and scientist Jared Diamond has written in his book "Guns, Germs and Steel" that barley was crucial for the development of agriculture and the rise of civilization. The earliest evidence of domesticated barley is from 8,500 B.C. near the eastern shores of the Mediterranean Sea, and it has also been used to produce beer since the Neolithic Age.

According to Nevo, the discovery has ramifications in the fight against hunger since scientists may eventually be able to enhance the ability of barley and wheat to withstand drought, thus increasing crop production. *Provided by Inside Science News Service*

http://www.eurekalert.org/pub_releases/2011-09/asoh-rsp090111.php

Researchers successfully perform first injection of cultured red blood cells in human donor

WASHINGTON – ***For the first time, researchers have successfully injected cultured red blood cells (cRBCs) created from human hematopoietic stem cells (HSCs) into a human donor, according to study results published today in Blood, the Journal of the American Society of Hematology (ASH).***

As the global need for blood continues to increase while the number of blood donors is decreasing, these study results provide hope that one day patients in need of a blood transfusion might become their own donors.

Using HSCs (stem cells that form all blood cell types) from one human donor, a Paris-based research team successfully generated billions of cRBCs in a petri dish with the aid of specific growth factors that regulate the proliferation and maturation of HSCs into red blood cells. Seeking to prove that the cRBCs were capable of reaching full maturation in the body, the researchers then injected the cells into four mouse models and confirmed that the cells were able to progress through the full maturation process. Using a volunteer donor, the researchers then repeated the process of creating another set of cRBCs and injected the cells back into the donor's own body to assess their survival in a human. After five days, the survival rate of the cRBCs in the donor's bloodstream was between 94 and 100 percent and, after 26 days, the rate was between 41 and 63

percent, comparable to the average 28-day half-life of normal native red blood cells. These results demonstrate that the lifespan and survival rate of cultured cells are similar to conventional red blood cells, further supporting their validity as a possible source of transfusion.

"Although previous research has shown that HSCs can be developed into fully matured red blood cells, this is the first study that has proven that they are capable of survival in the human body, a major breakthrough for the transplant community," said Luc Douay, MD, PhD, senior study author and Professor of Hematology at Université Pierre et Marie Curie in Paris, France. "There is a dire need for an alternative source of transfusable blood products, especially with the risk of infection from emergent new viruses that comes with traditional transfusion. Producing red blood cells in culture is promising since other efforts to create alternative sources have not yet been as successful as once hoped."

These results are especially timely, as blood donation organizations such as the American Red Cross have recently declared a critical nationwide blood shortage. Globally, the World Health Organization (WHO) recently reported donation rates of less than 1 percent of the population in more than 70 countries. Many of these countries are considered developing or transitional and have substantial transfusion needs due to high prevalence of maternal morbidity, childhood malnutrition, trauma casualties, and infectious disease.1

"The results from our study establish the feasibility of the concept of transfusing cRBCs and show promise that an unlimited blood reserve is within reach," said Professor Douay. "Although the full-scale production of these cells will require additional technological advances in cell engineering, we believe cRBCs could prove to be a valid alternative to classic transfusion products that will not only provide an adequate supply of blood, but reduce the risk of life-threatening complications and infections that can accompany traditional transfusion."

[1] World Health Organization. http://www.who.int/mediacentre/factsheets/fs279/en/index.html. Accessed August 19, 2011.

http://www.eurekalert.org/pub_releases/2011-09/tju-nhb090111.php

New half-match bone marrow transplant procedure yields promising outcomes for cancer patients

Kimmel Cancer Center at Jefferson clinical trial found improved overall survival in blood cancer patients who received two-step, half-match bone marrow transplant procedure

PHILADELPHIA—Half-matched bone marrow or stem cell transplants for blood cancer patients have typically been associated with disappointing clinical outcomes. However, a clinical trial conducted at the Kimmel Cancer Center at Jefferson testing its unique, two-step half-match procedure has produced some promising results: the probability of overall survival was 45 percent in all patients after three years and 75 percent in patients who were in remission at the time of the transplant.

Reporting in the journal Blood in a published-ahead-of-print article dated August 25, Neal Flomenberg, M.D., Chair of the Department of Medical Oncology at Thomas Jefferson University Hospital, Dolores Grosso, DNP, Co-Principal Investigator and lead author of the article, and colleagues discuss the results of 27 patients treated on this phase I/II trial who had diagnoses that included leukemia, lymphoma and myelodysplasia.

The patients received their transplant in two steps. First, after receiving radiation therapy to further treat their disease, the patients were given a specified dose of T cells (a type of immune cell that fights infection) from their half-matched family donor. The donors were parents, siblings or children of the patient. The patients next received the drug cyclophosphamide to help the newly infused donor T cells to be more tolerant to the patient's body. The second step of the transplant occurred when the patients received a dose of their donors' stem cells to help their blood counts return to normal and further strengthen their new immune system.

Dr. Flomenberg and his team found that after a follow-up of 28-56 months, overall survival for the patients after one year was 54 percent and 48 percent at three years. Patients in remission at the time of the transplant fared better with an overall survival of 75 percent. Seventeen of the 27 patients—with a median age of 52 years old—were alive six months after their transplant, which was the official end point of the trial.

While more recent studies have shown promising increases in overall survival for patients undergoing half-match transplants, historically, clinical outcomes for these types of transplants have been poor, which has limited the use of this type of procedure. The results of the Jefferson trial represent a very promising improvement in this area.

Bone marrow or stem cell transplants are performed in order to replace a patient's diseased immune system with that of a healthy donor. Traditionally, the use of a genetically fully matched donor has been associated with the best results in bone marrow transplant, but many patients lack a fully-matched related or unrelated donor. Almost every patient will have a half-matched donor (also known as a haploidentical donor) in their family, however.

The successful use of haploidentical donors would greatly expand the number of donors available to a patient, extending this therapy to almost everyone who would benefit from receiving a transplant. This would

include minority patients, including patients with sickle cell anemia, who do not have as many fully-matched unrelated donors available to them.

"Our half-match bone marrow transplant results open up many doors for different types of patients who can't find an exact match," said Dr. Flomenberg. "It also justifies recommending that patients at high risk for relapse should consider having a half-match transplant early in the treatment of their disease."

"Jefferson's two-step procedure provides promising results that could serve as the basis for further exploration and optimization of the technique," he added.

Jefferson medical oncologists' approach is unique in that the dosage, timing and treatment of donor T cells was carefully controlled and optimized. No other transplant regimen controls the exact amount of donor T cells given. The investigators believe that dosing the T cells in this way helped avoid many of the life-threatening side effects of this type of transplant.

"We believe the dosage and timing of T cells from the donor into the patient is essential for success. In fact, it's equally as important as prescribing specific doses of radiation and chemotherapy to initially treat the disease," said Dr. Grosso. "The goal of this two-step regimen was to develop a better technique for half-matched patients with relapsed blood cancers initially, but we also showed that it can be appropriate for high risk patients earlier in their disease who lacked fully matched donor options."

http://www.eurekalert.org/pub_releases/2011-09/vph-cca083111.php

Crippling condition associated with diabetes is often misdiagnosed and misunderstood

Diabetes Care article helps to identify and treat charcot foot

Van Nuys, CA—Robert Winkler says he limped around on his painful left foot for six months, suffering unnecessarily from a misdiagnosis by a physician who didn't know about the symptoms and treatments for Charcot foot, a form of localized osteoporosis linked to diabetes that causes the bones to soften and break, often resulting in amputation. When his primary care physician finally agreed to Mr. Winkler's request for an x-ray, they discovered the metatarsal bones in Mr. Winkler's left foot were all broken—a common symptom of this serious and potentially limb-threatening lower-extremity complication.

A new article in the September issue of the journal, Diabetes Care, describes Charcot foot and its treatment with a goal of educating medical professionals about this painful inflammation of the foot. The article is the product of an international task force of experts convened by the American Diabetes Association and the American Podiatric Medical Association in January to summarize available evidence on the pathophysiology, natural history, presentations and treatment recommendations for Charcot foot syndrome.

"Even though it was first described in 1883, the diagnosis and successful treatment of Charcot foot continue to be a challenge because this syndrome is not widely known or understood by the broader medical profession," said Lee C. Rogers, D.P.M., co-director of the Amputation Prevention Center at Valley Presbyterian Hospital in Van Nuys, CA, and lead author of the Diabetes Care article. "Charcot foot is now considered to be an inflammatory syndrome most often seen in patients with diabetes which can be successfully treated in its early stages."

The article describes Charcot foot as a condition affecting the bones, joints and soft tissues of the foot and ankle, which is characterized by inflammation in the earliest phase and is associated with diabetes and neuropathy. The report finds offloading, or removing weight from the foot, is the most important initial treatment recommendation. Surgery can be helpful in early stages involving acute fractures of the foot or ankle or in later stages when offloading is ineffective, according to the article.

In Mr. Winkler's case, he was first diagnosed with Charcot foot in 2004 and had already undergone one surgery that relieved the problem for several years. By 2010, though, he was facing the potential amputation of the foot because of complications associated with Charcot foot syndrome.

His podiatrist referred him to Dr. Rogers at Valley Presbyterian Hospital's Amputation Prevention Center, an integrated limb salvage center that is one of only a handful in the nation. Since its December 2009 opening, the Amputation Prevention Center's specialized multidisciplinary team of highly skilled professionals has treated patients from all over the country and around the world with leading-edge technology, achieving a limb salvage rate of 96 percent.

George Andros, M.D., the Center's Medical Director, performed vascular surgery to restore circulation to Mr. Winkler's left foot so that it would heal. Then, Dr. Rogers performed surgery to rebuild the bones in Mr. Winkler's foot. Dr. Rogers also implanted a bone stimulator that acts like a pacemaker for bones which encourages Mr. Winkler's body to rebuild and fuse the broken bones in his left foot. As a result, Mr. Winkler is expected to be able to recover the use of his left foot.

"I'm very pleased because I had gone to another doctor and he wanted to amputate my foot," Mr. Winkler said. "When I found Dr. Rogers and Valley Presbyterian Hospital's Amputation Prevention Center, it's like I

found a blessing and an angel in disguise. I have tears running down my face as I describe to you how I will be able to get up out of my chair and walk because of the care I received at Valley Presbyterian Hospital. All the people there are superb. They treat me like a king."

http://www.eurekalert.org/pub_releases/2011-09/cp-ap082911.php

An 'unconventional' path to correcting cystic fibrosis

Researchers have identified an unconventional path that may correct the defect underlying cystic fibrosis, according to a report in the September 2nd issue of the journal Cell, a Cell Press publication.

This new treatment dramatically extends the lives of mice carrying the disease-associated mutation.

Cystic Fibrosis is caused by a mutation in a gene responsible for the transport of ions across cell membranes. This gene encodes a protein channel, called the cystic fibrosis transmembrane conductance regulator or CFTR, that is normally found on the surfaces of cells lining the airway and intestine. In patients with the disease, the channels don't make it from inside cells to their surfaces along the standard path. As a result ions and fluids fail to move in and out of cells as they should, causing mucus build-up and chronic lung infections.

The new study identifies an unexpected way to send the mutant proteins to the surface where they can restore ion transport. A protein normally localized to membranes inside cells, called GRASP65, is co-opted to escort mutant CFTR channels to the cell surface by following a "detour" route.

"Many have searched for the so-called CFTR correctors that can aid the surface expression of mutant CFTR through conventional trafficking," said Min Goo Lee, senior author of this study. Some molecules have shown promise in the laboratory, but none have led to the development of commercially available therapies so far. "In this study, we discovered that CFTR surface trafficking can be rescued by an alternative route that former investigators had not expected."

Mice carrying the cystic fibrosis-linked mutation typically live for less than 3 months. In those that produce higher levels of GRASP65, only 1 out of 20 of the CFTR-mutant mice died in those first 3 months. Importantly, the transport of ions by CFTR in the animals' intestinal lining was also restored to more than 60 percent of the level seen in normal, healthy mice. The findings may ultimately have real treatment implications for those with cystic fibrosis or other genetic diseases stemming from problems with the transport of proteins that are folded incorrectly.

"We made a small step in understanding cell biology," Lee says. "We hope this could turn out to be a giant leap in future clinical medicine, especially for treating human genetic diseases." In the U.S., cystic fibrosis is the most common deadly inherited disorder, according to PubMed Health. One in 29 Caucasian Americans carry the cystic fibrosis mutation, and those with two copies of the mutant gene will develop the disease.

http://www.bbc.co.uk/news/health-14746365

Fatty skin cell clue to baldness

Fat cells in the skin have been identified as the source of chemicals needed to make hair grow, according to researchers in the US.

Experiments on mice, reported in the journal Cell, suggested hair stem cells were controlled by fat. Injecting a type of fat cell stimulated hair growth in mice which otherwise struggled to grow hair. The Yale University team says it may be possible to use the findings to one day restart hair growth to reverse balding.

Follicles

They said there was a four-fold increase in the number of "precursor" fat cells in the skin around a hair follicle when it started to grow. They looked at defective mice which could not produce these fat cells. Hair normally grows in cycles, but in the defective mice - the follicles had become trapped in the dormant phase of the cycle.

Scientists injected fat cells from healthy mice into the defective mice. Two weeks later, hair follicles had started to grow. They showed that precursor fat cells were producing a chemical - a platelet-derived growth factor - at 100 times the level of surrounding cells. Injecting the growth factor into the skin of defective mice could kick-start growth in 86% of follicles.

The study proposed: "That [fat] precursor cells secrete platelet-derived growth factor to promote hair growth."

The US team is continuing to look for other chemicals which may be involved. However, it is not known if the same chemical processes take place in humans. Previous studies in men have shown that bald parts of the scalp had the same number of hair stem cells as hairy areas.

Prof Valerie Horsley, from Yale University, said: "If we can get these fat cells in the skin to talk to the dormant stem cells at the base of hair follicles, we might be able to get hair to grow again."

The study suggested the fat cells could have other functions involving stem cells such as tumour formation or healing wounds.

http://www.newscientist.com/article/mg21128283.800-your-brain-chemistry-existed-before-animals-did.html

Your brain chemistry existed before animals did

01 September 2011 by Michael Marshall

WHEN wondering about the origins of our brain, don't look to Homo sapiens, chimpanzees, fish or even worms. Many key components first appeared in single-celled organisms, long before animals, brains and even nerve cells existed.

Dirk Fasshauer of the University of Lausanne, Switzerland, and colleagues were studying a pair of essential neural proteins called Munc18/syntaxin1 when they decided to look for them in very simple, single-celled organisms.

Choanoflagellates are aquatic organisms found in oceans and rivers around the globe. Being a single cell, they do not have nerves, yet the team found both proteins in the choanoflagellate Monosiga brevicollis, and the interaction between the two was the same as in neurons (Proceedings of the National Academy of Sciences, DOI: 10.1073/pnas.1106189108). These proteins are found in every nerve cell and control the release of the chemicals which neurons use to talk to each other, called neurotransmitters.

The finding is intriguing on its own, but much more significant when combined with a growing body of evidence that essential brain components evolved in choanoflagellates before multicellular life appeared.

In 2008, Xinjiang Cai of Duke University in Durham, North Carolina, discovered that M. brevicollis has the same calcium channels in its cells as those used by neurons (Molecular Biology and Evolution, DOI: 10.1093/molbev/msn077). Then, in 2010, it emerged that M. brevicollis also has several proteins that neurons use to process signals from their neighbours (BMC Evolutionary Biology, DOI: 10.1186/1471-2148-10-34).

And this year, Harold Zakon of the University of Texas at Austin and colleagues discovered that M. brevicollis has the same sodium channels that neurons use to pass electrical signals along their length (Proceedings of the National Academy of Sciences, DOI: 10.1073/pnas.1106363108).

Put together, these findings suggest that choanoflagellate cells have components for each of the three main functions of neurons: carrying electrical signals along their bodies, signalling to their neighbours with neurotransmitters, and receiving those signals.

Choanoflagellates are our closest single-celled relatives and, because they sometimes come together into colonies, are on the boundary between single-celled and multicellular animals. Some evolutionary biologists believe the first multicellular animal may have been an ancient choanoflagellate colony that stuck together permanently. If that's true, modern choanoflagellates give us a glimpse of how multicellular animals began.

"The choanoflagellates have a lot of precursors for things we thought were only present in animals," says Fasshauer. Today, says Zakon, the nervous system seems "unbelievably complex", but evidence from these tiny organisms suggests it was built up from several simple systems, which evolved separately for different reasons. For instance, Fasshauer suspects M. brevicollis uses Munc18/syntaxin1 to secrete chemicals, much like neurons use it to release neurotransmitters.

Not all of the components required for neurons to work were necessarily present in the ancestors of choanoflagellates, Zakon adds. For example, there is no evidence that they can make neurotransmitters, or that they wire up into networks as neurons do. "The brain is a lot more than a bunch of choanoflagellates," he says.

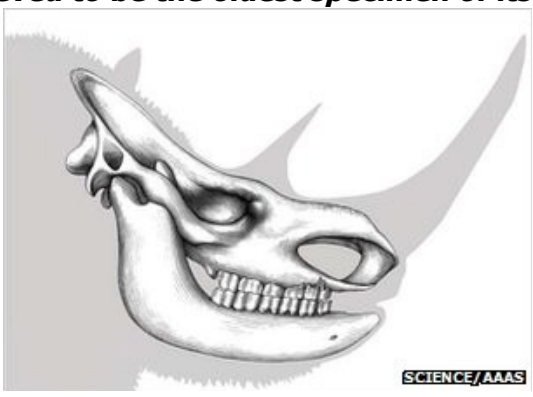
http://www.bbc.co.uk/news/science-environment-14754317

'Oldest' woolly rhino discovered

By Jonathan Amos Science correspondent, BBC News

A woolly rhino fossil dug up on the Tibetan Plateau is believed to be the oldest specimen of its kind yet found.

The creature lived some 3.6 million years ago - long before similar beasts roamed northern Asia and Europe in the ice ages that gripped those regions. The discovery team says the existence of this ancient rhino supports the idea that the frosty Tibetan foothills of the Himalayas were the evolutionary cradle for these later animals. The report appears in Science journal.



The Tibetan woolly rhino fossil is in generally good condition, if a little misshapen

"It is the oldest specimen discovered so far," said Xiaoming Wang from the Natural History Museum of Los Angeles County, US. "It is at least a million years older, or more, than any other woolly rhinos we have known.

"It's quite well preserved - just a little crushed, so not quite in the original shape; but the complete skull and lower jaw are preserved," he told BBC News.

The rhino was found in Tibet's Zanda Basin. The area is rich in fossil beds, and this specimen was unearthed along with examples of extinct horse, antelope, snow leopard, badger and many other kinds of mammals. It has been put in a new species classification - Coelodonta thibetana.

Dr Wang and colleagues say it displays some very primitive features compared with its counterparts that lived through the later great glaciations of the Pleistocene Epoch.

Judging from marks on the skull, the creature's horn, which has not survived, would likely have been quite flat in construction and leaning forward. This might have allowed the animal more easily to sweep snow out of the way to get at vegetation, a useful behaviour for survival in the harsh Tibetan climate, the team says.

"We think it would have used its horn like a paddle to sweep the snow away," Dr Wang explained.

Although the extinction of the Pleistocene beasts, such as woolly mammoths and rhinos, great sloths and sabre-tooth cats, has been intensively studied in recent years, much less is known about where these giants came from and how they acquired their adaptations for living in a cold environment.

The discovery team says it might have used its horn as a paddle to sweep snow from vegetation

The argument made in the Science paper is that perhaps they got those adaptations on the Tibetan Plateau.

"When this rhino existed, the global climate was much warmer and the northern continents were free of the massive ice sheets seen in the later ice ages," Dr Wang said.

"Then, about a million years later, when the ice age did hit the world, these Tibetan woolly rhinos were basically pre-adapted to the ice age environment because they had this ability to sweep snows. "They just happily came down from the high altitude areas and expanded to the rest of Eurasia."

The Los Angeles-based researcher concedes that many more fossil finds will be required to underpin the Tibetan hypothesis.

Andy Currant, an expert on the Pleistocene (1.8 million to about 11,000 years ago) at London's Natural History Museum, says this is not straightforward in the case of woolly rhinos, and good specimens can sometimes be hard to come by. "Woolly rhino were preyed on by spotted hyenas and they were eaten pretty thoroughly; the hyenas liked the bones," he told BBC News.

http://medicalxpress.com/news/2011-09-cdc-doctors-antibiotics-kids.html

CDC: Doctors prescribing fewer antibiotics to kids

(AP) -- ***The push to get pediatricians to stop prescribing antibiotics for the wrong illnesses is paying off a bit, a new government report found.***

Since the early 1990s, there's been a 10 percent drop in prescription rates for antibiotics for kids 14 and younger, the Centers for Disease Control and Prevention reported Thursday.

Antibiotics are often used - but don't work - against viral illnesses like colds and flu. Antibiotics fight infections caused by bacteria. Misuse can lead to antibiotic resistance.

Experts say doctors inappropriately prescribe antibiotics more than 50 percent of the time, and more often with respiratory infections.

The CDC found larger declines - about 25 percent - in how often doctors used antibiotics against sore throats, colds and some other upper respiratory infections. But there was no significant change in how often they prescribed the drugs for ear infection, bronchitis and sinusitis.

The new findings represent progress, but also suggest that doctors are still prescribing antibiotics too often, said Dr. Lauri Hicks, a CDC epidemiologist who worked on the study.

"The bad news is we still have a long way to go," she said.

The CDC study was the government's first look at the issue in about a decade. It was based on an annual survey of doctors' offices, and compared rates from 1993-1994 to 2007-2008.

The improvement could be partly driven by rapid diagnostic tests that help doctors pinpoint whether a sore throat is caused by a virus or strep bacteria, CDC researchers said. The study also found fewer parents took their kids to doctors for upper respiratory infections, which could be thanks to a vaccine against pneumococcal bacteria that became available in 2000.

A public health campaign about antibiotics may have also had some impact, CDC officials said.

Doctors have not always followed recommendations to cut back on antibiotics, partly because of pressure from parents, said Dr. Kenneth Bromberg, chairman of pediatrics at the Brooklyn Hospital Center in New York.

Moms and dads who have been up with sick, screaming infants in the middle of the night tend to expect more from a doctor than advice to keep an eye on the problem. Often, they want antibiotics, and may not stop at one doctor to get them, he said.

"In this new age of consumerism, they will go somewhere else and get what they want," Bromberg said.

The taxing nature of ear infections may be why the CDC didn't find a decrease in the antibiotic prescribing rate for that problem, he added. *More information: CDC report: http://www.cdc.gov/mmwr*

http://www.eurekalert.org/pub_releases/2011-09/sumc-dfo083011.php

Distinct features of autistic brain revealed in novel Stanford/Packard analysis of MRI scans

STANFORD, Calif. - ***Researchers at the Stanford University School of Medicine and Lucile Packard Children's Hospital have used a novel method for analyzing brain-scan data to distinguish children with autism from typically developing children.***

Their discovery reveals that the gray matter in a network of brain regions known to affect social communication and self-related thoughts has a distinct organization in people with autism. The findings will be published online Sept. 2 in Biological Psychiatry. While autism diagnoses are now based entirely on clinical observations and a battery of psychiatric and educational tests, researchers have been making advances toward identifying anatomical features in the brain that would help to determine whether a person is autistic.

"The new findings give a uniquely comprehensive view of brain organization in children with autism and uncover a relationship between the severity of brain-structure differences and the severity of autism symptoms," said Vinod Menon, PhD, a professor of psychiatry and behavioral sciences and of neurology and neurological sciences, who led the research.

"We are getting closer to being able to use brain-imaging technology to help in the diagnosis and treatment of individuals with autism," said child psychiatrist Antonio Hardan, MD, who is the study's other senior author and an associate professor of psychiatry and behavioral sciences at Stanford. Hardan treats patients with autism at Packard Children's. Brain scans are not likely to completely replace traditional methods of autism diagnosis, which rely on behavioral assessments, Hardan added, but they may eventually aid diagnosis in toddlers.

Autism occurs in about one in every 110 children. It is a disabling developmental disorder that impairs a child's language skills, social interactions and the ability to sense how one is perceived by others.

The study compared MRI data from 24 autistic children aged 8 to 18 with scan data from 24 age-matched, typically developing children. The data was collected at the University of Pittsburgh.

"We jumped at the results," Menon said. "Our approach allows us to examine the structure of the autistic brain in a more meaningful manner." The new findings expand scientists' basic knowledge of the core brain deficits in autism, he added.

The analysis method, called "multivariate searchlight classification," divided the brain with a three-dimensional grid, then examined one cube of the brain at a time, and identified regions in which the pattern of gray matter volume could be used to discriminate between children with autism and typically developing children. Instead of comparing the sizes of individual brain structures, as prior studies have done, the new analysis generated something akin to a topographical map of the entire brain. The scientists essentially mapped the autistic brain's distinct cliffs and valleys, uncovering subtle differences in the physical organization of the gray matter.

Such analysis may be a more useful approach than previous tacks. Earlier studies, for instance, suggested that people with autism may have larger brains in toddlerhood or have a large defect in one brain structure. This study took a different approach and discovered several autism-associated differences in the Default Mode Network, a set of brain structures important for social communication and self-related thoughts. Specific structures that differed included the posterior cingulate cortex, the medial prefrontal cortex and the medial temporal lobes. These findings align well with recent theoretical and functional MRI studies of the autistic brain, which also point to differences in the Default Mode Network, Menon said.

Once Menon and his team had found where the differences in autistic brains were located, they were able to use their analysis to classify whether individual children in the study had autism. They used a subset of their data to "train" the mathematical algorithm, then ran the remaining brain scans through the algorithm to classify the children.

"We could discriminate between typically developing and autistic children with 92 percent accuracy on the basis of gray matter volume in the posterior cingulate cortex," said Lucina Uddin, PhD, the study's first author. Uddin is an instructor in psychiatry and behavioral sciences at Stanford.

In addition, the children with the most severe communication deficits, as measured on a standard behavioral scale for diagnosing individuals with autism, had the biggest brain structure differences. Severe impairments in social behavior and repetitive behavior also showed a trend toward association with more severe brain differences.

Menon and his team plan to repeat the study in younger children and to extend it to larger groups of subjects. If the results are upheld, the new method offers the possibility of several applications in autism diagnosis and treatment. For instance, brain scans might eventually help distinguish autism from other behavioral disorders such as attention deficit hyperactivity disorder, or might predict whether high-risk children, such as those with autistic siblings, will go on to develop autism themselves. Brain scanning might also be able to predict what type of deficits will occur in a child with a new autism diagnosis, allowing clinicians to target their treatments to a child's predicted deficits.

"Scans would likely be used alongside clinical expertise, giving that extra hint from the brain data," Uddin said.

When such integrated assessments are possible, the researchers hope they will allow clinicians to build detailed profiles of each patient. "We hope we'll eventually be able to tell parents, 'Your child will probably respond to this treatment, or your child is unlikely to respond to that treatment,'" Hardan said. "In my mind, that's the future."

Other Stanford scientists who collaborated on the project were research scientist Srikanth Ryali, PhD; postdoctoral scholar Tianwen Chen, PhD; and research assistants Christina Young and Amirah Khouzam. Nancy Minshew, MD, from the University of Pittsburgh, also contributed to the project.

The research was supported by funding from the Singer Foundation, the Stanford Institute for Neuro-Innovation & Translational Neurosciences, the National Institute of Child Health & Human Development, the National Institute of Deafness & Other Communication Disorders, the National Institute of Mental Health, the National Institute of Neurological Disorders & Stroke and the National Science Foundation. Uddin was also supported by a postdoctoral fellowship from the Stanford University Autism Working Group. Additional information about the Department of Psychiatry and Behavioral Sciences, which also supported this work, is available at http://psychiatry.stanford.edu/

http://www.physorg.com/news/2011-09-chemical-complex-rare-earth-metals.html

First chemical complex consisting of rare earth metals and boron atoms produces unexpected results

Rare earth metals are critical components of hybrid vehicle engines, but a new partnership between these elements and boron atoms is set to have a transformative impact on synthetic chemistry.

Boron is an intriguing member of the periodic table because it readily forms stable compounds using only six electrons—two fewer than most other main-group elements. This means that chemists can easily add boron to unsaturated hydrocarbons, and then use electron-rich atoms, such as oxygen, to change organoborons into versatile units such as alcohols and esters. Recently, researchers found that combining transition metals with boron ligands produces catalysts powerful enough to transform even fully saturated hydrocarbons into new organic functionalities with high selectivity.

Now, Zhaomin Hou and colleagues from the RIKEN Advanced Science Institute in Wako have made another breakthrough in this field: they have created the first-ever complexes between boron ligands and rare earth metals1. Because these novel chemical combinations display a surprising ability to incorporate molecules such as carbon monoxide into their frameworks, they have potential applications that range from synthesizing organic substrates to controlling noxious emissions.

Rare earth metals are hot commodities because they are vital for products in high demand such as smartphones and electric cars (Fig. 1). However, full chemical studies of these elements are only in their infancy since they are difficult to handle under normal conditions.

According to Hou, typical methods to prepare transition metal–boron complexes—halogen or metal exchange reactions, for example—seemed unsuitable for rare earth metals. Instead, the team used a vigorous lithium–boron compound to handle the reactive rare earth precursors, producing previously unseen scandium–(Sc–B) and gadolinium–boron (Gd–B) complexes in good yields, but not without difficulty. “Rare earth–boron compounds are air- and moisture-sensitive and sometimes thermally unstable,” says Hou. “They therefore require great care in isolation and handling.”

To determine whether or not the Sc–B complex could act as a nucleophile—an important electron-donating reagent in organic chemistry—the team reacted it with N,N,-diisopropylcarbodiimide, a molecule that easily accepts electrons to change into an amidinate salt. X-ray analysis revealed that initially, the carbodiimide became incorporated between Sc and carbon ligands on the rare earth metal, but extra quantities of the reagent became incorporated between the Sc–B bond. Furthermore, adding carbon monoxide to this mixture also caused a rare earth–boron insertion, accompanied by an unexpected rearrangement into a cyclic structure.

Because chemists rely on insertion reactions to efficiently transform ligands into a diverse range of products, these findings should enable development of brand new synthetic techniques—opportunities that Hou and his team are actively pursuing.

More information: Li, S., et al. Rare earth metal boryl complexes: Synthesis, structure, and insertion chemistry. Angewandte Chemie International Edition 50, 6360–6363 (2011). Provided by RIKEN

http://www.bbc.co.uk/news/science-environment-14748623

Volcanic rock rafts 'could have been cradles of life'

By Mark Kinver Environment reporter, BBC News

Volcanic rock rafts could have played a key role in the origins of life on Earth, a team of scientists suggests.

Researchers say the buoyant rock pumice has the right properties to have provided the conditions for early life to emerge more than 3.5bn years ago.

Pumice "rafts" are found today on shores of islands such as the volcanic Greek island of Santorini (Thera). The team, from Oxford University and the University of Western Australia, calls for more research on the idea.

"During its life cycle, pumice is potentially exposed to - among other things - lightning associated with volcanic eruptions, oily hydrocarbons and metals produced by hydrothermal vents, and ultraviolet light from the Sun as it floats on water," explained co-author Professor Martin Brasier from the University of Oxford.

"All these conditions have the potential to host, or even generate, the kind of chemical processes that we think created the first living cells."

Beach life

The volcanic rock floats on water because it has the largest surface-area-to-volume ratio of any type of rock, which would have allowed it to act as a raft collecting material before becoming beached on a shore.

Another of the scientists involved, Dr David Wacey from the University of Western Australia, said that it was known that that life was "thriving" among beach sand grains some 3.4bn years ago.

"What we are saying here is that certain kinds of beach might have provided a cradle for life," he said.

The two researchers were part of an international team which recently published a paper suggesting that microscopic fossils unearthed in Western Australia provided "good, solid evidence" for cells and bacteria living in an oxygen-free world more than 3.4bn years ago.

Writing in their latest paper, to be published in the journal Astrobiology, the team said that the idea that rafts of pumice could have played a significant role in the emergence of some of the earliest organisms on Earth deserved to be "rigorously explored in the laboratory and the early rock record".

http://www.eurekalert.org/pub_releases/2011-09/sfgm-hsb090111.php

Harmless soil-dwelling bacteria successfully kill cancer

A bacterial strain that specifically targets tumours could soon be used as a vehicle to deliver drugs in frontline cancer therapy.

The strain is expected to be tested in cancer patients in 2013 says a scientist at the Society for General Microbiology's Autumn Conference at the University of York.

The therapy uses Clostridium sporogenes – a bacterium that is widespread in the soil. Spores of the bacterium are injected into patients and only grow in solid tumours, where a specific bacterial enzyme is produced. An anti-cancer drug is injected separately into the patient in an inactive 'pro-drug' form. When the pro-drug reaches the site of the tumour, the bacterial enzyme activates the drug, allowing it to destroy only the cells in its vicinity – the tumour cells.

Researchers at the University of Nottingham and the University of Maastricht have now overcome the hurdles that have so far prevented this therapy from entering clinical trials. They have introduced a gene for a much-improved version of the enzyme into the C. sporogenes DNA. The improved enzyme can now be produced in far greater quantities in the tumour than previous versions, and is more efficient at converting the pro-drug into its active form.

A fundamental requirement for any new cancer therapy is the ability to target cancer cells while excluding healthy cells. Professor Nigel Minton, who is leading the research, explains how this therapy naturally fulfils this need. "Clostridia are an ancient group of bacteria that evolved on the planet before it had an oxygen-rich atmosphere and so they thrive in low oxygen conditions. When Clostridia spores are injected into a cancer patient, they will only grow in oxygen-depleted environments, i.e. the centre of solid tumours. This is a totally natural phenomenon, which requires no fundamental alterations and is exquisitely specific. We can exploit this specificity to kill tumour cells but leave healthy tissue unscathed," he said.

The research may ultimately lead to a simple and safe procedure for curing a wide range of solid tumours. "This therapy will kill all types of tumour cell. The treatment is superior to a surgical procedure, especially for patients at high risk or with difficult tumour locations," explained Professor Minton. "We anticipate that the strain we have developed will be used in a clinical trial in 2013 led by Jan Theys and Philippe Lambin at the University of Maastricht in The Netherlands. A successful outcome could lead to its adoption as a frontline therapy for treating solid tumours. If the approach is successfully combined with more traditional approaches this could increase our chance of winning the battle against cancerous tumours."

http://www.eurekalert.org/pub_releases/2011-09/yu-yrs090111.php

Yale researchers solve mystery of disappearing bird digit

Evolution adds and subtracts, and nowhere is this math more evident than in vertebrates, which are programmed to have five digits on each limb.

But many species do not. Snakes, of course, have no digits, and birds have three.

Yale scientists now have a good handle on how these developmental changes are orchestrated in the embryo, but there is still one outstanding debate on birds: Which digits are they: a thumb with index and middle fingers, or the index, middle and ring fingers?

In five-digit vertebrates, the thumb comes from the precursor stem cells labeled pa.

While birds have a digit that looks like a thumb, pa precursor cells die off during development and never produce a digit in adults.

As a result, scientists have wondered whether precursor cells in pb can make a thumb.

Yale scientists have completed a genomic analysis of birds that reveals the answer (shown in orange on illustration).

It is a hands down "yes" — even though the first bird digit develops where the index finger on a five-finger vertebrae should be.

A genomic analysis shows that precursor cells pb that form index finger in five-fingered vertebrates can form the "thumb" (in orange) or first digit in three-digit bird wing **Yale University**

The results are published online Sept. 4 in the journal Nature. Authors are Zhe Wang, Rebecca L. Young, Huiling Xue, and Gunter P. Wagner from the Department of Ecology and Evolutionary Biology.

http://www.eurekalert.org/pub_releases/2011-09/chb-ntf090211.php

New tactic for controlling blood sugar in diabetes contradicts current view of the disease

Study finds inflammation may be part of the solution, not the problem

Increased low-grade inflammation in the body resulting from obesity is widely viewed as contributing to type 2 diabetes. Going against this long-held belief, researchers from Children's Hospital Boston report that two proteins activated by inflammation are actually crucial for maintaining good blood sugar levels – and that boosting the activity of these proteins can normalize blood sugar in severely obese and diabetic mice.

The research, led by Umut Ozcan, MD, in the Division of Endocrinology at Children's, is reported in the October issue of Nature Medicine, published online September 4.

"This finding is completely contrary to the general dogma in the diabetes field that low-grade inflammation in obesity causes insulin resistance and type 2 diabetes," says Ozcan. "For 20 years, this inflammation has been seen as detrimental, whereas it is actually beneficial."

Ozcan's team previously showed that obesity places stress on the endoplasmic reticulum (ER), a structure in the cell where proteins are assembled, folded and dispatched to do jobs for the cell. This so-called "ER stress" impairs the body's response to insulin in maintaining appropriate blood glucose levels, and is a key link between obesity and type 2 diabetes. Last year, Ozcan and colleagues showed that a protein that relieves ER stress, called XBP1s, cannot function in obese mice. Earlier this year, they showed that activating XBP1s artificially in the liver normalized high blood sugar in obese, insulin-resistant type 2 diabetic mice (as well as lean, insulin-deficient type 1 diabetic mice).

The new study shows that a second protein triggered by inflammatory signals, p38 MAPK, chemically alters XBP1s, enhancing its activity -- and that without these alterations, XBP1s cannot function to maintain normal glucose levels. The study further showed that obese mice have reduced p38 MAPK activity, and that re-activating p38 MAPK in the liver reduced their ER stress, increased insulin sensitivity and glucose tolerance, and significantly reduced blood glucose levels.

Together, the findings suggest that either increasing p38 MAPK activity -- despite its being an inflammatory signal -- or increasing XBP-1 activity by other means could represent new therapeutic options for diabetes.

The study also suggests a new model for understanding type 2 diabetes, in which obesity may interfere with the ability of people's cells to respond to inflammatory signals. "It may be that inflammatory pathways are not working optimally and there could be a resistance to cytokines which mediates the inflammation," Ozcan says. "This could be a paradigm shift for the field."

The researchers also raise a possible down side in using p38 MAPK inhibitors to treat inflammatory diseases such as Crohn's disease, psoriasis and asthma. "These therapeutic approaches should … be evaluated within the context of our results, and in light of the possibility that inhibition of XBP1s activity also decreases the ability of the cell to cope with the inflammatory conditions," they write.

The study (doi:10.1038/nm.2449) was supported by the National Institutes of Health and the Timothy Murphy funds provided to the Division of Endocrinology, Children's Hospital Boston. Jaemin Lee, PhD, and Cheng Sun, PhD, were co-first authors on the paper.