Closure of patent foramen ovale may benefit migraine sufferers

Reducing the frequency and severity of disabling migraines is crucial for quality of life. A new study, published in the February 2009 issue of JACC: Cardiovascular Interventions, finds significant improvement of migraine following catheter-based closure of patent foramen ovale (PFO) - a slight opening in the wall between the right and left atria.

These findings confirm those of previous observational studies, which consistently show that when a PFO is closed - whether it's following a stroke or decompression illness - migraine also tends to improve in the majority of cases (approximately 75 percent). However, the present study was the first to enroll patients with severe migraine, a large PFO and no history of stroke or transient ischemic attacks, but with silent brain lesions on magnetic resonance imaging.

"The study suggests closure of a large PFO may improve migraine in patients with subclinical brain lesions, as well as those with prior stroke," says Carlo Vigna, M.D., of Casa Sollievo della Sofferenza IRCCS Hospital, San Giovanni Rotondo, Italy. "In the past, the beneficial effect on migraine was occasionally seen after PFO closure was performed for other reasons, for example, unexplained stroke. Conversely, the recently published MIST trial did not show significant improvement of symptoms in 'pure migraneurs' in the absence of symptomatic or subclinical cerebral ischemia. As compared with these two extremes, we enrolled patients with an intermediate subset of characteristics."

Patients were divided into either the closure (n=53) or control (n=29) group based on their consent to undergo percutaneous PFO closure, and prospectively examined for 6 months. Compared with the medically treated control group, closure of a PFO resulted in greater numbers of patients who had cessation of migraine attacks, cessation of disabling attacks and over 50 percent reduction in migraine attacks.

While this may be good news for certain migraine sufferers, researchers say a larger randomized trial focusing on this patient population is needed. In addition, the relationship between PFO and migraine must be further examined and understood.

"We don't really know what's going on. A stroke could be caused if a blood clot passes across a PFO and travels to the brain, but with migraine we don't yet know what the trigger substance is that crosses the shunt," says Dr. Peter Wilmshurst, Royal Shrewsbury Hospital, United Kingdom. "Not everyone with migraine has a PFO, and not everyone with a PFO has migraine; there are other causes that we don't yet understand."

Background: It is widely accepted that migraine is associated with higher rates of stroke. Research also suggests that people with migraine also have a higher prevalence of right-to-left shunts on contrast echocardiograms, which are, by and large, due to PFO - something each of us has while in the womb to divert blood away from the lungs. However, for one in four people, a hole remains after birth.

Diamond no longer nature's hardest material

* 13:03 16 February 2009 **by Jessica Griggs**

Diamond will always be a girl's best friend, but it may soon lose favour with industrial drillers.

The gemstone lost its title of the "world's hardest material" to man-made nanomaterials some time ago. Now a rare natural substance looks likely to leave them all far behind – at 58% harder than diamond.

Zicheng Pan at Shanghai Jiao Tong University and colleagues simulated how atoms in two substances believed to have promise as very hard materials would respond to the stress of a finely tipped probe pushing down on them.

Extreme conditions

The first, wurtzite boron nitride has a similar structure to diamond, but is made up of different atoms.

The second, the mineral lonsdaleite, or hexagonal diamond is made from carbon atoms just like diamond, but they are arranged in a different shape.

Only small amounts of wurtzite boron nitride and lonsdaleite exist naturally or have been made in the lab so until now no one had realised their superior strength. The simulation showed that wurtzite boron nitride would withstand 18% more stress than diamond, and lonsdaleite 58% more. If the results are confirmed with physical experiments, both materials would be far harder than any substance ever measured.

Doing those tests won't be easy, though. Because both are rare in nature, a way is needed to make enough of either of them to test the prediction.

Rare mineral lonsdaleite is sometimes formed when meteorites containing graphite hit Earth, while wurtzite boron nitride is formed during volcanic eruptions that produce very high temperatures and pressures.

Flexible friend

If confirmed, however, wurtzite boron nitride may turn out most useful of the two, because it is stable in oxygen at higher temperatures than diamond. This makes it ideal to place on the tips of cutting and drilling

tools operating at high temperatures, or as corrosion resistant films c on the surface of a space vehicle, for example.

Paradoxically, wurtzite boron nitride's hardness appears to come from the flexibility of the bonds between the atoms that make it up. When the material is stressed some bonds re-orientate themselves by about 90º to relieve the tension.

Although diamond undergoes a similar process, something about the structure of wurtzite boron nitride makes it nearly 80% stronger after the process takes place, says study co-author Changfeng Chen at the University of Nevada, Las Vegas, an ability diamond does not have.

Single crystals

Natalia Dubrovinskaia from the University of Heidelberg in Germany, has carried out similar research.

"This is important because any attempt to give an insight into the mechanism that improves a material's property, especially hardness, is technologically extremely significant," she told New Scientist.

The more that is understood about what influences the hardness of materials, the more it will become possible to design hard materials to order, she explains.

However, she points out that in order to prove the theory, single crystals of each material would be needed. So far there are no known ways to isolate or grow such crystals of either material.

Journal reference: *Physical Review Letters (DOI: 10.1103/PhysRevLett.102.055503)*

Gadget reads users' minds from their grip

* 11:14 17 February 2009 **by Colin Barras**

The functions of previously separate gadgets like cameras, phones, and music players have come together into single devices in recent years. But juggling all of those functions in one product with multiple personalities is not simple, and confusing interfaces plague many big-selling gadgets. But a new prototype that is able to predict what function its user wants from the way it is manipulated, shows a more intuitive way to tackle the problem.

"The ideal device would be a generic block, like a bar of soap, that knew the user's intent and could change its interface accordingly," says Brandon Taylor at the Massachusetts Institute of Technology.

Click on image for video

A basic version of this concept is already built into a handful of portable gadgets. Some smartphones automatically dim the screen when they sense they have been swung against a person's ear during a call. But Taylor and colleague Michael Bove have taken the idea much further.

Getting a grip

They have created a "bar of soap" device, with an LCD screen front and rear. It contains a three-axis accelerometer to measure its motion in 3D, and 72 sensors across its surface to track the position of the user's fingers.

The researchers tested their prototype on 13 users who were asked to pick up several times, holding it each time in turn as if it were a remote control, PDA, camera, games controller, or mobile phone. By analysing the output from the sensors, the team spotted patterns in the way the different users held the gadget, and their grip gave clues about how they expected the device to perform (see image, right).

Those results were used to program the soap bar to guess what was expected of it and respond appropriately by presenting an interface tailored for that function – when held as a camera, the LCD screens display a camera mode. For the best results the device has to be trained to a specific person, says Taylor, "there are variations across users." If trained on one person the device correctly "guesses" which mode to enter 95% of the time. That figure drops to around 70% for the general population.

Safety sensors

"From our work, we are convinced that grasp-recognition could be implemented as a useful user interface," says Taylor. He thinks it could be applied to a wide range of devices. For example, to give games controllers new types of input, or to prevent power tools switching on unless they sense they are being held in a safe way.

Patrick Baudisch works on computer-user interaction at the Hasso Plattner Institute in Potsdam, Germany, and Microsoft Research in Redmond, Washington. Touch-skins and accelerometers are already widely used, but combining the two to detect activities is a "clever" approach, he says. "The 90% success rate sounds promising for this type of prototype."

The device should be sensitive enough for the tasks Taylor envisions, Baudisch adds. "I can see how a well-designed device could help recognising the subtleties of a grip."

Taylor will present his work at the CHI 2009 conference in Boston, US, in April.

Iron overload: An important co-factor in the development of liver disease in alcoholics

Alcohol and iron are believed to have a synergistic effect in the development of liver injury. Furthermore, alcohol enhances iron absorption. Primary hemochromatosis is a genetic disorder, mostly resulting from mutations in the HFE gene, with a disturbance in the iron metabolism which leads to iron accumulation that may eventually result in liver disease. However, data regarding an association between iron metabolism, HFE mutations and alcoholic liver disease are inconclusive at present.

A research article to be published on January 7, 2009 in the World Journal of Gastroenterology addresses this question. A research team led by Professor Helena Cortez-Pinto, from Hospital Santa Maria in Lisbon, studied a group of heavy drinkers with and without liver disease. A high prevalence of iron overload was found in alcoholics, which appeared to be related to the development of liver disease [odds ration for having liver disease in alcoholics with transferrin saturation greater than 45% was 2.2 (95% CI 1.37-3.54)]. Regarding HFE mutations, only H63D was found to be associated with alcoholic liver disease [odds ratio 1.57 (95% CI 1.02-2.40)]. Alcoholics who were heterozygotes for H63D mutation and had evidence of iron overload, showed an even greater risk of developing liver disease [odds ratio 2.17 (95% CI 1.42-3.32)].

Based on these findings, it appears that iron overload is an important co-factor in the development of liver disease in alcoholics. Even heterozygotes for H63D mutation, who classically do not develop liver disease, had an increased susceptibility to liver disease, in the presence of excessive alcohol consumption.

Reference: *Machado MV, Ravasco P, Martins A, Almeida MR, Camilo ME, Cortez-Pinto H. Iron homeostasis and H63D mutations in alcoholics with and without liver disease. World J Gastroenterol 2009; 15(1): 106-111 http://www.wjgnet.com/1007-9327/15/106.asp*

An adjuvant chemotherapeutic agent in gastric cancer therapy

Peritoneal carcinomatosis can be thought of as a series of events that together form a peritoneal metastatic cascade. The peritoneal stromal tissue appears to be a friendly host for tumour proliferation, providing a rich source of growth factors and chemokines known to be involved in tumour metastasis. Till now, our understanding of the molecular mediators that orchestrate this cascade is weakly understood. Astragalus memebranaceus,a traditional Chinese herbal medicine used for the treatment of common cold , diarrhea, fatigue anorexia and cardiac diseases. In recent years, it has been proposed that Astragalus may possess anti-apoptosis potential in peritoneal mesothelial cell. In spite of this, the anti-apoptosis effects of Astragalus saponin extract in human peritoneal mesothelial cells during peritoneal carcinomatosishas has not been studied. In this study, the anti-apoptosis effects of Astragalus saponin extract were investigated in human peritoneal mesothelial cells during peritoneal gastric cancer metastasis.

A research article to be published on February 7, 2009 in the World Journal of Gastroenterology addresses this question. The research team led by Professor Hui-Mian Xu from Department of Oncology, The First Affiliated Hospital, China Medical University. Human peritoneal mesothelial cell line HMrSV5 was co-incubated with gastric cancer cell supernatant and/or Astragalus injection. Morphological changes were observed. Apoptosis was determined by transmission electron microscope. Apoptosis was also quantified by two methods: the detection of acridine orange/ethidium bromide-stained condensed nuclei by fluorescent microscopy and flow cytometry. The expressions of Bcl-2 and Bax were evaluated by immunostaining.

After 24h of being treated with gastric cancer cell supernatant, mesothelial cells presented morphological changes, exfoliation happened and naked areas appeared.

Cell supernatant from gastric cancer cell MKN45 were effective in inducing apoptosis in mesothelial cells in a time-dependent manner. Obvious morphological changes of cell apoptosis were found. Astragalus injection could partly suppress these changes, as well as regulate the expressions of Bcl-2 and Bax in mesothelial cells. These findings demonstrated that gastric cancer cell could induce the apoptosis of human peritoneal mesothelial cell through its supernatant. Astragalus injection could inhibit this kind of phenomenon and therefore, might represent an adjuvant chemotherapeutic agent in gastric cancer therapy.

Reference: Na D, Liu FN, Miao ZF, Du ZM, Xu HM. Astragalus extract inhibits destruction of gastric cancer cells to mesothelial cells by anti-apoptosis. World J Gastroenterol 2009;15(5): 570-577 http://www.wjgnet.com/1007-9327/15/570.asp

College-level documents for 8th grade readers

Study shows patients unable to read or understand their rights

Patients hoping to find out about their rights are unlikely to get the information they need from hospital documents designed precisely for that purpose. In reality, patients are presented with information written in legal jargon that the majority of them can neither read nor understand. These findings1 by Dr. Michael Paasche-

Orlow from Boston University's School of Medicine in the US, and his team, were just published online in Springer's Journal of General Internal Medicine.

Some forty years ago, notions of informed consent and autonomy were first officially endorsed and the concept of patients' rights emerged. In 1990, a condition of hospital accreditation was to inform every patient about their rights. Then in 2001, the US House of Representatives and US Senate passed bills to create a Federal Patients' Bill of Rights (PBOR). Many states now have Patients' Bill of Rights laws in place.

Ironically, these efforts to progress patients' rights are being held back by the use of overly complex language which far exceeds patients' average reading capacity, which is at the 8th grade level. Paasche-Orlow and his team analyzed PBOR statutes for general patient populations in 23 states and 240 hospital PBOR documents from 50 states. They assessed their readability by looking at a combination of reading level, complexity of sentences and vocabulary, and quality of writing style.

The hospital PBOR documents had an average readability at the level of the second year of college. In the nine states that stipulate that PBOR texts are to be distributed to patients, the average reading grade level of the materials was that of a college junior. Not only was the language patients are presented with extremely complex, it was also usually exclusively in English.

These findings show that an advanced college reading level is routinely required to read PBOR documents. Bearing in mind that the average reading level of an American adult is 8th grade, it is clear that the written information patients are given in US hospitals far exceeds their reading capacity.

The authors highlight several reasons why clinicians and patient advocates should be concerned about the readability and accessibility of the language in PBOR documents. In essence, giving patients unreadable legal jargon is a missed opportunity to present the patient care mission in a clear manner.

Paasche-Orlow concludes that: "Patients' rights statutes are designed to promote the ethical and humane treatment of patients. These goals will not be realized by presenting patients with documents they are not able to read and understand."

Reference *1. Paasche-Orlow MK et al (2009). National Survey of Patients' Bill of Rights Statutes. Journal of General Internal Medicine. DOI 10.1007/s11606-009-0914-z*

Enzyme weakens the heart

Genetic suppression protects from chronic cardiac insufficiency in animal tests / Heidelberg cardiologists publish findings in "Proceedings of the National Academy of Sciences"

An enzyme makes the mouse heart prone to chronic cardiac insufficiency – if it is suppressed, the heart remains strong despite increased stress. Cardiologists at the Internal Medicine Clinic at Heidelberg University Hospital in cooperation with scientists at the University of Texas Southwestern Medical Center at Dallas and Göttingen University Hospital have now explained this key mechanism in a mouse model and thus discovered a promising approach for the systematic prevention of chronic cardiac insufficiency. The study has now been published online before print in the prestigious journal "Proceedings of the National Academy of Sciences".

Long-term high pressure and stenoses of the valves or aorta make the heart work harder. When it compensates by excessive muscle growth (cardiac hypertrophy), the pump function is affected – rhythm disorders or heart failure can be the result. Other risk factors are overweight and age – more than 40 percent of people over age 70 suffer from cardiac muscle hypertrophy.

Despite progress in medication, around 95,000 people in Germany die annually from the consequences of chronic cardiac insufficiency. "It is essential to find the molecules that are key to the development of cardiac insufficiency in order to develop new, more efficient treatment" states Dr. Johannes Backs, head of a research group in the Department of Cardiology, Angiology, and Pneumonology (Director Prof. Dr. med. Hugo A. Katus) at Heidelberg University Hospital.

Enzyme activates stress response and hypertrophy of the heart

A key molecule for cardiac hypertrophy brought on by stress is the naturally occurring enzyme CaMKII delta (Calcium/Calmodulin-dependent kinase II delta). Dr. Backs' international research team proved this in genetically modified mice that could no longer produce this enzyme by surgically obstructing the main aorta to put the heart under greater stress and thus simulate permanent high blood pressure or valve stenosis in humans. The anticipated enlargement of the heart was very slight – the animals were protected.

"With these mice, we succeeded for the first time in specifically suppressing the CaMKII delta enzyme and clarifying its function in detail," said Dr. Backs. CaMKII delta has a direct effect on the cells' stress response. If it is missing, certain information in cell DNA is not accessed that is normally activated by stress, leading to hypertrophy of the heart. "There was still some slight enlargement of the heart, but presumably not enough to cause cardiac insufficiency," said Dr. Backs. Under normal conditions, the genetically modified mice are inconspicuous – their hearts function and react normally.

The function of CaMKII delta as an intermediate of the heart's stress response is a possible approach for effective therapy – the Heidelberg researchers anticipate that agents that block only this function of the enzyme would prevent the heart muscle from reacting to overload. Other functions of CaMKII delta should not be affected in order to avoid harmful side effects.

References: *Backs J, Backs T, Neef S, Kreusser MM, Lehmann LH, Patrick DM, Grueter CE, Qi X, Richardson JA, Hill JA, Katus HA, Bassel-Duby R, Maier LS, Olson EN. The delta isoform of CaM kinase II is required for pathological cardiac hypertrophy and remodeling after pressure overload. Proc Natl Acad Sci USA. 2009 Jan 28. [Epub ahead of print*

More information on the internet: http://www.klinikum.uni-heidelberg.de/Immunologie.106593.0.html

NASA study predicted outbreak of deadly virus

An early warning system, more than a decade in development, successfully predicted the 2006-2007 outbreak of the deadly Rift Valley fever in northeast Africa, according to a new study led by NASA scientists.

Rift Valley fever is unique in that its emergence is closely linked to interannual climate variability. Utilizing that link, researchers including Assaf Anyamba, a geographer and remote sensing scientist with the University of Maryland Baltimore County and NASA's Goddard Space Flight Center in Greenbelt, Md., used a blend of NASA and National Oceanic and Atmospheric Administration measurements of sea surface temperatures, precipitation, and vegetation cover to predict when and where an outbreak would occur.

The final product, a Rift Valley fever "risk map," gave public health officials in East Africa up to six weeks of warning for the 2006-2007 outbreak, enough time to lessen human impact. The researchers described their findings in the Proceedings of the National Academy of Sciences.

The first-of-its-kind prediction is the culmination of decades of research. During an intense El Niño event in 1997, the largest known outbreak of Rift Valley fever spread across the Horn of Africa. About 90,000 people were infected with the virus, which is carried by mosquitoes and transmitted to humans by mosquito bites or through contact with infected livestock.

The 1997 outbreak provoked the formation of a working group-funded by the U.S. Department of Defense Global Emerging Infections Surveillance and Response System-to see if predictions of an outbreak could be made operational. Such predictions would not only aid mitigation efforts in the endemic countries and protect the global public, but would help protect American civilian and military personnel located and traveling overseas, ensure the safety of imported goods and animals, and prevent infected humans or mosquitoes from entering the United States.

"To do all that, we need to understand a disease in the endemic region," Anyamba said.

The link between the mosquito life cycle and vegetation growth was first described in a 1987 Science paper by co-authors Kenneth Linthicum of the U.S. Department of Agriculture and Compton Tucker of NASA Goddard. Then, a subsequent 1999 Science paper described link between the disease and the El Niño-Southern Oscillation (ENSO). ENSO is a cyclical, global phenomenon of sea surface temperature changes that can contribute to extreme climate events around the world.

For some areas, the warm phase of ENSO brings drought, while in some areas like the Horn of Africa, ENSO leads to above-normal rainfall. Excessive, sustained rainfall awakens the eggs of mosquitoes infected with Rift Valley fever that can remain dormant for up to 15 years in dried-out dambos - shallow wetlands common in the region.

Building on that research, Anyamba and colleagues set out to predict when conditions were ripe for excessive rainfall, and thus an outbreak. They started by examining satellite measurements of sea surface temperatures. One of the first indicators that ENSO will bring an abundance of rainfall is a rise in the surface temperature of the eastern equatorial Pacific Ocean and the western equatorial Indian Ocean.

But perhaps the most telling indicator of a potential outbreak is a measure of the mosquito habitat itself. The researchers used a satellite-derived vegetation data set-processed at NASA Goddard and called the Normalized Difference Vegetation Index - that measures the landscape's "greenness." Greener regions have more than the average amount of vegetation, which means more water and more potential habitat for infected mosquitoes.

"Greenness describes habitat and represents life," Anyamba said. "Without such systematic, continuous Earth system measurements from satellites, we would not be able to translate the information into outbreak predictions."

The final product is a risk map for Rift Valley fever, showing areas of anomalous rainfall and vegetation growth over a three-month period. The forecast is updated and issued monthly as a means to guide ground-based mosquito and virus surveillance.

As early as September 2006, the monthly advisory from Anyamba and colleagues indicated an elevated risk of Rift Valley fever activity in East Africa. By November, Kenya's government had begun collaborating with non-governmental organizations to implement disease mitigation measures - restricting animal movement,

distributing mosquito bed nets, informing the public, and enacting programs to control mosquitoes and vaccinate animals. "There is no human vaccine," Anyamba said, "so prevention is critical."

Between two and six weeks later - depending on the location - the disease was detected in humans.

"Satellite data is a valuable tool that allowed us to look remotely at large sections of land in Africa and understand what was happening on the ground," Linthicum said.

After the 2006-2007 outbreak, Anyamba and colleagues assessed the effectiveness of the warning maps. They compared locations that had been identified as "at risk" with the locations where Rift Valley fever was reported.

Of the 1,088 cases reported in Kenya, Somalia, and Tanzania, 64 percent fell within areas delineated on the risk map. The other 36 percent of cases did not occur within "at risk" areas, but none were more than 30 miles away, leading the researchers believe that they had identified most of the initial infection sites.

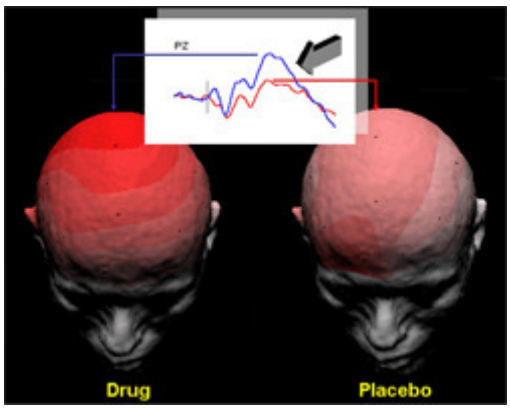
The potential for mapping the risk of disease outbreaks is not limited to Africa. Previous research has shown that risk maps are possible whenever the abundance of a virus can be linked to extremes in climate conditions. Chikungunya in east Africa and Hantavirus and West Nile virus in the United States, for example, have been linked to conditions of rainfall extremes.

"We are coming up on almost 30 years of vegetation data from satellites, which provides us with a good basis for predicting," Linthicum said upon returning from a Rift Valley fever workshop in Cairo, Egypt in January. "At this meeting, it was clear that using this tool as a basis for predictions has become accepted as the norm." *http://www.nasa.gov/topics/earth/features/riftvalley_fever.html*

Exploring new pathways to language

Temple research finds an ADHD drug could help individuals with aphasia regain language abilities.

When ABC journalist Bob Woodruff was injured while reporting in Iraq in 2006, he suffered severe head injuries that caused him to lose his ability to recall and produce common words - a condition called aphasia. Today, Woodruff has recovered most of his language skills thanks to intensive behavioral therapy - reading and repeating words and sounds.



"The standard of care for patients with aphasia has always been and will always be speech/language therapy, but a new area is opening up that looks at what drugs can be used in combination with therapy to enhance recovery from brain damage and help the brain repair itself," said Gerry Stefanatos, D.Phil., an associate professor of communication sciences and disorders in the College of Health Professions. "We're looking at the mechanism of how this combination works - it's underlying effect on patients with aphasia."

While most aphasia patients benefit from behavioral therapy to regain their language skills, a new area of treatment is opening up which looks at certain drugs to help augment the therapy. Temple's Gerry Stefanatos presented research this month which found that a medication commonly prescribed for ADHD can help process speech in the brain. The blue trace (above) represents brain electrical activity in response to speech during therapy while on the medication. **Art courtesy Gerry Stefanatos**

In research presented at the International Neurological Society this month, Stefanatos found that dextroamphetamine (D-AMPH), a drug commonly used to treat attention deficit hyperactivity disorder, improved the processing of speech among those suffering from Broca's aphasia and the similar Anomic aphasia.

"Improving a patient's attention and working memory may allow them to better focus and process information during therapy sessions," said Stefanatos. "Attention is critically important for learning and relearning skills, and could be helpful in forging new neural pathways in the brain."

The National Aphasia Association estimates some one million people in the United States live with aphasia, which is caused by lesions to the language centers of the brain. These lesions are often due to stroke or brain injury, but can also be the result of a brain tumor or progressive disease such as Parkinson's or Alzheimer's. Types of aphasia can range from a patient having difficulty finding and producing a word to a patient having no ability at all to speak or understand language.

Stefanatos' study looked at the use of D-AMPH in ten aphasia patients. All were also given a placebo for comparison purposes. In each condition, participants were asked to make decisions about different types of speech sounds (vowels, consonant-vowels) and complex tones. Their brain's electrical response to each was recorded via an electroencephalogram (EEG).

Those who took the D-AMPH had a strong reaction to the sounds - even to consonant-vowel sounds, which are more often difficult for individuals with aphasia to process.

"This tells us that D-AMPH may help the left hemisphere of the brain regain the ability to perform its functions," said Stefanatos. "Understanding why the drug is having this effect allows us to start to think about how to tailor treatments to make them more effective or explore alternative drugs or drug combinations."

Stefanatos said he and his team chose to look at this particular drug because in patients with ADHD it has been shown to stimulate the release of dopamine and epinephrine, which help in attention and learning. But he notes that some people aren't good candidates for this particular drug.

"Now that we have a rudimentary understanding of why the drug may work to enhance the results of therapy, our next step is to look at dose effects and perhaps other drugs with more favorable side effect profiles," said Stefanatos.

With collaborators from the departments of Radiology and Physical Medicine and Rehabilitation, Stefanatos will next study functional magnetic resonance imaging to explore the effects of D-AMPH on cerebral metabolism and where in the brain of individuals with aphasia it has the greatest effect.

Other authors on this study are Andrew DeMarco at Temple University, Robert Segal at McGill University in Quebec, and Arthur Gershoff, M.D. and Y. Ieuji of the Moss Rehab Stroke and Neurological Diseases Program, part of the Albert Einstein Healthcare Network in Philadelphia. This work was funded by grants from the National Institute of Health and the Pennsylvania Department of Health.

When dreaming is believing: Dreams affect people's judgment, behavior

Dreams can carry more weight than conscious thoughts, say researchers

Washington – While science tries to understand the stuff dreams are made of, humans, from cultures all over the world, continue to believe that dreams contain important hidden truths, according to newly published research.

In six different studies, researchers surveyed nearly 1,100 people about their dreams. "Psychologists' interpretations of the meaning of dreams vary widely," said Carey Morewedge, an assistant professor at Carnegie Mellon University and the study's lead author. "But our research shows that people believe their dreams provide meaningful insight into themselves and their world."

The article appears in the February issue of the Journal of Personality and Social Psychology, published by the American Psychological Association.

In one study that surveyed general beliefs about dreams, Morewedge and co-author Michael Norton, an assistant professor at Harvard Business School, surveyed 149 university students in the United States, India and South Korea. The researchers asked the students to rate different theories about dreams. Across all three cultures, an overwhelming majority of the students endorsed the theory that dreams reveal hidden truths about themselves and the world, a belief also endorsed by a nationally representative sample of Americans.

In another study reported in the article, the researchers wanted to explore how dreams might influence people's waking behavior. They surveyed 182 commuters at a Boston train station, asking them to imagine that one of four possible scenarios had happened the night before a scheduled airline trip: The national threat level was raised to orange, indicating a high risk of terrorist attack; they consciously thought about their plane crashing; they dreamed about a plane crash; or a real plane crash occurred on the route they planned to take. A dream of a plane crash was more likely to affect travel plans than either thinking about a crash or a government warning, and the dream of a plane crash produced a similar level of anxiety as did an actual crash.

Finally, the researchers wanted to find out whether people perceive all dreams as equally meaningful, or whether their interpretations were influenced by their waking beliefs and desires. In another study, 270 men and women from across the United States took a short online survey in which they were asked to remember a dream they had had about a person they knew. People ascribed more importance to pleasant dreams about a person they liked as compared to a person they did not like, while they were more likely to consider an unpleasant dream more meaningful if it was about a person they disliked.

"In other words," said Morewedge, "people attribute meaning to dreams when it corresponds with their pre-existing beliefs and desires. This was also the case in another experiment which demonstrated that people who believe in God were likely to consider any dream in which God spoke to them to be meaningful; agnostics, however, considered dreams in which God spoke to be more meaningful when God commanded them to take a pleasant vacation than when God commanded them to engage in self-sacrifice."

The authors say more research is needed to explore fully how people interpret their dreams, and in what cases dreams may actually reveal hidden information.. "Most people understand that dreams are unlikely to predict the future but that doesn't prevent them from finding meaning in their dreams, whether their contents are mundane or bizarre," said Morewedge.

***Article:** "When Dreaming Is Believing: The (Motivated) Interpretation of Dreams," Carey K. Morewedge, PhD, Carnegie Mellon University, Michael I. Norton, PhD, Harvard University; Journal of Personality and Social Psychology, Vol. 96, Issue 2. (Full text of the article is available from the APA Public Affairs Office and at http://www.apa.org/journals/releases/psp962249.pdf)*

In flurry of studies, researcher details role of apples in inhibiting breast cancer

By Susan Lang

Six studies published in the past year by a Cornell researcher add to growing evidence that an apple a day - as well as daily helpings of other fruits and vegetables - can help keep the breast-cancer doctor away.

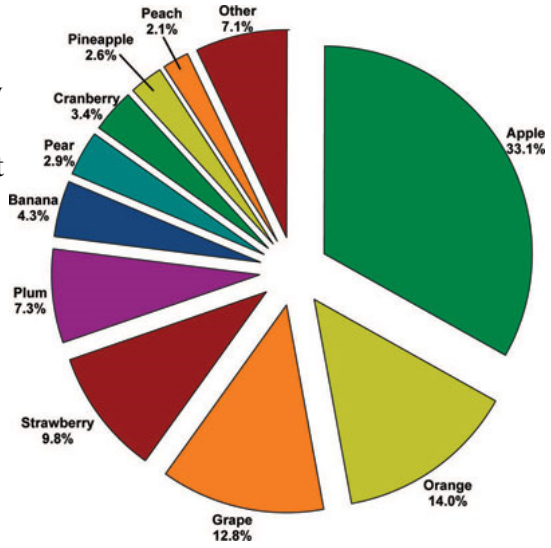
In one of his recent papers, published in the Journal of Agricultural and Food Chemistry (57:1), Rui Hai Liu, Cornell associate professor of food science and a member of Cornell's Institute for Comparative and Environmental Toxicology, reports that fresh apple extracts significantly inhibited the size of mammary tumors in rats - and the more extracts they were given, the greater the inhibition.

"We not only observed that the treated animals had fewer tumors, but the tumors were smaller, less malignant and grew more slowly compared with the tumors in the untreated rats," said Liu, pointing out that the study confirmed the findings of his preliminary study in rats published in 2007.

In his latest study, for example, he found that a type of adenocarcinoma - a highly malignant tumor and the main cause of death of breast-cancer patients, as well as of animals with mammary cancer - was evident in 81 percent of tumors in the control animals. However, it developed in only 57 percent, 50 percent and 23 percent of the rats fed low, middle and high doses of apple extracts (the equivalent of one, three and six apples a day in humans), respectively, during the 24-week study.

"That reflects potent anti-proliferative [rapid decrease] activity," said Liu.

The studies highlight the important role of phytochemicals, known as phenolics or flavonoids, found in apples and other fruits and vegetables. Of the top 25 fruits consumed in the United States, Liu reported in the same journal (56:18) that apples provide 33 percent of the phenolics that Americans consume annually.



This chart from one of Liu's recent papers shows the percentage of phenolics (phytochemicals) that Americans get from various fruits. **Provided**

In a study of apple peel published in the same journal (56:21), Liu reported on a variety of new phenolic compounds that he discovered that also have "potent antioxidant and anti-proliferative activities" on tumors. And in yet another study in the same journal (56:24), he reported on his discovery of the specific modulation effects that apple extracts have on cell cycle machinery. Recently, Liu's group also reported the finding that apple phytochemicals inhibit an important inflammation pathway (NFkB) in human breast cancer cells.

Breast cancer is the most frequently diagnosed invasive cancer and the second leading cause of cancer deaths in women in the United States, said Liu.

"These studies add to the growing evidence that increased consumption of fruits and vegetables, including apples, would provide consumers with more phenolics, which are proving to have important health benefits. I would encourage consumers to eat more and a wide variety of fruits and vegetables daily."

The studies were supported, in part, by the American Institute for Cancer Research, the Ngan Foundation and the U.S. Apple Association.

Basics

In Pain and Joy of Envy, the Brain May Play a Role

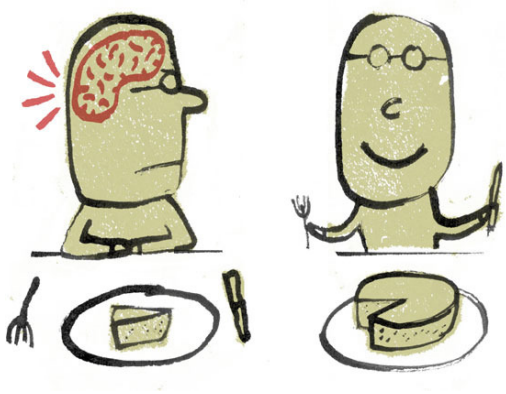
By Natalie Angier

Most human vices have enough sense to be very, very tempting. Lust, gluttony, sloth, hurling powerful if unimaginative expletives at a member of the political opposition, buying a pair of Thierry Rabotin snakeskin printed shoes at 25 percent off even though you just bought a pair of cherry-red slingbacks last week - all these things feel awfully good to indulge in, which is why people must be repeatedly abjured not to.

One vice, however, dispenses with any hedonic trappings and instead feels so painful you would think it was a virtue, except that there's no gain in lean muscle mass at the end: envy. Skulking at sixth place on traditional lists of the seven deadly sins, right between wrath and pride, envy is the deep, often hostile resentment you feel toward somebody who has something you want, like wealth, beauty, a promotion or the admiration of peers. It is a vice few can avoid yet nobody craves, for to experience envy is to feel small and inferior, a loser shrink-wrapped in spite.

"Envy is corrosive and ugly, and it can ruin your life," said Richard H. Smith, a professor of psychology at the University of Kentucky who has written about envy. "If you're an envious person, you have a hard time

appreciating a lot of the good things that are out there, because you're too busy worrying about how they reflect on the self."



Now researchers are gleaning insights into the neural and evolutionary underpinnings of envy, and why it can feel like a bodily illness or a physical blow. They're also tracing the pathway of envy's equally petty foil, the sensation of schadenfreude - taking pleasure when those whom you envied are themselves brought down low.

Reporting in the current issue of the journal Science, researchers at the National Institute of Radiological Sciences in Japan and their colleagues described brain-scanning studies of subjects who were told to imagine themselves as protagonists in social dramas with characters of greater or lesser status or achievement. When confronting characters that the participants admitted to envying, brain regions involved in registering physical pain were aroused: the higher the subjects rated their envy, the more vigorously flared the pain nodes in the brain's dorsal anterior cingulate cortex and related areas.

Conversely, the researchers said, when subjects were given a chance to imagine the golden one's downfall, the brain's reward circuits were activated, again in proportion to the strength of envy's sting: the subjects who felt the greatest envy the first time around reacted to news of their rival's misfortune with a comparatively livelier response in the dopamine-rich pleasure centers of, for example, the ventral striatum. "We have a saying in Japanese, 'The misfortunes of others are the taste of honey,' " said Hidehiko Takahashi, the first author on the report. "The ventral striatum is processing that 'honey.' "

Matthew D. Lieberman of the psychology department at the University of California, Los Angeles, who co-wrote a commentary that accompanies the report, said he was impressed by how the neural correlates of envy and schadenfreude were tied together, with the magnitude of one predicting the strength of the other. "This is the way other needs-processing systems like hunger and thirst work," he said. "The hungrier or thirstier that you feel, the more pleasurable it is when you finally eat or drink."

The new findings are preliminary, and some scientists have expressed reservations about what they or other scanning results from the fast-moving field of behavioral neuroscience really mean. Nevertheless, the research throws a spotlight on a potent emotion that we deny or deride but ignore at our peril. Much of the recent economic crisis, Dr. Smith suggested, may well have been fueled by runaway envy, as financiers competed to avoid the shame of being a "mere" millionaire.

Envy can be seen in other social animals with personal reputations to defend. Frans de Waal of the Yerkes National Primate Research Center in Atlanta noted that monkeys were perfectly happy to work for cucumber slices until a person started giving one monkey a preferred treat like grapes. Then the others stopped working for cucumbers and started nursing a grudge. "The underlying emotion is likely envy or resentment," Dr. de Waal said.

When children realize they have siblings, their lives become dominated by the calipers of envy. Why does she always get to sit by the window? His cupcake has more sprinkles! No siblings? No problem: you can envy the cat.

Researchers often distinguish between envy and the jealousy you feel by, say, seeing a loved one flirt at a party. Jealousy is a triangle, Dr. Smith said, in which you fear losing a loved one to the embrace of another. Envy is a two-bodied affair, an arrow proceeding from your covetous breast to the heart of the well-endowed Other. Yet envy is restless and gregarious and can embrace popular cliques, honor rolls and entire nation-states. "It's a fact of life that we pay close attention to status, to who's doing well and who isn't and how we stand in comparison to others," said Colin W. Leach, an associate professor of psychology at the University of Connecticut, in Storrs, who studies envy.

As a rule, we envy those who are like us in most ways - in sex, age, class and curriculum vitae. Potters envy potters, Aristotle observed.

Paradoxically, this most socially driven of emotions is among the least socially acceptable to confess to. Jealous hostility toward a romantic rival is an acceptable topic for conversation. Envious hostility toward a professional rival is more like an embarrassing body function: please do not share. When asked by researchers about their envy, study participants have said, "I'm privately ashamed of myself."

As evolutionary scientists see it, envy's salient features - its persistence and universality, its fixation with social status and the fact that it cohabits with shame - suggest that it serves a deep social role. They propose that our invidious impulses may help explain why humans are comparatively less hierarchical than many primate

species, more prone to a rough egalitarianism and to rebelling against kings and tycoons who hog more than their fair share.

Envy may also help keep us in line, making us so desperate to look good that we take the high road and start to act good, too. We struggle with our private envy, our longing for more esteem than we command, and the struggle only sharpens the painful contrast between the imagined perfection of the envied adversary that we have enshrined on an imaginary throne, and the defective merchandise that is ourselves.

“If you desire glory, you may envy Napoleon,” Bertrand Russell said. “But Napoleon envied Caesar, Caesar envied Alexander, and Alexander, I daresay, envied Hercules, who never existed.” If envy is a tax levied by civilization, it is one that everyone must pay.

Athletes' own blood could nurse them to health

By Alan Schwarz Tuesday, February 17, 2009

Two of the Pittsburgh Steelers' biggest stars, Hines Ward and Troy Polamalu, used their own blood in an innovative injury treatment before winning the Super Bowl. At least one major league pitcher, about 20 professional soccer players and perhaps hundreds of recreational athletes have also undergone the procedure, commonly called platelet-rich plasma therapy.

The technique's early promise is reassuring experts in sports medicine that platelet-rich plasma therapy, which is strikingly straightforward and easy to perform, could eventually improve the treatment of stubborn injuries like tennis elbow and knee tendinitis for athletes of all types.

The method centers on injecting portions of a patient's own blood directly into the injured area, which catalyzes the body's instincts to repair muscle, bone and other tissue. Most enticing, many doctors said, is that the technique appears to help regenerate ligament and tendon fibers, which could shorten rehabilitation time and possibly obviate surgery.

Research into the effects of platelet-rich plasma has accelerated in recent months, with most doctors cautioning that more rigorous studies are necessary before the therapy can emerge as scientifically proven. But many researchers suspect that the procedure could become an increasingly attractive course of treatment for reasons both medical and financial.

"It's a better option for problems that don't have a great solution - it's non-surgical, and uses the body's own cells to help it heal," said Dr. Allan Mishra, an assistant professor of orthopedics at Stanford University Medical Center and one of the primary researchers in the field. "I think it's fair to say that platelet-rich plasma has the potential to revolutionize not just sports medicine but all of orthopedics. It needs a lot more study, but we are obligated to pursue this."

Dr. Neal ElAttrache, the Los Angeles Dodgers' team physician, used platelet-rich plasma therapy in July on a partially torn ulnar collateral ligament in the throwing elbow of pitcher Takashi Saito. Surgery would have ended Saito's season and shelved him for about 10 to 14 months; he instead returned to pitch in the September pennant race without pain.

While ElAttrache said he could not be certain that the procedure caused the pitcher's recovery - about 25 percent of such cases heal on their own, he said - it was another encouraging sign for the nascent technique, which doctors in the field said could help not just injuries to professional athletes but the tendinitis and similar ailments found in the general population.

"For the last several decades, we've been working on the mechanical effects of healing - the strongest suture constructs, can we put strong anchors in," ElAttrache said. "But we've never been able to modulate the biology of healing. This is addressing that issue. It deserves a lot more study before we can say that it works with proper definitiveness. The word I would use is promising."

Platelet-rich plasma is derived by placing a small amount of the patient's blood in a filtration system or centrifuge that rotates at high speed, separating red blood cells from the platelets that release proteins and other particles involved in the body's self-healing process. A teaspoon or two of the remaining substance is then injected directly onto the damaged area. The high concentration of platelets - from 3 to 10 times that of normal blood - often catalyzes the growth of new soft-tissue or bone cells.

Because the substance is injected where blood would rarely go otherwise, it can deliver the healing instincts of platelets without triggering the clotting response for which platelets are typically known. “This could be a method to stimulate wound healing in areas that are not well-vascularized, like ligaments and tendons," said Dr. Gerjo van Osch, a researcher in the department of orthopedics at Erasmus University Medical Center in the Netherlands. "I call it a growth factor cocktail - that's how I explain it."

Van Osch and several other experts said they had used the procedure as a first option before surgery for reasons beyond its early results. There is little chance for rejection or allergic reaction because the substance is autologous, meaning it comes from the patient's own body; the injection carries far less chance for infection

than an incision, and leaves no scar; and it takes only about 20 minutes, with a considerably shorter recovery time than after surgery.

Because of those apparent benefits, the consensus among doctors is that the procedure is not controversial. However, several doctors emphasized that platelet-rich plasma therapy as it stands now appears ineffective in about 20 to 40 percent of cases, depending on the injury. But they added that because the procedure costs about $2,000 - compared to $10,000 to $15,000 for surgery - they expect that with more refinement, insurance companies will eventually not only authorize the use of PRP therapy but even require it as a first course of treatment.

Mishra said that he was particularly encouraged by PRP therapy's effectiveness on chronic elbow tendinitis, or tennis elbow. For a 2006 study published by The American Journal of Sports Medicine, he used the treatment on 15 of 20 patients who were considering surgery; the five others received only anaesthetic. Two months later, the patients receiving PRP therapy noted a 60 percent improvement in pain measurements, compared with 16 percent for the control group.

Van Osch is currently performing a double-blind, randomized study on 54 patients with Achilles' tendon injuries, while doctors in the United States, India, Sweden and elsewhere are performing formal trials on PRP therapy's performance with rotator-cuff shoulder strains, partial knee-ligament tears and bone fractures. Studies also are examining PRP therapy's possible use in conjunction with surgery, which a group in Spain used on Achilles' tendon ruptures and found recovery time reduced.

"The guy who plays softball on weekends, the woman who runs a 5k race every now and then, they suffer very common injuries," said Samir Mehta, the chief of the orthopaedic trauma service at the Hospital of the University of Pennsylvania who has performed PRP therapy on nine patients. "It's for those people that we hope that this therapy's uses can be more apparent."

The possibilities of platelet-rich plasma are certainly apparent to the Pittsburgh Steelers. Polamalu, an all-pro safety, had the procedure for a strained calf after a playoff game and, although the injury was not considered particularly serious, he returned healthy enough the following Sunday against the Baltimore Ravens to return an interception 40 yards for a touchdown.

The technique played its most glaring role with Ward, a receiver who left that Baltimore game in the first quarter with a sprain of the medial collateral ligament in his right knee. The next day he was injected with a form of PRP therapy called autologous conditioned plasma, which features different proportions of platelets and other cells. Along with strenuous rehabilitation and hyperbaric oxygen therapy, Ward recovered enough to make two catches in the Super Bowl, in which the Steelers beat the Arizona Cardinals.

"I was next in line, the next guinea pig," Ward said, referring to Polamalu's experience with platelet-rich plasma. "I think it really helped me. The injury that I had was a severe injury, maybe a four- or six-week injury. In order for me to go out there and play in two weeks, I don't think anyone with a grade-2 M.C.L. sprain gets back that fast."

Professional sports teams have great financial incentive to pursue decreasing athletes' rehabilitation even one week. Last year, Major League Baseball's 30 teams had 519 players spend 28,602 days on the disabled list - representing $455 million in total salary sitting idle - according to data compiled by Baseball Prospectus.

"Let's say a soccer player is out six weeks - if you can cut week or two off, that equates to two, three, four games," said Dr. Michael Gerhardt, the team physician for Major League Soccer's Chivas USA and Los Angeles Galaxy clubs. He said that he had administered PRP therapy to about 20 players with medial collateral ligament injuries, and has found an average decrease in recovery time of 25-30 percent.

But most doctors said that if platelet-rich plasma is scientifically proven to be safe and effective, its largest effects will be on the amateur, weekend-warrior athletes for whom sports is both recreation and healthy lifestyle. Said Stanford's Mishra: "It's not just the professional athlete who needs to get back to their game. Everyone wants to get back to what they do for play or for work."

Report of 'organ tourism' stirs new Japan-China controversy

By Mark McDonald Tuesday, February 17, 2009

HONG KONG: China said Tuesday it was investigating whether 17 Japanese tourists had received illegal kidney and liver transplants in China.

"China strongly opposes organ transplant tourism," the Ministry of Health said Tuesday in a statement on its Web site, adding that the hospitals and medical personnel "who carried out the organ transplants against the rules will be severely dealt with according to the law."

China has banned all transplants for foreigners - so-called "organ tourists" - because an estimated 1.5 million Chinese are on waiting lists for transplants. The ban was issued May 1, 2007.

The ministry's investigation, reported in the state-run newspaper China Daily, comes after a report by the Kyodo News agency in Japan that the 17 tourists had spent the equivalent of $87,000 each for the operations. The price reportedly included travel, accommodation and 20 days of treatment at a hospital in Guangzhou, in southern China.

At the request of the hospital, some of the Japanese patients registered under Chinese names, the Kyodo report said. Most of the patients were between 50 and 65 years old.

The agency also said most of the organs were probably harvested from executed Chinese prisoners.

Chinese officials have said the state uses only those prisoners' organs that have been voluntarily donated. Courts, doctors, health officials and hospitals must approve such transplants, and the prisoners must agree in writing, the government said.

China Daily reported that China was second only to the United States in the number of transplant operations performed each year.

"Due to the lack of organ donors, shortage of organs is a problem in all countries, not just China," Mao Qunan, a Health Ministry spokesman, said at a recent news briefing. "Priority must be given to domestic patients in urgent need of an operation."

Last year, the deputy health minister, Huang Jiefu, said his ministry had punished three Chinese hospitals for selling organs to foreigners. The revelation, reported in local media, came in remarks Huang made at a medical conference in Shanghai.

An investigation in China in 2004 by the British newspaper The Independent found a flourishing underground trade in organ sales and transplants, especially for Japanese patients. And in 2006, a reporter from the BBC went to a public hospital in the city of Tianjin, ostensibly to arrange a liver transplant for his ailing father. The reporter said hospital officials told him a suitable liver could be available in three weeks.

Earlier this month, after years of controversy over organ trafficking in China, the government said it would establish a registry for organ donors and recipients.

It was not immediately clear whether news of the scandal would inflame anti-Japanese sentiment in China. Relations between the two countries can be fragile, with even old hurts still sensitive.

There was uproar on the Internet and outrage in China's state-run media in 2003 when 400 Japanese men and 500 Chinese prostitutes held a three-day sex party at a hotel in the southern city of Zhuhai. A court sentenced 14 Chinese citizens to prison - the hotel's general manager and a prostitute received life terms - and China sought an Interpol warrant against three Japanese organizers.

The final day of the debauchery fell on Sept. 18, the anniversary of what China considers the start of the Japanese occupation of Manchuria in 1931. While apparently coincidental, the timing angered many in China who believe that Japan has not fully atoned for its incursions into Chinese territory and wartime brutality, including large-scale rapes.

Kyodo also reported in November that the police in Yokohama were questioning a 52-year-old Japanese man on suspicion of brokering organ transplants for Japanese tourists in China.

A court in Shenyang, China, had previously found the man guilty of false advertising in connection with an alleged organ-transplant brokerage he ran over the Internet. Hiroyuki Nagase, who received a 14-month prison term and a fine in China, was deported to Japan after serving his sentence, Chinese state media reported.

Brokering organ transplants is illegal in Japan, and Nagase is also suspected of arranging transplants in the Philippines, Kyodo said, citing unnamed sources.

Stem cell 'cure' boy gets tumour

A boy treated with foetal stem cells for a rare genetic disease has developed benign tumours, raising questions about the therapy's safety.

The boy, now 17, received the stem cells in 2001 at a Moscow hospital and four years later scans showed brain and spinal tumours, PLoS Medicine reports.

Stem cells have been linked with cancer in animals

Israeli doctors removed the abnormal growth from his spine and tests suggest it sprouted from the stem cells. Critics say the finding is evidence against the controversial therapy.

Apart from the ethics of using cells taken from embryos, opponents say there are big safety concerns. As well as the possibility that stem cells may turn cancerous, some researchers fear that it is possible that stem cell therapy could unwittingly pass viruses and other disease causing agents to people who receive cell transplants.

Experimental therapy

Experts are hopeful that stem cells, which have the ability to develop into other kinds of human cells, will eventually lead to treatments for some of the most intractable conditions.

The boy in question was treated for a condition called Ataxia Telangiectasia - a genetic disease that attacks the brain region controlling movement and speech.

He received three courses of foetal stem cell injections to the brain and the fluid surrounding the spine. Four years after his first injection he was investigated for recurrent headaches and his doctors at the Sheba Medical Centre in Tel Aviv found two tumours - one in the spine and one in the brain at the same sites the injections had been given. A year later, when the boy was 14, the doctors removed the non-cancerous tumour from his spine and it was found to contain cells that could not have arisen from the patient's own tissue and had in all probability grown from the donated stem cells.

Although they were unable to sample the growth in the boy's brain, the scientists believe this probably arose from the injected stem cells too.

Donor-derived cells might have been able to spark tumours in this patient because people with Ataxia Telangiectasia often have a weakened immune system, say the researchers. It is not clear whether the stem cell therapy helped his genetic condition.

Safety fears

They say the findings "do not imply that the research in stem cell therapeutics should be abandoned."

Nonetheless, they say more work should be done to assess the safety of this therapy.

Josephine Quintavalle of the public interest group Comment on Reproductive Ethics said: "The risks of tumour formation in association with embryonic stem cells are widely acknowledged and one reason why there are very serious concerns about the proposed use of such cells in treating spinal cord injury in the US.

"It would appear from this report that foetal stem cells are similarly unstable. These are not areas of therapy we should be rushing into, whatever the ethical debates surrounding the use of embryo or foetal tissue per se."

Stem cell scientist Dr Stephen Minger, of King's College London, said it was clear that the tumours had arisen from the transplanted cells. "This is worrying and we have to be cautious. We need to have long term monitoring and follow up of the patients given stem cells and rigorous regulation of centres providing cell therapy. "Although this is just one case it does show that we need to be careful about the cell populations we are using." He said not all clinics used good quality cells.

Hope over peanut allergy 'cure'

A group of children with peanut allergies have had their condition effectively cured, doctors believe.

A team from Cambridge's Addenbrooke's Hospital exposed four children to peanuts over a six-month period, gradually building up their tolerance. By the end the children were eating the equivalent of five peanuts a day.

It is the first time a food allergy has been desensitised in such a way, although a longer-term follow up is now needed to confirm the findings.

Peanut allergies affect one in 50 young people in the UK and commonly cause breathing problems. But at their most serious, they can lead to a potentially life-threatening anaphylactic shock.

The Cambridge team started the children on tiny 5mg daily doses of peanut flour before they trained their bodies up to cope regularly with 800mg - the equivalent to five whole peanuts.

Kate Frost, the mother of a nine-year-old who was one of the four participants, said: "It's very hard to describe how much of a difference it's made - not just in Michael's life, but for all of us. "A peanut allergy affects the whole family. You can't go out to a restaurant. If your child goes to a birthday party, he takes a packed lunch."

The concept of desensitising people to allergies has been successfully done with bee and wasp stings and pollen allergies, but this is the first time it has been achieved with a food-related allergy.

A few trials were done in the 1990s using peanut injections, but these were not successful.

'Quality of life'

Dr Andy Clark, who led the research published in the journal Allergy, said: "Every time people with a peanut allergy want something, they're frightened that it might kill them. "Our motivation was to find a treatment that would change that and give them the confidence to eat what they like. It's all about quality of life. "It's not a permanent cure, but as long as they go on taking a daily dose they should maintain their tolerance."

The team have now expanded the study to include another 18 children and say there is no reason why the technique would not work for adults.

John Collard, the clinical director of Allergy UK, said it was "an important step forward".

"This could make a real difference, but at this stage it is too early to tell whether it will work for everyone. We need to see it used on more people and over a long period of time."

Skylon spaceplane gets cash boost

By Jonathan Amos Science reporter, BBC News

An innovative UK launcher concept is to get 1m euros (£900,000) of investment from the European Space Agency (Esa).

Skylon would be totally reusable

The Skylon spaceplane would take off from a conventional aircraft runway, carry over 12 tonnes to orbit and then return to land on the same runway. The money will help prove the vehicle's core technologies, including its Sabre air-breathing rocket engine.

Reaction Engines, the company behind the project, believes its reusable launcher could fly within 10 years.

Alan Bond, the Oxfordshire firm's managing director, said: "Traditional throw-away rockets costing more than a $100m per launch are a drag on the growth of this market.

"The Holy Grail to transform the economics of getting into space is to use a truly reusable space-plane capable of taking off from an airport and climbing directly into space, delivering its satellite payload and automatically returning safely to Earth." The Skylon concept's key enabling technology is its Sabre propulsion system.

It is part jet engine, part rocket engine. It burns hydrogen and oxygen to provide thrust - but in the lower atmosphere this oxygen is taken from the atmosphere. At high speeds, this requires Sabre cope with 1,000 degree gasses entering its intake. These need to be cooled prior to being compressed and burnt with the hydrogen.

Reaction Engines' breakthrough is a remarkable heat exchanger pre-cooler. Arrays of extremely fine piping plunge the hot intake gases to minus 130C in just 1/100th of a second.

The Esa money comes from the agency's technology development programmes and contributes to a total programme of investment in Skylon worth almost £6m. It will enable Reaction Engines to build a full test pre-cooler at its facility at Culham. Other aspects of the Skylon design will be investigated by EADS Astrium, the German space agency (DLR) and the University of Bristol.

Skylon would operate like more traditional transportation systems

Europe already has a very capable expendable rocket system in the Ariane 5, but Esa constantly has one eye on the future and the technologies that will provide the next generation of launch systems.

Guaranteed access to space for its member states is one of Esa's primary objectives, but lowering the cost of that access is also important. The "brochure price" for an Ariane 5 is about 160m euros (£140m).

'Good position'

"People are looking for the technologies which are going to enable us to really transform the economics of putting stuff up into space," said UK science minister Lord Drayson. "Britain is well placed here. The Skylon project is a good example; but I'd also point to Surrey Satellite Technology Limited with their microsatellites that are a fraction of the price of conventional satellites.

"We're in a promising position as a country to be working on those areas of technology that are applicable to the future of space research," he told BBC News.

Lord Drayson said the coming year was an exciting one for the UK as it finessed its policies in the light of an important review being undertaken into space activity and exploration. The minister said it was possible a new structure - meaning a dedicated UK space agency - was needed to oversee this future.

"We need to ask ourselves, 'are we as well organised as we can be to make the best from this good position we've got?' We haven't made any decisions about this yet because I'm waiting for this review to come to me."

Forget the antioxidants? McGill researchers cast doubt on role of free radicals in aging

Some organisms live longer when their ability to rid themselves of free radicals is partially disabled

This release is available in French.

For more than 40 years, the prevailing explanation of why we get old has been tied to what is called oxidative stress. This theory postulates that when molecules like free radicals, oxygen ions and peroxides build up in cells, they overwhelm the cells' ability to repair the damage they cause, and the cells age.

An industry of "alternative" antioxidant therapies - such as Vitamin E or CoQ10 supplements in megadose format -has sprung up as the result of this theory. However, clinical trials have not shown that these treatments have statistically significant effects.

And now researchers at McGill University, in a study published in the February issue of the journal PLoS Genetics, are calling the entire oxidative stress theory into question. Their results show that some organisms actually live longer when their ability to clean themselves of this toxic molecule buildup is partially disabled. Collectively, these molecules are known as reactive oxygen species, or ROS for short.

Dr. Siegfried Hekimi of McGill's Department of Biology, said most of the evidence for the oxidative stress theory is circumstantial, meaning oxidative stress could just as easily be a result of aging as its cause.

"The problem with the theory is that it's been based purely on correlative data, on the weight of evidence," explained Hekimi, McGill's Strathcona Chair of Zoology and Robert Archibald & Catherine Louise Campbell Chair in Developmental Biology. "It is true that the more an organism appears aged, whether in terms of disease, or appearance or anything you care to measure, the more it seems to be suffering from oxidative stress".

"This has really entrenched the theory," he continued, "because people think correlation is causation. But now this theory really is in the way of progress."

Hekimi and postdoctoral fellow Jeremy Van Raamsdonk studied mutant Caenorhabditis elegans worms. They progressively disabled five genes responsible for producing a group of proteins called superoxide dismutases (SODs), which detoxify one of the main ROS. Earlier studies seemed to show that decreased SOD production shortened an organism's lifespan, but Hekimi and Van Raamsdonk did not observe this. In fact, they found quite the opposite.

None of their mutant worms showed decreased lifespan compared to wild-type worms, even though oxidative stress was clearly raised. In fact, one variety actually displayed increased lifespan, the researchers said.

"The mutation that increases longevity affects the main SOD found in mitochondria inside the animals' cells," said Hekimi. "This is consistent with earlier findings that mitochondria are crucial to the aging process. It seems that reducing mitochondrial activity by damaging it with ROS will actually make worms live longer."

The researchers hasten to point out that they are not suggesting that oxidative stress is good for you. "ROS undoubtedly cause damage to the body," Hekimi said. "However, they do not appear to be responsible for aging."

On The Web: *http://dx.plos.org/10.1371/journal.pgen.1000361*

Anthropologist's studies of childbirth bring new focus on women in evolution

Article by Tracey Bryant

Feb. 16, 2009 - Contrary to the TV sitcom where the wife experiencing strong labor pains screams at her husband to stay away from her, women rarely give birth alone. There are typically doctors, nurses and husbands in hospital delivery rooms, and sometimes even other relatives and friends. Midwives often are called on to help with births at home.

Assisted birth has likely been around for millennia, possibly dating as far back as 5 million years ago when our ancestors first began walking upright, according to University of Delaware paleoanthropologist Karen Rosenberg. She says that social assistance during childbirth is just one aspect of our evolutionary heritage that makes us distinctive as humans.

Rosenberg, who is a professor and chairperson of the Department of Anthropology at the University of Delaware, presented a talk on natural selection and childbirth on Feb. 13 at the annual meeting of the American Association for the Advancement of Science in Chicago. It was part of the symposium “The Invisible Woman in Evolution: Natural Cycle and Life-Cycle Events,” which Rosenberg co-organized.

The meeting's theme, “Our Planet and Its Life: Origins and Futures,” commemorated the 200th anniversary of Charles Darwin's birth and the 150th anniversary of the publication of his book On the Origin of Species by Means of Natural Selection.

“Humans need helpers in childbirth because it is difficult and potentially dangerous,” Rosenberg says. “While it's not so risky today - maternal mortality is low - as recently as two generations ago, it was not uncommon to hear of women dying in childbirth.”

Through fossil records and comparisons of humans with other primates, Rosenberg says that anthropologists can now show how the uniquely human traits of bipedalism, large brains, infant helplessness and social assistance all came together, resulting in the challenging and somewhat dangerous manner in which humans give birth.

When our ancestors evolved to begin walking on two legs, Rosenberg says, this upright posture created a wide but short opening in the pelvis in which the baby must travel, requiring a new form of birth so that the baby could find its way through a now tight birth canal.

According to Rosenberg, the average pelvic opening in women today is 13 centimeters at its largest diameter and 10 centimeters at its smallest. The average infant head is 10 centimeters from front to back, and the shoulders are 12 centimeters across. And today the birth canal is a twisty tunnel subjecting the infant to a series of complex twists and turns on its way out.

"Until recently, there was a sexism in the study of evolution," Rosenberg says. "Researchers focused on men and the tools they used in hunting, and these things were more difficult to connect to reproductive success and hence to natural selection," she notes. "With childbirth, as well as many of the other things that happen to women - pregnancy, nursing, menopause - it's really easy to see how natural selection works," Rosenberg notes.

Childbirth is just one of a series of examples throughout a woman's life cycle, in which enlisting the help of other women significantly improves reproductive outcomes, according to Rosenberg.

"Women take up the slack for other women when they are pregnant and nursing so that they have the energy to devote to their infants. Cooperative childcare is something in which women help each other out. Often, but not always, these helpers are post-reproductive women who have fewer of those responsibilities of their own, but may be helping out their daughters. All of this puts a great selective premium on a kind of social intelligence that many scientists think partly accounts for the increase in brain size that happened over the last two million years," she notes.

How will women and childbirth continue to evolve? Will the birth canal grow narrower, or wider? Will childbirth become more painful, or easier? Will more helpers be needed in future births? It's really anybody's guess. "Evolution doesn't have a direction," Rosenberg says. "Knowing where we've been doesn't give us any help in where we're going. But it does help us understand what makes us human, as well as how we're connected to the natural world. "

A graduate of the University of Chicago, Rosenberg received her doctorate in biological anthropology from the University of Michigan and joined the University of Delaware faculty in 1987.

She says she began focusing on the evolution of women and childbirth around the time she had her first child, although she doesn't think there was a connection between the two.

Ironically, her brother is an obstetrician although she and he have never conducted research together.

Stroke patients who reach hospitals within "golden hour" twice as likely to get clot-busting drug

Study highlights:

· Stroke patients who reach the hospital within one hour of symptoms receive a clot-busting drug twice as often as those arriving later. Researchers call the first hour of symptom onset "the golden hour."

· The study reviewed patients from hospitals participating in the American Heart Association's Get With The Guidelines–Stroke program.

· The study reinforces the importance of reacting quickly to stroke symptoms because "time lost is brain lost."

San Diego, Feb. 18, 2009 - Patients who arrived at specific hospitals within one hour of experiencing stroke symptoms received a powerful clot-busting drug twice as often as those who arrived later in the approved time window for treatment, according to a new study presented today at the American Stroke Association's International Stroke Conference 2009.

Among more than 100,000 patients treated at hospitals participating in the American Heart Association's Get With The Guidelines–Stroke (GWTG–Stroke) quality improvement program, 27.1 percent who arrived within the "golden hour" (one hour of symptom onset) were treated with the clot-busting drug tissue plasminogen activator (tPA). Of those who arrived between one and three hours of symptom onset 12.9 percent received the drug.

"The treatment rate among under-one-hour-arriving patients is good news for Get With The Guidelines hospitals," said Jeffrey L. Saver, M.D., lead author of the study and professor of neurology and director of the Stroke Center at the University of California, Los Angeles. "Prior studies have suggested that 25 percent to 30 percent of early arriving patients are fully eligible for clot-busting drug treatment, and Get With The Guidelines-Stroke hospitals are delivering the therapy to virtually all these individuals."

The drug is the only approved acute stroke treatment for clot-related (ischemic) stroke and has been shown to reduce stroke-related disability. However, it's only approved for use within three hours of symptom onset.

Recently, the European Cooperative Acute Stroke Study (ECASS 3) study suggested that tPA was safe and effective up to 4.5 hours symptom onset for some patients, but the current research reinforces the importance of quick action among patients and physicians.

"These findings support public education efforts to increase the proportion of patients arriving within the first 30 to 60 minutes after stroke onset," he said.

Little has been known about how frequently patients arrive at a hospital within the "golden hour," or how often hospitals meet the guidelines for beginning tPA infusion within 60 minutes after hospital arrival, Saver said.

Researchers reviewed records of 106,924 ischemic stroke patients treated in a four-plus year period at 905 GWTG–Stroke hospitals.

The analysis found that:

· 28.3 percent of the patients arrived within 60 minutes;

· 31.7 percent arrived one to three hours after symptoms started; and

· 40.1 percent arrived more than three hours after symptoms started.

"That more than one quarter of ischemic stroke patients presenting to Get With The Guidelines–Stroke emergency departments arrived within the 'golden hour' is a very encouraging finding because in stroke, time lost is brain lost," Saver said. "However, more than 70 percent arrived beyond the 'golden hour,' when larger amounts of brain damage have occurred and our chance to reverse damage is much reduced.

"We have a great deal of additional work to do in educating the public and stroke center staffs. For every minute in which blood flow is not restored, nearly two million additional nerve cells die."

Researchers said "golden hour" patients showed significantly more stroke deficits than later arrivals, suggesting that more intense symptoms propelled them to seek medical attention early.

But early and late arrivals were about the same age and were split almost evenly among men and women in each category. Blacks were less often early arrivals, of which only 11.8 percent arrived within one hour and 11.9 percent arrived within three hours.

Once at the hospital however, the time-to-treatment for the "golden hour" patients averaged almost 15 minutes longer than for patients who arrived one to three hours after symptom onset. Hospital performance improvement activities are needed to shorten the arrival-to-treatment initiation time for patients who arrive within the "golden hour," researchers said.

Before stroke treatment can begin, patients must undergo numerous tests, including a brain scan to ensure the stroke's cause is a blocked artery and not a hemorrhaging blood vessel.

"There are a huge number of reasons for waiting, but they are all trumped by the fact that the longer you wait, the more brain dies," Saver said. "We need to overcome the natural tendency to relax in the early-arriving patient and to think there is some extra time."

In addition, researchers site the value of GWTG-Stroke in facilitating important stroke research.

"We are extremely excited that Get With The Guidelines–Stroke is now in a position to facilitate this type of stroke research. With more than 800,000 patients entered from more than 1,400 hospitals, this data registry can contribute significantly to our understanding of acute stroke care and outcomes," said co-author Lee Schwamm, M.D., associate professor of neurology, Harvard Medical School in Boston.

Other co-authors: are Eric E. Smith, M.D.; Adrian Hernandez, Ph.D.; Dai Wai Olson, Ph.D. and Xin Zhao, Ph.D. Individual author disclosures can be found on the abstract.

The American Heart Association funded the study.

Young adult stroke patients may be misdiagnosed in ER

Study highlights:

· Stroke patients under age 50 may be misdiagnosed in the emergency rooms - missing out on important time-sensitive treatment.

· Some are misdiagnosed with vertigo, migraine or alcohol intoxication.

· Researchers said people under 50 with "seemingly trivial" symptoms such as vertigo and nausea should be assessed meticulously by emergency room staff.

San Diego, Feb. 18, 2009 - Young adults with stroke symptoms are sometimes misdiagnosed in emergency rooms - making them miss effective early treatment - according to research presented today at the American Stroke Association's International Stroke Conference 2009.

In the Misdiagnosis of Acute Stroke in the Young During Initial Presentation in the Emergency Room study, researchers reviewed data on 57 patients, ages 16 to 50 years old, enrolled since 2001 in the Young Stroke Registry at the Comprehensive Stroke Center at Wayne State University in Detroit, Mich. Four males and four females (14 percent), average age 34, were misdiagnosed as having vertigo, migraine, alcohol intoxication or other conditions. They were discharged from the hospital and later discovered to have suffered a stroke.

Those misdiagnosed included:

· an 18-year-old man who reported numbness on his left side but was diagnosed with alcohol intoxication;

· a 37-year-old woman who arrived with difficulty speaking and was diagnosed with a seizure;

· a 48-year-old woman with sudden blurred vision, an off-balance walk, lack of muscle coordination, difficulty speaking and weakness in her left hand, who was told she had an inner ear disorder.

"Accurate diagnosis of stroke on initial presentation in young adults can reduce the number of patients who have continued paralysis and continued speech problems," said Seemant Chaturvedi, M.D., senior author of the study and a professor of neurology and director of the stroke program at Wayne State.

"We have seen several young patients who presented to emergency rooms with stroke-like symptoms within three to six hours of symptom onset, and these patients did not get proper treatment due to misdiagnosis. The first hours are really critical."

Intravenous delivery of the clot-busting drug tissue plasminogen activator (tPA) is the only U.S. government-approved treatment for acute stroke. It must be delivered within three hours of symptom onset to reduce permanent disability caused by stroke. Chaturvedi said experimental interventional stroke treatment such as intra-arterial clot busters and mechanical clot retrieval may be an option for some patients three to eight hours after symptoms.

"Part of the problem is that the emergency room staff may not be thinking stroke when the patient is under 45 years old," Chaturvedi said. "Physicians must realize that a stroke is the sudden onset of these symptoms."

Patients arriving with "seemingly trivial symptoms like vertigo and nausea" should be assessed meticulously, he said. "Some people believe that younger people may respond better to stroke treatments, so that makes it doubly important to recognize when a stroke is happening. After 48 to 72 hours, there are no major interventions available to improve stroke outcome."

No matter the age, people must also get to the hospital quickly if these stroke symptoms occur:

· sudden numbness or weakness of the face, arm or leg, especially on one side of the body;

· sudden confusion, trouble speaking or understanding;

· sudden trouble seeing in one or both eyes;

· sudden trouble walking, dizziness, loss of balance or coordination; and/or

· sudden, severe headache with no known cause.

Stroke is the third leading cause of death and one of the top causes of disability in the United States.

"Early intervention is the most critical component of effective stroke care," said Abraham Kuruvilla, M.D., the study's lead author and a stroke fellow in the neurology department at Wayne State University. "Early intervention will reduce the burden of disability of the young patients afflicted with stroke disability and the associated high cost of medical care in this population."

The other co-author is Kumar Rajamani, M.D. Individual author disclosures are on the abstract.

Editor's note: The American Heart Association/American Stroke Association advocates for stroke telemedicine programs that provide effective stroke treatment to underserved areas and the elimination of disparities in stroke awareness and care. For more information, please visit www.strokeassociation.org/yourethecure.

"Suicide by Cop" Phenomenon Occurring in Over a Third of North American Shootings Involving Police

Pasadena, CA "Suicide by Cop" (SBC) is a suicide method in which a person engages in actual or apparent danger to others in an attempt to get oneself killed or injured by law enforcement. A new study in the Journal of Forensic Sciences examined the prevalence of this phenomenon among a large sample of officer-involved shootings.

Results show that SBC occurs at extremely high rates, with 36 percent of all shootings being categorized as SBC. The findings confirm the growing incidence of this method of suicide, with SBC cases more likely to result in the death or injury of the subjects 50 percent of the time.

The study was led by noted police and forensic psychologist Kris Mohandie, Ph.D., who has over nineteen years of experience in the assessment and management of violent behavior. Dr. Mohandie responded on-scene to the O.J. Simpson barricade and assisted the L.A. County District Attorney's prosecution of the stalker of Steven Spielberg. He has appeared in numerous news programs, including CNN and MSNBC, as well as on the Discovery Channel, A & E, and the History Channel addressing issues pertaining to violent behavior.

Using the largest empirical sample of police shootings to examine the issue of SBC, Dr. Mohandie, J. Reid Meloy, Ph.D., A.B.P.P., and Peter I. Collins, M.C.A., M.D., F.R.C.P., examined 707 cases of North American officer-involved shootings from 1998 to 2006. Materials reviewed included police reports, witness statements, criminal histories on subjects, photographs, videotapes, and external review reports.

SBC was found to occur at a momentous rate among officer-involved shooting cases. The fact that 36 percent of all shootings in the sample could be categorized as SBC underscores the significance of suicidal impulses among those who become involved in shootings and other uses of force with police officers.

The study also verifies that suicidal individuals can in fact threaten, injure, and kill others in their quest to commit suicide. These individuals are quite lethal to themselves, with a 97 percent likelihood of being injured or killed. There was a one in three chance of others being harmed during the incident.

"It is clear from our research that SBC is a common occurrence among officer involved shootings and must be considered as an issue during post-event investigations," the authors conclude.

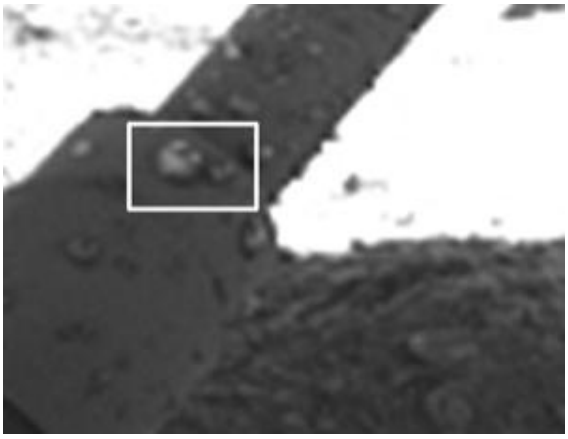
First liquid water may have been spotted on Mars

* 01:16 18 February 2009 by David Shiga

NASA's Phoenix lander may have captured the first images of liquid water on Mars - droplets that apparently splashed onto the spacecraft's leg during landing, according to some members of the Phoenix team.

The controversial observation could be explained by the mission's previous discovery of perchlorate salts in the soil, since the salts can keep water liquid at sub-zero temperatures. Researchers say this antifreeze effect makes it possible for liquid water to be widespread just below the surface of Mars, but point out that even if it is there, it may be too salty to support life as we know it.

A few days after Phoenix landed on 25 May 2008, it sent back an image showing mysterious splotches of material attached to one of its legs. Strangely, the splotches grew in size over the next few weeks, and Phoenix scientists have been debating the origin of the objects ever since.



Clumps on one of Phoenix's legs were observed to grow over time **(Image: NASA/JPL-Caltech/University of Arizona/Max Planck Institute)**

One intriguing possibility is that they were droplets of salty water that grew by absorbing water vapour from the atmosphere. Arguments for this idea are laid out in a study by Phoenix team member Nilton Renno of the University of Michigan in Ann Arbor, and co-authored by 21 other researchers, including the mission's chief scientist, Peter Smith of the University of Arizona in Tucson. The study (pdf) will be presented in March at the Lunar and Planetary Science Conference in Houston, Texas.

Widespread water

Gaping canyons and river-like channels attest to the fact that large amounts of liquid water once flowed on Mars. The surface now appears dry, though the changing appearance of some crater gullies over a period of several years has hinted at the existence of subsurface aquifers that occasionally release bursts of water.

Certainly, at Phoenix's landing site in the Martian arctic, it is too cold for pure water to exist in liquid form - the temperature never rose above -20° C during the five-month-long mission.

But salty water can stay liquid at much lower temperatures. And perchlorate salts, which were detected for the first time on Mars by Phoenix, would have an especially dramatic 'antifreeze' effect. An extremely salty mixture of water and perchlorates could stay liquid all the way down to -70° C.

If perchlorates are widespread on Mars at high concentrations, then pockets of liquid water might also be widespread below the planet's surface. "According to my calculations, you can have liquid saline solutions just below the surface almost anywhere on Mars," Renno told New Scientist.

And Phoenix may have already snapped images of water kept liquid thanks to perchlorate salts.

Melted ice

The clumps may have come from ice melted by the lander's thrusters. Phoenix's thrusters cleared away the topsoil at the landing site, exposing an ice layer below.

Laboratory experiments the team carried out on Earth suggest the thrusters would have melted the top millimetre or so of this layer and then could have splashed the melted water onto the lander's leg. If enough perchlorate was mixed into the droplets, they could have stayed liquid during the daytime, though they may have frozen each night. Alternatively, Renno says the clumps may have come from a thin layer of perchlorate-rich water that was already liquid.

Why does the team think the clumps might be liquid water in the first place? The argument rests on the fact that salt is hygroscopic, meaning it attracts water. So droplets of salty fluid on Mars would tend to absorb water vapour from the atmosphere, explaining why the clumps grew over time. Indeed, at the temperatures and humidity observed at the Phoenix site, the expected growth rate of salty droplets matches the observations, the team says.

Most provocatively, a series of images (pictured here) appears to show one candidate droplet growing after absorbing the liquid from its neighbour - a behaviour the team ascribes to liquid water.

'Convincing story'

Mark Bullock of the Southwest Research Institute in Boulder, Colorado, who has experimented with salty water under Martian conditions but was not involved in Renno's study, is impressed with the results. "I think it makes a pretty convincing story for the existence of exotic brines on the Phoenix lander leg," he told New Scientist.

But Phoenix team member Michael Hecht of NASA's Jet Propulsion Laboratory in Pasadena, California, disagrees. He says the clumps were probably patches of ice that formed and grew from water vapour freezing onto the leg.

Renno counters that ice would be more likely to sublimate than grow on the leg, which would have been warmed by heat leaking from the spacecraft's body. Indeed, the layer of ice exposed beneath Phoenix was observed to vaporise over time.

But Hecht argues that the leg may have been colder than its surroundings. Though there were no temperature sensors on the leg, he says the surface of the ice patch was warmed by direct sunlight, whereas the lander leg was in shadow. Water vapour that sublimated from the ice below Phoenix might have recondensed as ice on its cold leg, he argues.

Too salty for life?

Phoenix, which ran out of solar power five months after landing, is not expected to wake up again, so there is no way to further investigate the bumps on its leg. But Renno hopes to bolster the case for salty droplets with future experiments on perchlorate-rich water under Mars-like conditions. He says those tests should be completed in a few months.

Regardless of their outcome, the discovery of perchlorates in the Martian soil suggests that pockets of liquid water may dot the planet. Could life eke out an existence in such pockets? "It's possible," Renno says, pointing out that there are microorganisms on Earth that can survive extreme conditions, including very salty water.

But it may be difficult. One way to describe salt concentrations is with a number called the water activity, which is 1 for pure water, and smaller for saltier solutions. The most salt-tolerant organism known on Earth is a fungus that can survive down to a water activity of 0.61.

However, to lower water's freezing point all the way down to -70 °C with perchlorates, the necessary concentration of perchlorate salts would give a water activity of just 0.5. "If you tried to put any kind of life-form you can imagine on Earth in a brine solution of that sort, the water would be sucked out of the cells," mission leader Peter Smith told New Scientist.

Natural antifreeze may keep Mars running with water

* 18 February 2009 **by David Shiga**

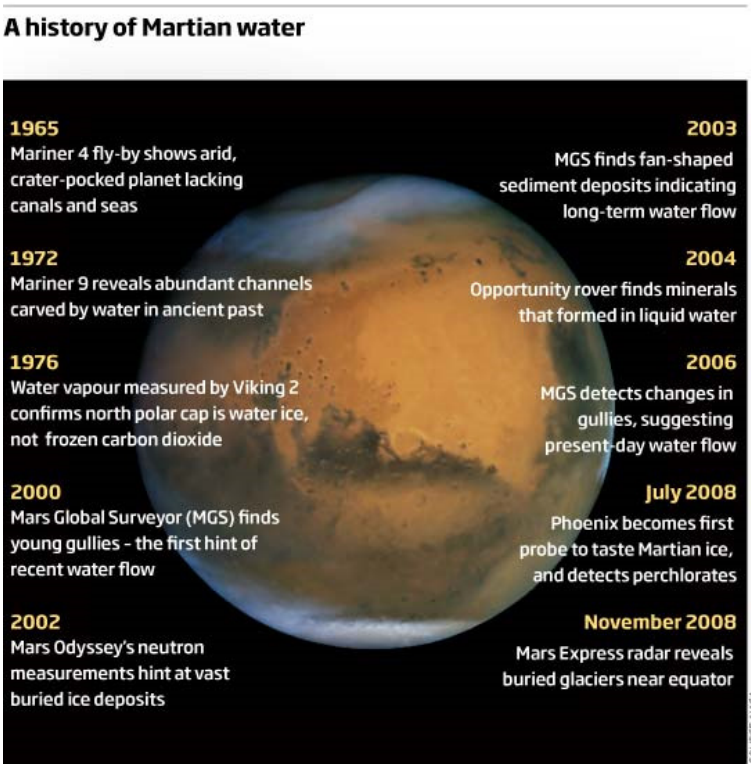
THERE'S nothing like a little antifreeze to thaw out a frozen planet. Thanks to chemicals called perchlorates, liquid water may play a bigger role on Mars than expected, which is good news for the search for life.

Last year, NASA's Phoenix lander team announced the unexpected discovery on Mars of perchlorates - compounds containing an atom of chlorine bound to four oxygen atoms. Relatively sparse on Earth, they turn out to be abundant on Mars, forming 1 per cent of the soil tasted by Phoenix.

The initial excitement focused on whether Martian microorganisms could use perchlorates as food, as some Earth microbes do. That remains possible, but now it's emerging that perchlorates could have far-reaching consequences on Mars for another reason: their ability to keep water liquid far below 0 °C.

The Phoenix measurements could not distinguish between different kinds of perchlorates, but the most likely candidates are magnesium and sodium perchlorate, based on the abundance of magnesium and sodium ions that Phoenix detected. Concentrated solutions of these salts can stay liquid down to -72 °C and -37 °C respectively.

That makes it possible for liquid water to play a bigger role in shaping modern Mars than previously thought, despite temperatures that are usually far below zero. Pockets of water could persist just



below the surface, insulated by the soil above, and might occasionally flow across the surface. "It's possible to have [liquid] almost everywhere where there is ice and the temperature goes above this threshold value - that's most of Mars," says Phoenix team member Nilton Renno of the University of Michigan in Ann Arbor.

This could explain gullies on Martian slopes that look much like water-carved features seen on Earth and seem to have formed recently. "A handful of people have argued for brines being the source of gullies, [but] there was nothing we had seen before that could form brines at those temperatures," says Michael Hecht of NASA's Jet Propulsion Laboratory in Pasadena, California, and the lead scientist for the instrument that found the perchlorates.

Perchlorate-laced water might also accumulate beneath glaciers and help them slide around, which could explain signs that extremely cold and stiff glaciers on Mars's northern ice cap have flowed over time, according to a study by David Fisher of the Geological Survey of Canada in Ottawa, to be presented in March at the Lunar and Planetary Science Conference (LPSC) in Houston, Texas. "The ice is deforming very little but it moves on top of this mobile sludge bed," Fisher says.

Fisher thinks some perchlorate-rich water beneath glaciers might end up trickling deep underground through cracks in the rock, providing a crucial source to replenish Martian groundwater. Groundwater appears to have leaked onto the surface in numerous episodes over Martian history, leaving dried-up river channels and evidence of ancient hot springs.

Perchlorate-rich water droplets might even explain some mysterious bumps on Phoenix's leg that appeared to flow and merge, according to a study led by Renno that will also be presented at the LPSC. Others, including Hecht, think they are more likely to be lumps of ice, with changing light giving the illusion of liquid-like behaviour.

If pockets of liquid water exist on present-day Mars, they might even support life, says Renno. The most concentrated perchlorate solutions would be unlikely to support life, but milder solutions could allow liquid and thus life to exist.

'iTunes university' better than the real thing

* 16:35 18 February 2009 **by Ewen Callaway**

Students have been handed another excuse to skip class from an unusual quarter. New psychological research suggests that university students who download a podcast lecture achieve substantially higher exam results than those who attend the lecture in person.

Podcasted lectures offer students the chance to replay difficult parts of a lecture and therefore take better notes, says Dani McKinney, a psychologist at the State University of New York in Fredonia, who led the study.

"It isn't so much that you have a podcast, it's what you do with it," she says.

Skipping class

Launched less than two years ago, Apple's iTunes university offers college lectures on everything from Proust to particle physics to students and the public. Some universities make their lectures available to all, while others restrict access to enrolled students. Some professors even limit downloads to encourage class attendance, McKinney says.

To find out how much students really can learn from podcast lectures alone - mimicking a missed class - McKinney's team presented 64 students with a single lecture on visual perception, from an introductory psychology course.

Half of the students attended the class in person and received a printout of the slides from the lecture. The other 32 downloaded a podcast that included audio from the same lecture synchronised with video of the slides. These students also received a printed handout of the material.

The researchers told the students they would be tested on the material in a week, and they also asked students to hold onto their class notes.

Clear results

Students who downloaded the podcast averaged a C (71 out of 100) on the test - substantially better than those who attended the lecture, who on average mustered only a D (62).

But that difference vanished among students who watched the podcast but did not take notes. Students who listened to the podcast one or more times and took notes had an average score of 77, McKinney says.

Motivation might have been an issue, as the experiment did not count for class credit, though the highest scorer in each group earned a $15 iTunes gift certificate.

McKinney want to now test how podcasts affect learning across an entire semester, rather than from just a single lecture. Students might find them more useful early on in a class, when the material is still new, she says.

Though her team's paper is subtitled "Can podcasts replace Professors," McKinney thinks these technologies can buttress traditional lectures, particularly for a generation that has grown up with the Internet.

"I do think it's a tool. I think that these kids are programmed differently than kids 20 years ago," she says.

Darren Griffin, a geneticist and education researcher at the University of Kent in Canterbury, UK, says podcast lectures are good for lecturers too. They free him up to spend precious class time interacting with his students, rather than just talking at them.

To further coax them into the classroom, he gives his students brief quizzes before each class. "I get 98% attendance that way," he says.

Journal reference: Computers and Education (DOI: 10.1016/j.compedu.2008.11.004)

Billions of years ago, microbes were key in developing modern nitrogen cycle

As the world marks the 200th anniversary of Charles Darwin's birth, there is much focus on evolution in animals and plants. But new research shows that for the countless billions of tiniest creatures – microbes – large-scale evolution was completed 2.5 billion years ago.

"For microbes, it appears that almost all of their major evolution took place before we have any record of them, way back in the dark mists of prehistory," said Roger Buick, a University of Washington paleontologist and astrobiologist.

All living organisms need nitrogen, a basic component of amino acids and proteins. But for atmospheric nitrogen to be usable, it must be "fixed," or converted to a biologically useful form. Some microbes turn atmospheric nitrogen into ammonia, a form in which the nitrogen can be easily absorbed by other organisms.

But the new research shows that about 2.5 billion years ago some microbes evolved that could carry the process a step further, adding oxygen to the ammonia to produce nitrate, which also can be used by organisms. That was the beginning of what today is known as the aerobic nitrogen cycle.

The microbes that accomplished that feat are on the last, or terminal, branches of the bacteria and archaea domains of the so-called tree of life, and they are the only microbes capable of carrying out the step of adding oxygen to ammonia.

The fact that they are on those terminal branches indicates that large-scale evolution of bacteria and archaea was complete about 2.5 billion years ago, Buick said.

"Countless bacteria and archaea species have evolved since then, but the major branches have held," said Buick, a UW professor of Earth and space sciences.

He is the corresponding author of the research, which appears in the Feb. 20 edition of Science. Lead author is Jessica Garvin, a UW Earth and space sciences graduate student. Other authors are Ariel Anbar and Gail Arnold of Arizona State University and Alan Jay Kaufman of the University of Maryland. The work was funded by NASA and the National Science Foundation.

The scientists examined material from a half-mile-deep core drilled in the Pilbara region of northwest Australia. They looked specifically at a section of shale from 300 to 650 feet deep, deposited 2.5 billion years ago, and found telltale isotope signatures created in the process of denitrification, the removal of oxygen from nitrate.

If denitrification was occurring, then nitrification – the addition of oxygen to ammonia to form nitrate – also must have been taking place, Buick said. That makes the find the earliest solid evidence for the beginning of the aerobic nitrogen cycle.

"What this shale deposit has done is record the onset of the modern nitrogen cycle," he said. "This was a life-giving nutrient then and remains so today. That's why you put nitrogen fertilizer on your tomato plants, for example."

The discovery gives clues about when and how the Earth's atmosphere became oxygen rich, Buick believes.

Geochemical examination of stratigraphic samples from the core indicates that atmospheric oxygen rose in a temporary "whiff" about 2.5 billion years ago. The whiff lasted long enough to be recorded in the nitrogen isotope record, then oxygen dropped back to very low levels before the atmosphere became permanently oxygenated about 2.3 billion years ago.

It is unclear why the oxygen level declined following the temporary increase. It could have been that the oxygen was depleted rapidly as it reacted with chemicals and minerals that had not been exposed to oxygen previously, Buick said. Or something could have halted the photosynthesis that produced the oxygen in the first place.

But it seems clear, he said, that the tiniest creatures played a crucial role in completing the nitrogen cycle that life depends on today.

"All microbes are amazing chemists compared to us. We're really very boring, metabolically," Buick said.

"To understand early evolution of life, we have to know how organisms were nourished and how they evolved. This work helps us on both of those counts," he said.

Clot-buster boosts survival, decreases disability for deadly subset of stroke

Patients continued to improve function 6 months after treatment

New results from a multicenter study led by Johns Hopkins show that patients who got an experimental clot-busting treatment for a particularly lethal form of stroke were not only dramatically more likely to survive but also continued to shed lingering disabilities six months later. The findings, announced at the International Stroke Conference in San Diego on Feb. 19, are likely to build support for the use of tissue plasminogen activator (tPA) in patients with intracranial hemorrhage, a treatment-resistant form of stroke marked by brain bleeding.

Last May, study leader Daniel Hanley, M.D., professor of neurology at the Johns Hopkins School of Medicine, and his colleagues reported early findings among 52 intracranial hemorrhage (ICH) patients treated with tPA given by catheter directly into patients' brains to bathe and destroy blood clots with this clot-busting agent. The researchers worked with patients at 38 study sites scattered throughout the United States, as well as Canada, Germany and Finland.

The treatment, developed by Hanley's team, gives low doses of tPA over several days after strokes involving intracranial hemorrhage. This drug normally isn't recommended for conditions that involve bleeding, such as ICH, because it can increase the risk of further hemorrhage. However, since tPA is effective at breaking up clots in other conditions, such as heart attacks and other types of strokes, Hanley and his colleagues have been studying its safety and efficacy for treating ICH.

Early results from this study using information collected 30 days after tPA treatment showed that about 80 percent survived, compared to data from previous studies showing that about 80 percent of untreated ICH patients die. In the new study, the researchers report on the patients' progress six months after treatment using assessments for overall levels of disability as well as their skill in accomplishing specific tasks often affected by stroke, such as dressing, bathing or walking.

The researchers found that about 10 percent of patients had no lingering disability after six months. Another 40 percent had only mild to moderate disability and were independently caring for themselves at home by 180 days, but required assistance with everyday tasks such as lifting heavy objects. Even patients who were initially more severely disabled continued to improve months after treatment, with the majority scoring lower on disability assessments after six months compared to the same assessments taken at 30 days.

"We're painting a pretty good picture for quality of life after our treatment for ICH," Hanley says. "Survival doesn't have to mean just getting by - we're showing that it can mean truly living again."

Hanley adds that patients, families, physicians and ethicists worry deeply about the impact of stroke treatments that keep patients alive but leave them with a sharply curbed quality of life. "Our new treatment appears to greatly increase patients' chances for survival and quality of life similar to what they experienced before they had their stroke," he says.

Intracerebral hemorrhage, or ICH, causes blood to pool and clot inside the brain's interior cavities, building up pressure within the brain. The higher pressure, along with inflammation caused by chemicals in the trapped blood, can irreversibly damage the brain, usually leading to death or extreme disability.

Hanley and colleagues, with a clinical planning grant from the National Institute of Neurological Diseases and Stroke will design a pivotal test to assess the value of tPA therapy on a much larger group of ICH patients. They expect to start this clinical trial imminently..

Other Johns Hopkins researchers who participated in this study include Wendy Ziai, M.D.; Ricardo Carhuapoma, M.D.; Neal Naff, M.D.; Becky Sullivan, M.B.A.; Timothy Morgan, B.S.; Eric Melnychuk, B.A., E.M.T.-B; Susan Rice, R.N., M.P.H., C.C.R.P.; Amber Stahl, B.A.; Shannon LeDroux, B.S.; Amanda Bistran, B.S.; and Karen Lane, C.M.A., C.C.R.P.

Study shows ultrasound and tPA effective for stroke

BIRMINGHAM, Ala. – An experimental therapy using tiny bubbles activated by transcranial Doppler (TCD) ultrasound combined with the clot busting drug tissue plasminogen activator (tPA) is more effective than tPA alone in treating patients suffering from ischemic stroke, according to new research presented at the American Stroke Association's International Stroke Conference in San Diego.

The findings, presented by Andrei Alexandrov, M.D., director of the UAB (University of Alabama at Birmingham) Comprehensive Stroke Center, and Carlos Molina, M.D., of the Vall d'Hebron Hospital in Barcelona, Spain, show that patients can be treated safely with TCD in combination with a specific dose of the bubbles, called microspheres, and tPA.

The microspheres, developed by ImaRx Therapeutics, are tiny gas-filled lipid structures that cavitate (rapidly expand and collapse) when exposed to ultrasound waves, helping to reopen blocked arteries and restore blood flow.

"These findings demonstrate that ultrasound combined with microspheres and tPA can be tested further in a pivotal clinical trial with the goal of providing a more effective treatment option for stroke patients by promoting faster clearing of blocked blood vessels as well as improved patient outcomes," said Alexandrov, UAB professor of neurology. "It's very promising to see such results, which support the potential of this therapy as a more effective and expansive therapy for stroke patients."

The Phase 1/2 trial involved 35 patients and evaluated two different doses of ImaRx's MRX-801 microspheres. Cohort I and cohort II patients received 1.4 mL and 2.8 mL of microspheres respectively. Control patients received the standard dose of tPA alone.

The researchers report that complete recanalization was achieved in 120 minutes in 67 percent of cohort I patients, in 46 percent of cohort II patients and 33 percent of control patients. Dramatic clinical recovery has achieved in 45 percent of cohort I, 10 percent of cohort II and 27 percent of controls.

In addition, clinical improvement after 90 days was reported in 75 percent of cohort I, 50 percent of cohort II and 36 percent of controls.

According to the American Heart Association, approximately one-third of adults in the United States have some form of cardiovascular disease. Approximately 700,000 adults in the U.S., are afflicted with, and 150,000 die as a result of, some form of stroke each year.

Stroke is the third leading cause of death, and the leading cause of disability, in the United States. The vast majority of strokes are ischemic strokes, meaning that they are caused by blood clots, while the remainder are the more deadly hemorrhagic strokes caused by bleeding in the brain.

What is the most effective therapy for low-dose aspirin induced peptic ulcer?

The incidence of low-dose aspirin-induced peptic ulcer seems to be increasing in Japan in conjunction with the increasing proportion of elderly individuals, in whom metabolic syndrome frequently develops. However, a therapeutic and prevention strategy for such peptic ulcers has not yet been established.

A research team led by Dr. Satoshi Mochida from Japan addressed this question. Their study will be published on February 14, 2009 in the World Journal of Gastroenterology.

In their study, Upper gastrointestinal endoscopy was performed in 68 patients receiving daily low-dose aspirin (81 or 100 mg/day). The endoscopic findings were classified according to the Lanza score, and the scores were compared between groups categorized according to the concomitant use of anti-ulcer drugs and the types of drugs used. In another study, 31 hemorrhagic peptic ulcer patients who had been receiving low-dose aspirin were enrolled. The patients were randomly classified into the proton pump inhibitor (PPI)-treated group and the H2 receptor antagonist (H2RA)-treated group. The administration of low-dose aspirin was continued concomitantly, and endoscopic examinations were performed 8 wk later.

They found that the Lanza scores (mean ± SD) of the gastro-mucosal lesions were 1.0 ± 1.9 and 1.9 ± 2.3 in 8 and 16 patients receiving prevention therapy with a PPI and an H2RA, respectively. Both scores were significantly smaller than the scores in 34 patients who were not receiving prevention therapy (4.7 ± 1.0) and in 10 patients receiving cytoprotective anti-ulcer drugs (4.3 ± 1.6). In the prospective study, 18 and 13 patients received a PPI and an H2RA, respectively. Endoscopic examinations revealed that the tissue in the region of the gastro-mucosal lesions had reverted to normal in all patients in the PPI-treated group and in 12 patients (92%) in the H2RA-treated group; no significant differences were observed between the groups.

Their results indicated that H2RA therapy was effective for both the prevention and treatment of low-dose aspirin induced peptic ulcers, similar to the effects of PPIs, while cytoprotective anti-ulcer drugs were ineffective in preventing peptic ulcers.

Reference: Nakashima S, Ota S, Arai S, Yoshino K, Inao M, Ishikawa K, Nakayama N, Imai Y, Nagoshi S, Mochida S. Usefulness of anti-ulcer drugs for the prevention and treatment of peptic ulcers induced by low doses of aspirin. World J Gastroenterol 2009; 15(6): 727-731 http://www.wjgnet.com/1007-9327/15/727.asp

The upside of herpes - when one infection protects against another

by Ed Yong

herpes_labialis

When people say that every cloud has a silver lining, they probably aren't thinking about herpes at the time. Herpes may be unpleasant, but the viruses that cause it and related diseases could have a bright side. In mice at least, they provide resistance against bacteria, including the bubonic plague.

Herpes is one of a number of itchy, blistering diseases, caused by the group of viruses aptly-named herpesviruses. Eight members infect humans and cause a range of illnesses including glandular fever, chickenpox, shingles and, of course, herpes itself.

Almost everyone gets infected by one of these eight during their childhood. But herpesviruses are for life, not just for Christmas. After your body fights off the initial infection, the virus retreats into a dormant phase known as 'latency'. It remains hidden and causes no symptoms, but has the potential to reactivate at a later date. In this way, herpesviruses can seem like life-long parasites, ensuring their own survival at the cost of their host's future health. In extreme cases, latent viruses can lead to chronic inflammation, which in turn can cause autoimmune diseases, or some types of cancer.

Macrophage

But there is a bright side too. Erik Barton and colleagues from Washington University Medical School found that once infected mice entered the latent stage, they were surprisingly resistant to certain types of bacteria. Unlike their vulnerable uninfected peers, they even managed to ward off the deadly plague bug, Yersinia pestis.

At least in mice, latent herpesviruses turn out to be paying tenants rather than free-loading squatters - bacterial resistance is their rent. The latent stage is crucial to the resistance effect, and Barton found that a mutant herpesvirus that infects but doesn't set up shop provides no benefits to its host.

The viruses work their magic by putting the immune system on high alert. The effect is similar to a raising of the terror alert creating a heightened level of security where the body is prepared to fight off any further threats. The viruses trigger the release of high levels of immune system chemicals called cytokines. These molecules - including interferon-gamma (IFN-g) and tumour necrosis factor alpha (TNF-a) - help to co-ordinate the defence against infections.

These chemicals activate macrophages - a type of white blood cell. These cellular assassins engulf invading bacteria, and sentence them to death by digestion. And in mice latently infected by herpesviruses, they are activated in bulk. This sequence is similar to the way the immune system normally protects us against multiple bacterial invaders. But in Barton's experiments, the protection was set off by viruses instead, and lasted for much longer than normal.

All well and good for the mice, but do these viruses benefit us too? Barton thinks so. In his study, two very different strains - murine gammaherpesvirus 68 (gHV68) and murine cytomegalovirus (MCMV) - had the same effect. He believes that providing bacterial resistance is a general property of all herpesviruses.

There is certainly growing evidence to support his claims. If many people, the latent viruses reactivate regularly, but not strongly enough to cause major symptoms. In these cases, doctors have seen higher levels of cytokines and long-term activation of the immune system, just like Barton saw in his mice.

Barton even suggests that herpesvirus infection may play a role in protecting against allergies. According to the 'hygiene hypothesis', infections during childhood prime the immune system against future threats. By depriving children of these experiences, overly clean homes can lead to naïve immune systems that react disproportionately to harmless things like pollen. Allergies are the result.

It isn't clear what role herpesviruses play in priming the immune system. But at least one study found that people who are infected with the Epstein-Barr herpesvirus (EBV) are less likely to show sensitive antibody reactions to allergens in their environment. Clearly, the subject is a rich vein for further research.

Almost everyone has had an encounter with a herpesvirus of some kind. They cause a wide range of diseases, but could they be protecting us from many more?

Reference: *Barton, White, Cathelyn, Brett-McClellan, Engle, Diamond, Miller & Virgin IV. 2007. Herpesvirus latency confers symbiotic protection from bacterial infection. Nature 447: 326-330.*

Malaria parasite zeroes in on molecule to enhance its survival, team finds

Posted February 19, 2009; 11:55 a.m. **by Kitta MacPherson**

A team of researchers from Princeton University and the Drexel University College of Medicine has found that the parasite that causes malaria breaks down an important amino acid in its quest to adapt and thrive within the human body. By depleting this substance called arginine, the parasite may trigger a more critical and deadlier phase of the disease.

The scientists believe that shedding light on this poorly understood aspect of malaria metabolism has given them new insights on the interactions between the parasite and its human hosts. The work also may point the way to better treatments.

"The more we know about the parasite's metabolic network, the more intelligent we can be about targeting therapies that will cure malaria," said Kellen Olszewski, a graduate student at Princeton University and first

author of the Feb. 18 Cell Host & Microbe paper describing the work. The project was led by Manuel Llinás, an assistant professor of molecular biology and the Lewis-Sigler Institute for Integrative Genomics at Princeton.

As a central part of the research, the scientists created a "metabolomic" profile of the parasite, Plasmodium falciparum. Metabolomics is a new field that aims to analyze metabolic processes by simultaneously measuring the levels of all of the more than 500 core metabolites that make up an organism's "metabolic network." A metabolite is a chemical involved in metabolism, the process by which an organism takes up nutrients from the environment and converts them to energy and the molecular building blocks that cells use to grow. Amino acids, sugars, nucleotides and vitamins are all metabolites.

To conduct the study, the team used a mass spectrometry-based method developed in the neighboring laboratory of Joshua Rabinowitz, an assistant professor of chemistry at Princeton and another author on the paper. Mass spectrometry is a highly sensitive technique that identifies chemicals based on their size and electrical charge.

The researchers were interested in seeing how the concentrations of metabolites in parasite-infected human red blood cells change over a single 48-hour "generation" of parasite growth. Scanning the data, the scientists noted that arginine levels dramatically dipped by the end of one 48-hour cycle. "The parasite destroys this amino acid specifically and preferentially over all other amino acids," Olszewski said.

Follow-up experiments showed that the parasite doesn't break down arginine in order to grow, suggesting that this process serves some secondary function that helps P. falciparum proliferate within the human body. Arginine is an essential fuel for the human body's immune system, which uses it to produce a molecule called nitric oxide that is highly toxic to foreign organisms. The parasite-led attack on arginine may be an attempt by the parasite to "switch off" a human immune function that might threaten its survival, the researchers said.

Scientists are interested in studying the metabolism of P. falciparum to understand how organisms adapt to a parasitic lifestyle. Understanding this is important because many of the drugs used to treat malaria successfully in the past have targeted some aspect of the parasite's metabolism. "Designing the next generation of anti-malarial drugs will likely require a detailed knowledge of the 'weak points' in the parasite's metabolic network," Llinás said.

According to the World Health Organization, some 350 to 500 million people are infected with malaria every year by mosquitoes carrying one of the four human malaria parasites, P. falciparum, P. vivax, P. malariae or P. ovale. The P. falciparum infections are by far the most deadly, killing more than 1 million people each year, mainly young children and pregnant women. The disease, which can incapacitate a victim for several weeks, also imposes a massive social and economic burden. People living in endemic areas can be infected up to several times a year. About 60 percent of the cases of malaria worldwide and more than 80 percent of malaria deaths occur in sub-Saharan Africa.

Other authors on the paper include: Daniel Wilinski, a research specialist in the Llinás lab; and Joanne Morrisey, James Burns and Akhil Vaidya, all of the Center for Molecular Parasitology at the Drexel University College of Medicine.

The research was supported by the Burroughs Wellcome Fund; the National Institutes of Health; the National Science Foundation; and the Arnold and Mabel Beckman Foundation.

Scripps Research study shows how microscopic changes to brain cause schizophrenic behavior in mice

The findings are being published in an Early Edition of the journal Proceedings of the National Academy of Sciences this week.

"We found several microscopic pathologies and behavioral traits that are hallmarks of schizophrenia, says Ulrich Mueller, Ph.D., a professor at Scripps Research who was senior author of the study. "These findings in mice may help shed light on how schizophrenia, an often severe and debilitating disease, emerges in humans."

In the study Mueller, Research Associate Claudia Barros, and colleagues also showed that the schizophrenic mice could recover normal behavior when treated with clozapine, a decades-old drug sometimes used to treat schizophrenia in people. This suggests that these mice might provide researchers with a good model system for studying schizophrenia and testing new drugs designed to treat people suffering from it.

Schizophrenia affects millions of Americans - about one percent of all people in the United States, according to the National Institute of Mental Health - and manifests in symptoms like hearing imaginary voices, paranoia, delusions of grandeur, severe apathy, and incoherent speech. Despite its prevalence, however, the causes of schizophrenia are not entirely understood.

The scientific consensus is that the disease results from a combination of genes and other factors. Schizophrenia runs in families, which is strong evidence that inherited genes play a role, but the disease is not completely genetic. Some identical twins, for instance, are discordant - one will have the disease while the other

will not. The fact that it can strike one genetically identical twin to the exclusion of the other means that there are more than just genes involved. Development may be another factor.

People with schizophrenia usually do not begin showing signs of the disease until their late teens or early 20s. One of the current scientific hypotheses regarding schizophrenia, however, is that the disease is caused by developmental defects that occur in the brain long before the signs of the disease emerge. The mice that Mueller, Barros, and colleagues studied would seem to lend credence to this hypothesis.

In the new paper, the team describes what happens to the mice when they lose the function of a brain protein called neuregulin - an important developmental protein that helps the brain form its distinct structures early in development. Genetic studies have linked inherited forms of this protein and its receptors to schizophrenia and numerous other mental health problems.

Mueller, Barros, and colleagues managed to effectively remove the function of neuregulin by eliminating the receptor to which it binds. Because this is such an important developmental protein, they expected that eliminating its receptor would severely impact the development of the mouse's brain. To the researchers' surprise, that did not happen. Overall, the brains were normal. Microscopically, however, the loss of neuregulin tells another story.

To understand what happens when you hamper the action of neuregulin, Mueller says, you have to understand something about how neurons in the brain form and communicate. Humans, mice, and other mammals have brains that develop through multiple intricate stages, bursts, and crawls. Brain tissue first forms without neurons, as a sort of scaffold, and then the neurons grow, creep into place, and connect to each other.

When it is finished, the average human brain has some 100 billion neurons - a highly intricate, overlapping web of branched structures that communicate with one another (and the outside world). They have tree-like networks of extensions called "dendrites" that receive input from other neurons, as many as ten thousand inputs for a single neuron. The structure that enables one neuron to contact another is called a dendritic spine. These humble structures look like a little fingers coming off the dendrites, and their proper formation may be one of the keys to schizophrenia.

In their study, the scientists discovered that when mice are deprived of neuregulin, their dendritic spines start to form, but do not mature completely - instead falling apart while the brain matures. The effect of this loss is evident in behavior tests, where mice display hallmarks of schizophrenia, such as social interaction problems and reduced anxiety. Loss of the spines also leads to the loss of the ability to adapt to and anticipate a startling noise - a classic sign of a schizophrenia-like state in mice.

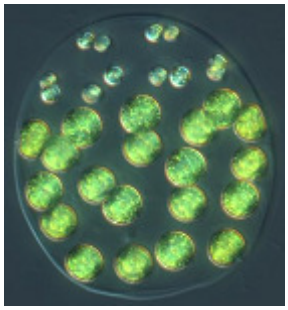
This study provides support for a hypothesis about schizophrenia that implicates what are known as "glutamatergic" neurons. All neurons communicate by releasing particular chemicals called neurotransmitters into synapses, the tiny gaps in between two neurons. One longstanding hypothesis concerning schizophrenia implicates neurons that release the neurotransmitter dopamine. Another hypothesis is that glutamatergic neurons, which release the neurotransmitter glutamate, are also important in schizophrenia. The study supports the second hypothesis, says Mueller, because the mice had problems with their glutamatergic synapses, which are located at dendritic spines.

This work was supported by the National Institutes of Health, by a Christopher Reeve Foundation fellowship, by support given by the American Health Assistant Foundation, and through a Basque Government fellowship.

In addition to Mueller and Barros, the article, "Impaired maturation of dendritic spines without disorganization of cortical cell layers in mice lacking NRG1/ErbB signaling in the central nervous system," was authored by Pablo Chamero, Amanda J. Roberts, Ed Korzus, Lisa Stowers, and Mark Mayford of Scripps Research; Barbara Calabrese and Shelley Halpain of the University of California, San Diego; and Kent Lloyd of University of California, Irvine.

How *Volvox* got its groove

Single-celled algae took the leap to multicellularity 200 million years ago



Pleodorina starrii has an incomplete division of labor. Although the 12 small cells near the top of this colony only swim, the 20 larger cells both swim and reproduce.

Some algae have been hanging together rather than going it alone much longer than previously thought, according to new research.

Ancestors of Volvox algae made the transition from being a single-celled organism to becoming a multicellular colony at least 200 million years ago, during the Triassic Period.

At that time, Earth was a hot-house world whose inhabitants included tree ferns, dinosaurs and early mammals. Previous estimates had suggested Volvox's ancestors arose only 50 million years ago.

The algae switched to a communal lifestyle in only 35 million years - "a geological eyeblink," said lead researcher Matthew D. Herron of The University of Arizona in Tucson.

Figuring out how algae made the leap can provide clues to how multicellular organisms such as plants and animals evolved from single cells.

Cooperating successfully is the key, Herron said. "All the macroscopic organisms we see around us trace back to unicellular ancestors," said Herron, a doctoral candidate in the UA's department of ecology and evolutionary biology. "Each of those groups had to go through a transition like this one. "We think the early changes in this process were related to cooperation among cells and conflicts among cells - and finally to the resolution of those conflicts," he said.

The researchers used DNA sequences from about 45 different species of Volvox and related species to reconstruct the group's family tree and determine how long ago the first colonial ancestor arose.

The team's article "Triassic origin and early radiation of multicellular volvocine algae," is in this week's online Early Edition of the Proceedings of the National Academy of Sciences. Herron's co-authors Jeremiah D. Hackett and Richard E. Michod are members of the UA's department of ecology and evolutionary biology. Co-author Frank O. Aylward was at the UA when the research was conducted and is now at the University of Wisconsin in Madison. The Society of Systematic Biologists and Sigma Xi helped fund the research.

Volvox and its relatives live in freshwater ponds all over the world. Some of the species are unicellular, while others live in colonies of up to 50,000 cells. Many of the colonial algae species are visible to the eye and appear to be little green spheres rolling through the water. The most complex species have a division of labor - some cells do the swimming, others do the reproducing.

Although an earlier estimate suggested the algae's ancestors banded together 50 million years ago, Herron wanted to check the estimate using 21st-century genetic and molecular techniques.

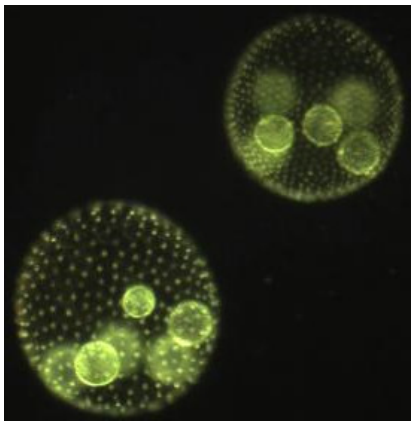
In addition to constructing the Volvox family tree, the team determined how long ago the group's oldest common ancestor lived by comparing the amount of genetic differences between species.

One of the earliest traits to evolve is the clear jelly-like substance visible between the cells of the spherical Volvox colonies, Herron said. "We think that stuff is what held the earliest multicellular colonies together." Banding together in a larger mass can provide protection from predators, he said. "Some things can't eat you if you're bigger."

But producing the goo, called extracellular matrix, takes resources and is one of the costs of cooperation.

"So now there's a temptation to cheat," Herron said. "Let's say I'm in a four-cell colony. I'm going to let the other three guys make the extracellular matrix, and I'm going to focus on growing and reproducing. That's the conflict."

Overcoming that conflict is essential to becoming a multicellular organism, he said. The benefits of cheating have to be reduced for the cells to cooperate successfully.



The colonial alga Volvox tertius has about 2,000 cells and a complete division of labor: cells either swim or reproduce, but not both. The few large cells within these colonies are the reproductive cells, while the many tiny cells do the swimming. **Copyright 2009 Matthew Herron.**

Some traits the team studied are genetic traits that mediate conflict. Genetic control of cell number is one of those, he said. "If my number of offspring is fixed at four, now there's no reason for me to cheat. I can't have eight offspring when everyone else is having only four."

Herron is now studying whether the size of the colony affects the degree to which there are different types of cells within the colony.

Study finds inconsistent teaching quality in first grade classrooms

A nationwide study of first grade classrooms finds that while many teachers create positive social environments in the classroom, most provide inadequate instructional support. The report is published in the March issue of The Elementary School Journal.

Authors Megan Stuhlman and Robert Pianta (University of Virginia) used direct observations to assess the social and instructional quality of interactions between teachers and students in 820 first grade classrooms. Previous studies have indicated that the quality of such interactions can have a significant impact on student learning, especially in early grades.

The researchers found 23 percent of classrooms to be of "high overall quality," with teachers getting high marks for creating a positive social climate in the classroom and for providing strong instructional support to students. Twenty-eight percent of classrooms were deemed "mediocre," with teachers scoring just below the sample mean on all study measures. Seventeen percent were "low overall quality."

A fourth category of classrooms characterized by "positive emotional climate, low academic demand" accounted for 31 percent of classrooms - the largest category in the sample. In these classrooms, Stuhlman explains, teachers are warm and do not discipline using threats, but they tend not to give constructive feedback that helps students understand concepts.

"We found that quality, particularly instructional features of teacher behavior, was rather low across the sample," Pianta says. "In other studies we have demonstrated the connection between these observed teacher-child interactions and student learning gains. So what we are seeing here may influence the extent to which children can perform at standards consistent with accountability frameworks such as No Child Left Behind."

The study also casts doubt on traditional assumptions about the factors that influence educational quality. Class size and teacher credentials, for example, had little impact on quality. And in a finding that may come as a surprise to advocates of private school vouchers, public school classrooms actually fared a bit better than private school classes.

"[M]ore public schools were categorized as high overall quality than would be expected by chance," the authors write. "Moreover, equal proportions of public and private schools were in the lowest rated classroom type."

The results suggest that educational opportunity will not be improved simply by shipping students to private schools, Pianta says. "Instead, strong, instructionally-focused, and effective professional development for a large number of teachers is perhaps the most important next step."

MMR vaccine not linked to autism, says US court

NO, VACCINES do not cause autism, the US Court of Federal Claims has ruled. It found no basis for claims made by three families that the MMR vaccine, combined with a mercury-based vaccine preservative, was responsible for their children's autism.

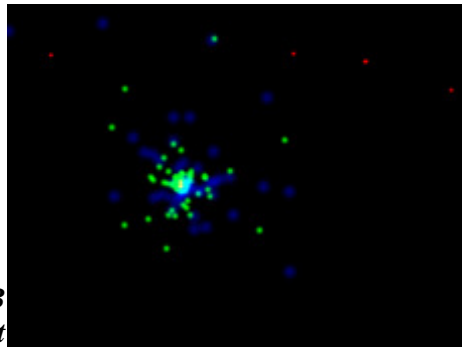
More than 5500 claims have been filed by US families seeking compensation through the government's Vaccine Injury Compensation Program. The 12 February ruling means those families making the same claim will not receive compensation.

The ruling does not directly affect those making slightly different claims, such as that the preservative thimerosal alone is to blame. But Paul Offit of the Children's Hospital of Philadelphia in Pennsylvania expects a similar outcome for all the cases, as he believes last week's ruling clearly supports the science. "It's not only that they didn't leave a door open, they slammed the door shut," he says.

In one ruling, Special Master George L. Hastings wrote that while the daughter of the family had "tragically suffered" due to autism, "the petitioners have also failed to demonstrate that her vaccinations played any role at all in causing those problems".

NASA's Fermi Telescope Sees Most Extreme Gamma-ray Blast Yet

The first gamma-ray burst to be seen in high-resolution from NASA's Fermi Gamma-ray Space Telescope is one for the record books. The blast had the greatest total energy, the fastest motions and the highest-energy initial emissions ever seen.



"We were waiting for this one," said Peter Michelson, the principal investigator on Fermi's Large Area Telescope at Stanford University. "Burst emissions at these energies are still poorly understood, and Fermi is giving us the tools to understand them."

This movie compresses about 8 minutes of Fermi LAT observations of GRB 080916C into 6 seconds. Colored dots represent gamma rays of different energies. Visible light has energy between about 2 and 3 electron volts (eV). The blue dots represent lower-energy gamma rays (less than 100 million eV); green, moderate energies (100 million to 1 billion eV); and red, the highest energies (more than 1 billion eV). **NASA/DOE/Fermi LAT Collaboration** *View video*

Gamma-ray bursts are the universe's most luminous explosions. Astronomers believe most occur when exotic massive stars run out of nuclear fuel. As a star's core collapses into a black hole, jets of material - powered by processes not yet fully understood - blast outward at nearly the speed of light. The jets bore all the way through the collapsing star and continue into space, where they interact with gas previously shed by the star and generate bright afterglows that fade with time.

This explosion, designated GRB 080916C, occurred at 7:13 p.m. EDT on Sept. 15, in the constellation Carina. Fermi's other instrument, the Gamma-ray Burst Monitor, simultaneously recorded the event. Together, the two instruments provide a view of the blast's initial, or prompt, gamma-ray emission from energies between 3,000 to more than 5 billion times that of visible light.

Nearly 32 hours after the blast, Jochen Greiner of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany, led a group that searched for the explosion's fading afterglow. The team simultaneously

captured the field in seven wavelengths using the Gamma-Ray Burst Optical/Near-Infrared Detector, or GROND, on the 2.2-meter telescope at the European Southern Observatory in La Silla, Chile. In certain colors, the brightness of a distant object shows a characteristic drop-off caused by intervening gas clouds. The farther away the object is, the redder the wavelength where this fade-out occurs. This gives astronomers a quick estimate of the object's distance. The team's follow-up observations established that the explosion took place 12.2 billion light-years away.

"Already, this was an exciting burst," said Julie McEnery, a Fermi deputy project scientist at NASA's Goddard Space Flight Center in Greenbelt, Md. "But with the GROND team's distance, it went from exciting to extraordinary."

With the distance in hand, Fermi team members showed that the blast exceeded the power of approximately 9,000 ordinary supernovae, if the energy was emitted equally in all directions. This is a standard way for astronomers to compare events even though gamma-ray bursts emit most of their energy in tight jets.

Coupled with the Fermi measurements, the distance also helps astronomers determine the slowest speeds possible for material emitting the prompt gamma rays. Within the jet of this burst, gas bullets must have moved at 99.9999 percent the speed of light. This burst's tremendous power and speed make it the most extreme recorded to date.

One curious aspect of the burst is a five-second delay separating the highest-energy emissions from the lowest. Such a time lag has been seen clearly in only one earlier burst. "It may mean that the highest-energy emissions are coming from different parts of the jet or created through a different mechanism," Michelson said.

The team's results appear today in the online edition of the journal Science.

NASA's Fermi Gamma-ray Space Telescope is an astrophysics and particle physics partnership mission, developed in collaboration with the U.S. Department of Energy and important contributions from academic institutions and partners in France, Germany, Italy, Japan, Sweden, and the United States.

Buck Scientists Propose New Model For Alzheimer's Disease

Discovery of brain protein may be clue to treatment

Listen to the podcast

A study from the Buck Institute for Age Research offers a revolutionary new model for Alzheimer's disease (AD), a devastating neurodegenerative disorder which afflicts 24 million people worldwide. In an effort to unravel the normal function of a protein implicated in AD, scientists in California and France have discovered a naturally occurring protein that provides a new therapeutic target for the disease. The finding upsets the current theory that AD is a disease of toxicity stemming from damage caused by sticky plaques that collect in the brain – this research points to the condition as a disorder involving an imbalance in signaling between neurons. The study appears online in the Nature publication Cell Death and Differentiation.

One of the mysteries of AD has been the normal function of the amyloid precursor protein (APP) which are concentrated at the points where neurons connect. Even though the sticky amyloid plaques which have been viewed as a hallmark sign of AD result from APP, it seems unlikely that APP exists simply to cause Alzheimer's disease. In their study, scientists from the Buck Institute and the CNRS (Centre Nationale de la Recherche Scientifique) show that APP binds to netrin-1, a protein that helps to guide nerves and their connections in the brain, as well as helping nerve cells to survive. When netrin-1 was given to mice that have a gene for Alzheimer's disease their symptoms were reversed, and the sticky amyloid was reduced. These results suggest that the long-held belief that AD is caused by brain cell damage inflicted by the amyloid plaques may be wrong; instead, it is beginning to appear that the disease stems from an imbalance between the normal making and breaking of connections in the brain, with netrin-1 supporting the connections and the amyloid breaking the connections - both by binding to APP and activating normal cell programs. Not only did the netrin-1 binding to APP keep the nerve cells alive and connected, but it also shut down the production of the amyloid, all of which makes it an interesting potential therapeutic.

"I think we're going to see an explosion in the next five years involving the dissection of these signaling pathways whose imbalance leads to Alzheimer's disease," said Buck Institute Faculty Member Dale Bredesen, MD, who led the California half of the French-Californian collaborative research. "We now believe that APP is part of a 'plasticity module' that functions in normal memory and forgetting, and that netrin-1 gives us an important starting point to restore the normal balance."

"We believe that Alzheimer's disease is somewhat analogous to cancer, which results from an imbalance between the normal processes that support cell survival and those that cause cell turnover," said Patrick Mehlen, PhD, Director of the Apoptosis, Cancer and Development CNRS Laboratory at the University of Lyon and co-senior author of the study. "Our hope is that this research will lead to therapeutics that will be used to address this imbalance much earlier in the disease process."

Research is underway to develop a drug based on the findings. The Buck Institute and the CNRS in Lyon are partnering with Neurobiological Technologies Inc., (NASDAQ: NTII) to bring the discovery from the laboratory to clinical trials.

Other researchers involved in the study include first author Filipe Calheiros Lourenço, of the University of Lyon, along with co-workers Joanna Fombonne, Véronique Corset and Fabien Llambi; Verónica Galvan of the Buck Institute, and Ulrike Müller of the University of Heidelberg. The work was supported by the Agence Nationale de la Recherche, the CNRS (Centre Nationale de la Recherche Scientifique), the National Institutes of Health, the Joseph Drown Foundation, the John Douglas French Foundation, and the Alzheimer's Association.

When should prostate-specific antigen testing be stopped?

New York, NY – Although widespread Prostate-Specific-Antigen (PSA) testing has undoubtedly decreased prostate cancer mortality, is there a point of diminishing returns? In a study published in the April 2009 issue of The Journal of Urology, researchers found that in a subgroup of elderly men, among those who were 75 years old or older and had a PSA below 3 ng/ml (nanograms per milliliter), none subsequently died of prostate cancer. The discontinuation of routine PSA screening in these men may not increase the rates of undetected lethal disease, and could avoid potentially unnecessary treatments and reduce diagnostic costs.

Because PSA screening can find cancers that may become life-threatening in 5 to 25 years, there has been increased usage of the test in 40 to 50-year-olds. But the test can also discover cancers that never become life-threatening, perhaps in up to 30% of the cases. Many men who are older than 75 undergo continued PSA screening, potentially leading to unnecessary treatment since death from other causes is more likely than death from prostate cancer.

The study conducted by investigators from the Baltimore Longitudinal Study of Aging (National Institute on Aging, National Institutes of Health) and the Department of Urology at Johns Hopkins School of Medicine involved 849 men (122 with and 727 without prostate cancer) with serial PSA measurements . Researchers found that for men over 75 with PSA < 3ng/ml, none died of prostate cancer and only one developed high-risk prostate cancer. In contrast, men of all ages with a PSA ≥3.0 ng/ml had a continually rising probability of death from prostate cancer.

Writing in the article, Edward M. Schaeffer states, "The optimal approach to prostate cancer screening remains controversial. To date, there is limited evidence from which to inform the decision on when to discontinue prostate cancer screening. Our findings suggest that men at an age of 75-80 years who have a PSA level below 3ng/ml are unlikely to be diagnosed with a high risk prostate cancer during life. These men may therefore represent an ideal target group for discontinuation of PSA testing, which could dramatically reduce the costs associated with screening and the potential morbidity of additional evaluations and/or treatment in a population unlikely to gain benefit." Dr. Schaeffer emphasized that these findings need to be confirmed in a much larger study, and that men over the age of 75 years should continue to be monitored for development of clinical signs of prostate cancer.

The article is "Prostate Specific Antigen Testing Among the Elderly: When To Stop?" by Edward M. Schaeffer MD, PhD, H. Ballentine Carter MD, Anna Kettermann MA, Stacy Loeb MD, Luigi Ferrucci MD, PhD, Patricia Landis BS, Bruce J. Trock PhD, and E. Jeffrey Metter MD. It appears in The Journal of Urology, Volume 181, Issue 4 (April 2009) published by Elsevier.

Abandon hope

Live sustainably just because it's the right thing to do

Do you "hope" that everyone will see the light and start living more sustainably to save the environment? If so, you may be doing more harm than good.

So say an environmental scientist and an environmental ethicist in a provocative essay in the March 2009 issue of the international journal, The Ecologist. John Vucetich, assistant professor of animal ecology at Michigan Technological University, and Michael Nelson, associate professor of environmental ethics at Michigan State University, challenge the widespread belief that hope can motivate people to solve overwhelming social and environmental problems.

"Is hope a placebo, a distraction, merely sowing the seeds of disillusionment?" they ask, in an opinion piece titled "Abandon Hope." The authors, co-founders and directors of the Conservation Ethics Group, an of environmental ethics consultancy, examine the proper role of hope in environmentalism. They suggest that hope's alternative is not hopelessness or despair, but rather the inherent virtue of "doing the right thing."

For decades, say Vucetich and Nelson, we have been hammered by the ceaseless thunder of messages predicting imminent environmental cataclysm: global climate change, air and water pollution, destruction of wildlife habitat, holes in the ozone. The response of environmentalists - from Al Gore to Jane Goodall - to this persistent message of hopelessness has focused on the need to remain hopeful.

But hope may actually be counter-productive, Vucetich and Nelson suggest. "I have little reason to live sustainably if the only reason to do so is to hope for a sustainable future, because every other message I receive suggests that disaster is guaranteed," they explain.

People are hearing radically contradictory messages:

* ***Scientists present evidence that profound environmental disaster is imminent.***
* ***It is urgent to live up to an extremely high standard of sustainable living.***
* ***The reason to live sustainably is that doing so gives hope for averting disaster.***
* ***Yet disaster is inevitable.***

"Given a predisposition to mistrust authorities, such contradictions justifiably elicit mistrust," say Vucetich and Nelson.

If hope for averting environmental disaster is not the right reason to live sustainably, what is? The scholars say we must provide people with reasons to live sustainably that are rational and effective, based on virtues rather than consequences. That means equating sustainable living not with hope for a better future, but with basic virtues such as sharing and caring, virtues that we recognize as good in themselves and fundamentally the right way to live in the present, they explain.

One advantage to such an approach is that it can motivate even people who do not believe that we are on the brink of environmental disaster, Vucetich and Nelson point out. It also clarifies the connection between environmental and social problems, a connection many people fail to grasp.

"Instead of hope, we need to provide young people with reasons to live sustainably that are rational and effective," they say. "We need to lift up examples of sustainable living motivated by virtue more than by a dubious belief that such actions will avert environmental disaster."

If It's Hard to Say, It Must be Risky

We all have different criteria for what we consider risky. However, numerous studies have suggested that we tend to perceive familiar products and activities as being less risky and hazardous than unfamiliar ones. If something is familiar, the thinking goes, it is comfortable and safe. But how do we know if something is familiar? We often rely on a simple shortcut: If it is easy to perceive, remember or pronounce, we have probably seen it before. If so, will a product's name and how easy it is to pronounce, affect how we view the product? Will it seem safer when its name is easy to pronounce? In a new study reported in Psychological Science, a journal of the Association for Psychological Science, psychologists Hyunjin Song and Norbert Schwarz from the University of Michigan present evidence that we if have problems pronouncing something, we will consider it to be risky.

A group of students were given a list of made-up food additives and were asked to rate how harmful they were. The additives all contained twelve letters, with Magnalroxate being one of the easiest to pronounce and Hnegripitrom one of the hardest to pronounce. The students rated the difficult to pronounce additives as being more harmful. In addition, the hard to pronounce additives were considered to be more novel than those with easier names. In another experiment, students were shown a list of made-up names of amusement-park rides and were asked to rate the rides on how adventurous they would be and how risky (and therefore most likely to make them sick) the rides would be. The names ranged from being easy to pronounce (such as Chunta) to very difficult to pronounce (such as Vaiveahtoishi). Consistent with the first experiment, the students rated the rides with the difficult to pronounce names as being more risky, but also more exciting.

These results show that people consistently classify difficult to pronounce items as risky, and this is the case for both undesirable risks (such as getting sick on a roller coaster or hazardous food additive) as well as desirable risks (such as an adventurous amusement park ride). These findings also suggest that risk perception may be influenced by the way the items are presented - if they are difficult to process (such as hard to pronounce names), they will be viewed as being inherently riskier. The authors note that these findings are relevant for risk communication and they suggest that difficult product names "may alert consumers to the risks posed by potentially hazardous products, possibly motivating them to pay closer attention to warnings and instructions."

Is Difficult Better? Study Reveals We Tend to Ignore Simple Items While Pursuing Goals

Try the following experiment with two young children. To one child, hold a toy out just beyond their grasp and watch them bounce all over the place trying to reach it. With the second child, just hand the toy over to them. Is the first child likely to find the toy more interesting than the other child? When we are pursuing a goal, we need to carefully consider the best ways of achieving it. If we come across something very difficult, how will that affect our ability to meet our goal? University of Chicago psychologists Aparna A. Labroo and Sara Kim investigated the extent that subjective feelings of difficulty are associated with an increased appeal towards a product.

A group of students were assigned with the goals of feeling good or being kind. Then they were presented with ads for chocolate (the group who had the goal of feeling good) and a children's charity (the group who had the goal of being kind). The volunteers were shown one of two versions of the ads - a clear, easy to read ad or a blurry, difficult to read ad (the content in both of the ads was identical). The students then completed questionnaires about how much they desired the chocolates and their thoughts about the charity. The volunteers who were shown the charity advertisement were also given the option of donating money to the charity.

The results, described in Psychological Science, a journal of the Association for Psychological Science, were very interesting. The students who viewed the ads for chocolate were more likely to desire the chocolates in the blurry ad than the ones in the clear, easy-to-read ad. In addition, the volunteers who watched the charity advertisement donated more money to the charity, but only after seeing the blurry, difficult to read ad.

These findings reveal that when something is difficult, we tend to believe that because it is difficult, it must be important in helping us achieve our goals. These results were surprising because they are counterintuitive to earlier studies which showed that objects are liked more when they are easy to process and understand. The authors suggest that when we have goals, we need to be careful as we consider just how useful certain actions and products will be in helping us meet those goals - and that difficult is not necessarily better.

Computer components shrinking faster than predicted

* 18:06 20 February 2009 **by Colin Barras**

For more than 40 years, computer processors have increased in power and shrunk in size at a tremendous rate. But engineers are approaching the point where there is not much more to be gained from tweaking the traditional ways of making those components (see our feature What happens when silicon can shrink no more?).

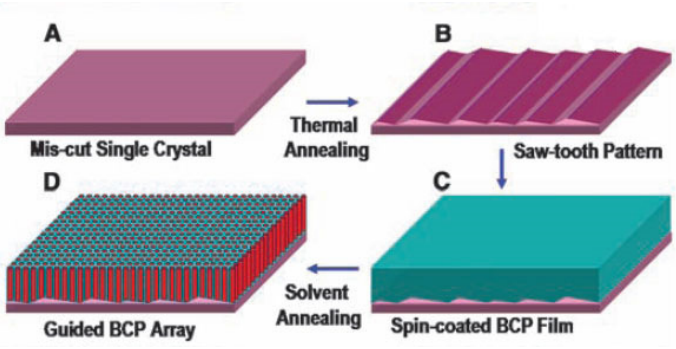
However, advanced new forms of transistors and memory unveiled this week could develop into products that keep that growth from tailing off.

Two US groups have announced transistors almost 1000 times smaller than those in use today, and a version of flash memory that could store all the books in the US Library of Congress in a square 4 inches (10 cm) across.

Domino effect

Thomas Russell at the University of Massachusetts and his international team have become the first to realise a long-mooted idea - that flash memory could be made from patterns of nanoscale magnets.

The group has worked out how to make the memory build itself, in a cascading domino-like effect.



A pattern of tiny magnets can store data at unprecedented densities **(Image: Science)**

They found weakening a specific plane in a sapphire or silicon wafer brings a subtle instability to the highly ordered crystal. Heating the crystal to around 1400 °C then emphasises the instability and the atoms rearrange, producing a saw-tooth pattern of depressions across the wafer's surface. That pattern is then used to shepherd polymers into a regular repeating nanoscale pattern and make a mask to create an array of tiny nickel magnets. Each of these can store digital bits (1 or 0) in their magnetic north-south orientation.

Dense data

Using 3-nanometre magnets, an array could store 10 terabits (roughly 270 standard DVDs) per square inch, says Russell, who is now working to perfect magnets small enough to cram 100 terabits into a square inch.

"Currently, industry is working at half a terabit [per square inch]," he says. "They wanted to be at 10 terabits in a few years' time - we have leapfrogged that target."

Sebastien Lecommandoux who researches self-assembling nanotechnologies at the University of Bordeaux, France, is impressed. "The work described can, I believe, bring a real breakthrough in high-capacity storage devices."

Tiny transistors

This week also saw the announcement of an advance that could shrink the transistors used to make computer processors by 1000 times.

The smallest features in current silicon transistors are 45 nanometres in size, but the latest made by Jeremy Levy at the University of Pittsburgh and colleagues have features just 2 nanometers in size, allowing many more transistors to be crammed into the same area.

Rather than building them from silicon, the team used two different forms of the common mineral perovskite. When two of the insulating crystals of the right thickness are held together, the place where they meet can conduct electricity. But if one of the pieces is too thin, then current will not flow.

Working with wafers that were just too thin to conduct, Levy's team found that they could "draw" conducting patches onto the crystal using a microscopic needle. A positive voltage from the needle rearranges the crystal's atoms to create lines 2 nm across that conduct like electrical wire.

Write and erase

The process has been used to make transistors roughly 1000 times smaller in area than those fashioned from silicon. The "wires" can also be easily erased and recreated up to 100 times.

Being able to erase parts of a design and write over them again also offers more exotic possibilities, says Levy. It could be possible to use the phenomenon to could create hardware that rewires itself as it handles data, he says. "It could blur or dissolve the distinction between software and hardware, for example by integrating memory and logic," he says.

Jean-Marc Triscone at the University of Geneva has shown that perovskite crystals can also behave as superconductors. "The achievements of Levy and co-workers coupled to [our] superconductivity [work] may allow small electronic circuits to be realised, which would open many interesting possibilities," he says.

Journal references: Russell's paper: Science (DOI: 10.1126/science.1168108) Levy's paper: Science (DOI: 10.1126/science.1168294)

NASA's Swift Spies Comet Lulin

While waiting for high-energy outbursts and cosmic explosions, NASA's Swift Gamma-ray Explorer satellite is monitoring Comet Lulin as it closes on Earth. For the first time, astronomers are seeing simultaneous ultraviolet and X-ray images of a comet. "We won't be able to send a space probe to Comet Lulin, but Swift is giving us some of the information we would get from just such a mission," said Jenny Carter, at the University of Leicester, U.K., who is leading the study.

"The comet is releasing a great amount of gas, which makes it an ideal target for X-ray observations," said Andrew Read, also at Leicester.

A comet is a clump of frozen gases mixed with dust. These "dirty snowballs" cast off gas and dust whenever they venture near the sun. Comet Lulin, which is formally known as C/2007 N3, was discovered last year by astronomers at Taiwan's Lulin Observatory. The comet is now faintly visible from a dark site. Lulin will pass closest to Earth - 38 million miles, or about 160 times farther than the moon - late on the evening of Feb. 23 for North America.

On Jan. 28, Swift trained its Ultraviolet/Optical Telescope (UVOT) and X-Ray Telescope (XRT) on Comet Lulin. "The comet is quite active," said team member Dennis Bodewits, a NASA Postdoctoral Fellow at the Goddard Space Flight Center in Greenbelt, Md. "The UVOT data show that Lulin was shedding nearly 800 gallons of water each second." That's enough to fill an Olympic-size swimming pool in less than 15 minutes.

Swift can't see water directly. But ultraviolet light from the sun quickly breaks apart water molecules into hydrogen atoms and hydroxyl (OH) molecules. Swift's UVOT detects the hydroxyl molecules, and its images of Lulin reveal a hydroxyl cloud spanning nearly 250,000 miles, or slightly greater than the distance between Earth and the moon.

Swift image of comet Lulin passing through the constellation Libra Comet Lulin was passing through the constellation Libra when Swift imaged it. This view merges the Swift data with a Digital Sky Survey image of the star field. **Credit: NASA/Swift/Univ. of Leicester/DSS (STScI, AURUA)/Bodewits et al.**

The UVOT includes a prism-like device called a grism, which separates incoming light by wavelength. The grism's range includes wavelengths in which the hydroxyl molecule is most active. "This gives us a unique view into the types and quantities of gas a comet produces, which gives us clues about the origin of comets and the solar system," Bodewits explains. Swift is currently the only space observatory covering this wavelength range.

In the Swift images, the comet's tail extends off to the right. Solar radiation pushes icy grains away from the comet. As the grains gradually evaporate, they create a thin hydroxyl tail.

Farther from the comet, even the hydroxyl molecule succumbs to solar ultraviolet radiation. It breaks into its constituent oxygen and hydrogen atoms. "The solar wind - a fast-moving stream of particles from the sun - interacts with the comet's broader cloud of atoms. This causes the solar wind to light up with X rays, and that's what Swift's XRT sees," said Stefan Immler, also at Goddard.

This interaction, called charge exchange, results in X-rays from most comets when they pass within about three times Earth's distance from the sun. Because Lulin is so active, its atomic cloud is especially dense. As a result, the X-ray-emitting region extends far sunward of the comet.

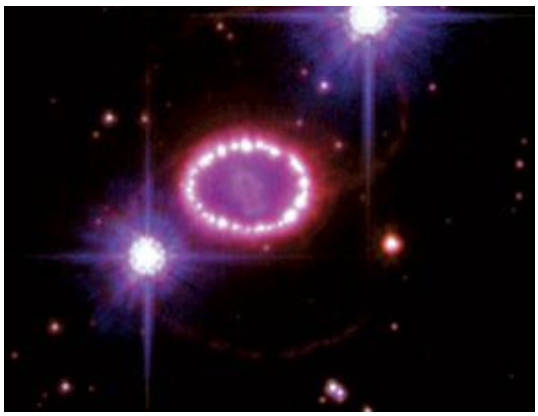
"We are looking forward to future observations of Comet Lulin, when we hope to get better X-ray data to help us determine its makeup," noted Carter. "They will allow us to build up a more complete 3-D picture of the comet during its flight through the solar system."

Other members of the team include Michael Mumma and Geronimo Villanueva at Goddard.

NASA's Goddard Space Flight Center in Greenbelt, Md., manages the Swift satellite. It is being operated in collaboration with partners in the U.S., the United Kingdom, Italy, Germany and Japan. NASA's Fermi Gamma-ray Space Telescope is an astrophysics and particle physics observatory developed in collaboration with the U.S. Department of Energy and with important contributions from academic institutions and partners in France, Germany, Italy, Japan, Sweden, and the U.S. ***Francis Reddy*** *NASA's Goddard Space Flight Center*

Quark star may hold secret to early universe

* 21 February 2009 **by Paul Parsons**



A NEW kind of star may be lurking in the debris from a nearby supernova explosion. If confirmed, the "quark star" could offer fresh insights into the earliest moments of the universe.

When supernovae explode, they leave behind either a black hole or a dense remnant called a neutron star. However, recent calculations suggest a third possibility: a quark star, which forms when the pressure falls just short of creating a black hole.

Astronomers believe these form after the neutron star stage, when the pressure inside a supernova rises so high the neutrons disintegrate into their constituents - quarks. These form an even denser star than neutrons.

(Image: P Challis and R Kirshner **(Harvard-Smithsonian Center For Astrophysics)/NASA/ESA/STScI/SPL)**

Observing a quark star could shed light on what happened just after the big bang, because at this time, the universe was filled with a dense sea of quark matter superheated to a trillion °C. While some groups have claimed to have found candidate quark stars, no discovery has yet been confirmed.

Now Kwong-Sang Cheng of the University of Hong Kong, China, and colleagues have presented evidence that a quark star formed in a bright supernova called SN 1987AMovie Camera (pictured), which is among the nearest supernovae to have been observed.

The birth of a neutron star is known to be accompanied by a single burst of neutrinos. But when the team examined data from two neutrino detectors - Kamiokande II in Japan and Irvine-Michigan-Brookhaven in the US - they found that SN 1987A gave off two separate bursts. "There is a significant time delay between [the bursts recorded by] these two detectors," says Cheng. They believe the first burst was released when a neutron star formed, while the second was triggered seconds later by its collapse into a quark star. The results will appear in The Astrophysical Journal (www.arxiv.org/abs/0902.0653v1).

"This model is intriguing and reasonable," says Yong-Feng Huang of Nanjing University, China. "It can explain many key features of SN 1987A." However, Edward Witten of the Institute for Advanced Study in Princeton, New Jersey, is not convinced. "I hope they're right," he says. "My first reaction, though, is that this is a bit of a long shot."

High-resolution X-ray observatories, due to fly in space in the next decade, may have the final say. Neutron stars and quark stars should look very different at X-ray wavelengths, says Cheng.