Sea urchin yields a key secret of biomineralization

MADISON - The teeth and bones of mammals, the protective shells of mollusks, and the needle-sharp spines of sea urchins and other marine creatures are made-from-scratch wonders of nature.

Used to crush food, for structural support and for defense, the materials of which shells, teeth and bones are composed are the strongest and most durable in the animal world, and scientists and engineers have long sought to mimic them.

Now, harnessing the process of biomineralization may be closer to reality as an international team of scientists has detailed a key and previously hidden mechanism to transform amorphous calcium carbonate into calcite, the stuff of seashells. The new insight promises to inform the development of new, superhard materials, microelectronics and micromechanical devices.

In a report today (Oct. 27) in the Proceedings of the National Academy of Sciences (PNAS), a group led by University of Wisconsin-Madison physicist Pupa Gilbert describes how the lowly sea urchin transforms calcium carbonate - the same material that forms "lime" deposits in pipes and boilers - into the crystals that make up the flint-hard shells and spines of marine animals. The mechanism, the authors write, could "well represent a common strategy in biomineralization…."

"If we can harness these mechanisms, it will be fantastically important for technology," argues Gilbert, a UW-Madison professor of physics. "This is nature's bottom-up nanofabrication. Maybe one day we will be able to use it to build microelectronic or micromechanical devices."

Gilbert, who worked with colleagues from Israel's Weizmann Institute of Science, the University of California at Berkeley and the Lawrence Berkeley National Laboratory, used a novel microscope that employs the soft-X-rays produced by synchrotron radiation to observe how the sea urchin builds its spicules, the sharp crystalline "bones" that constitute the animal's endoskeleton at the larval stage.

Similar to teeth and bones, the sea urchin spicule is a biomineral, a composite of organic material and mineral components that the animal synthesizes from scratch, using the most readily available elements in sea water: calcium, oxygen and carbon. The fully formed spicule is composed of a single crystal with an unusual morphology. It has no facets and within 48 hours of fertilization assumes a shape that looks very much like the Mercedes-Benz logo.

These crystal shapes, as those of tooth enamel, eggshells or snails, are very different from the familiar faceted crystals grown through non-biological processes in nature. "To achieve such unusual - and presumably more functional - morphologies, the organisms deposit a disordered amorphous mineral phase first, and then let it slowly transform into a crystal, in which the atoms are neatly aligned into a lattice with a specific and regular orientation, while maintaining the unusual morphology," Gilbert notes.

The question the Wisconsin physicist and her colleagues sought to answer was how this amorphous-to-crystalline transition occurs. The sea urchin larval spicule is a model system for biominerals, and the first one in which the amorphous calcium carbonate precursor was discovered in 1997 by the same Israeli group co-authoring the current PNAS paper. A similar amorphous-to-crystalline transition has since been observed in adult sea urchin spines, in mollusk shells, in zebra fish bones and in tooth enamel. The resulting biominerals are extraordinarily hard and fracture resistant, compared to the minerals of which they are made.

"The amorphous minerals are deposited and they are completely disordered," Gilbert explains. "So the question we addressed is 'how does crystallinity propagate through the amorphous mineral?'"

To answer it, Gilbert and her colleagues observed spicule development in 2- to 3-day-old sea urchin larvae. The sea urchin spicule is formed inside a clump of specialized cells and begins as the animal lays down a single crystal of calcite in the form of a rhombohedral seed, from which the rest of the spicule is formed. Starting from the crystalline center, three arms extend at 120 degrees from each other, as in the hood ornament of a Mercedes-Benz. The three radii are initially amorphous calcium carbonate, but slowly convert to calcite.

"We tried to find evidence of a massive crystal growth, with a well defined growth front, propagating from the central crystal through the amorphous material, but we never observed anything like that," Gilbert says. "What we found, instead, is that 40-100 nanometer amorphous calcium carbonate particles aggregate into the final morphology. One starts converting to crystalline calcite, then another immediately adjacent converts as well, and another, and so on in a three-dimensional domino effect. The pattern of crystallinity, however, is far from straight. It resembles a random walk, or a fractal, like lightning in the sky or water percolating through a porous medium," explains Gilbert.

The new work, according to Gilbert, brings science a key step closer to a thorough understanding of how biominerals form and transform. Knowing the step-by-step process may permit researchers to develop new crystal structures that can be used in applications ranging from new microelectronic devices to medical applications. *The new study was funded by the National Science Foundation and the U.S. Department of Energy.*

Are you phonagnosic?

The first known case of someone born without the ability to recognise voices has been reported in a paper by UCL (University College London) researchers, in a study of a rare condition known as phonagnosia. The UCL team are calling for other people to come forward if they think they have also grown up with the condition.

The case study, reported in the online issue of the journal Neuropsychologia, is of a woman who is unable to recognise people by their voice, including her own daughter whom she has great difficulty identifying over the phone. The woman, known as KH, avoids answering the phone where possible, and for many years has only answered 'booked calls'. KH books calls with friends or co-workers, so she knows who to expect when the telephone rings at a certain time. In the 1980s, KH had a job in which she introduced herself with a different form of her first name so she would know that it was someone related to her job when they called and asked for her using that name.

KH, a 60-year old successful professional woman, was aware from an early age that there was something she couldn't do that others clearly could. But it was only when reading an article in a popular science magazine years later that KH finally understood her lifelong problem. The article discussed prosopagnosia, a condition where people have severe difficulty recognising faces. KH realized she might have the vocal analogue of prosopagnosia, and contacted the magazine, who put her in touch with UCL's Dr Brad Duchaine.

Dr Brad Duchaine, co-author of the paper, says: "Occasionally, people have experienced problems recognising voices following a stroke or brain damage, but this is the first documented case of someone growing up with this condition. We suspect that there are other people out there with similar problems, and we'd like to get in touch with them. If you think you might be phonagnosic, please contact us."

"Voice recognition may not seem as important as face recognition, given that failing to recognise someone in front of you can cause much more social anxiety than not recognising them over the phone. Yet we rely on voice recognition in our day-to-day lives, to identify people on the phone or those speaking on the radio."

In the study, Dr Duchaine and Lucia Garrido of the UCL Institute of Cognitive Neuroscience presented KH with a series of tasks involving the recognition of faces, voices, vocal emotions, speech perception and music. KH struggled to recognise the voices of famous actors and politicians, and also had difficulty learning and recognising new voices. Compared to a control group of volunteers, nearly all of whom identified the voices of Margaret Thatcher, David Beckham, Dawn French, Chris Tarrant, Joanna Lumley, Sean Connery and Ann Widdecombe, KH was only able to identify the voice of Sean Connery.

However, KH performed well on nearly all other tasks. For example, in a test involving emotional sounds - achievement/triumph, amusement, anger, disgust, fear, pleasure, relief, sadness and surprise - KH could identify the emotional state of the person speaking roughly 80 per cent of the time, similar to the control group. KH also did well on all music tasks, identifying famous tunes and discriminating between instruments. KH says that she is able to enjoy and appreciate music, though she usually doesn't recognize singers.

Phonagnosia has only been documented so far in people with brain lesions in the right hemisphere following a stroke or brain damage, and the mechanisms behind it are not well understood. In KH's case, a MRI brain scan showed no evidence of brain damage in regions associated with voice or auditory perception, and her hearing abilities were found to be normal. ***Notes for Editors***

1. To request an interview or to get in touch with Dr Brad Duchaine, please contact him on tel: +44 (0)20 7679 1005, e-mail: b.duchaine@ucl.ac.uk.

2. KH wishes to remain anonymous. All queries regarding KH should be addressed to Jenny Gimpel in the UCL Media Relations Office on tel: +44 (0)20 7679 9726, mobile: +44 (0)7747 565 056, out of hours +44 (0)7917 271 364, e-mail: j.gimpel@ucl.ac.uk.

3. 'Developmental phonagnosia: A selective deficit of vocal identity recognition', by Lucia Garrido, Frank Eisner, Carolyn McGettigan, Lauren Stewart, Disa Sauter, Richard Hanley, Stefan Schweinberger, Jason Warren and Brad Duchaine, is published in the journal Neuropsychologia. Journalists can obtain copies of the paper by contacting the UCL Media Relations Office.

4. The study was primarily funded by the Economic and Social Research Council.

Scientists unveil mechanism for 'up and down' in plants

Versatile hormone It is known for a long time that the plant hormone auxin is transmitted from the top to the bottom of a plant, and that the local concentration of auxin is important for the growth direction of stems, the growth of roots, the sprouting of shoots. To name a few things; auxin is also relevant to, for instance, the ripening of fruit, the clinging of climbers and a series of other processes. Thousands of researchers try to understand the different roles of auxin.

In many instances the distribution of auxin in the plant plays a key role, and thus the transport from cell to cell. At the bottom of plant cells, so-called PIN proteins are located on the cell membrane, helping auxin to

flow through to the lower cell. However, no one thoroughly understood why the PIN proteins only showed up at the bottom of a cell.

Endocytosis An international group of scientists from labs in five countries, headed by Jirí Friml of the VIB-department Plant Systems Biology at Ghent University, revealed a rather unusual mechanism. PIN proteins are made in the protein factories of the cell and are transported all over the cell membrane. Subsequently they are engulfed by the cell membrane, a process called endocytosis. The invagination closes to a vesicle, disconnects and moves back into the cell. Thus the PIN proteins are recycled and subsequently transported to the bottom of the cell, where they are again incorporated in the cell membrane. It is unclear why plants use such a complex mechanism, but a plausible explanation is this mechanism enables a quick reaction when plant cells feel a change of direction of gravity, giving them a new 'underside'.

Gene technology To see the path of the protein, the researchers used gene technology to make cells in which the PIN protein was linked to fluorescent proteins. (This technology was rewarded with the Nobel Prize 2008 for chemistry.) Subsequently they produced cells in which the endocytosis was disrupted in two different ways. The PIN proteins showed up all over the cell membrane. When the researchers proceeded from single cells to plant embryos, the embryos developed deformations, because the pattern of auxin concentrations in the embryo was distorted. When these plants with disrupted endocytosis grew further, roots developed where the first leaflet should have been.

Glutamate: Too much of a good thing in schizophrenia?

Philadelphia, PA, October 27, 2008 – Is schizophrenia a disorder of glutamate hyperactivity or hypoactivity? While the predominant hypothesis for many years was that schizophrenia was a glutamate deficit disorder, there is growing evidence of glutamate hyperactivity as well. The study by Karlsson et al., appearing in the November 1st issue of Biological Psychiatry, reinforces this point with new data about the impact of deleting the gene for the glutamate transporter EAAT1. EAAT1, implicated in schizophrenia, plays a critical role in inactivating glutamate by removing it from the synaptic and extracellular spaces. The authors demonstrate that these "knockout" animals show increased responses to the NMDA glutamate receptor antagonist, MK-801. This drug causes the release of more glutamate into the synapse in the frontal cortex. This effect of MK-801 is reduced by a group II metabotropic glutamate receptor agonist, which reduces glutamate release. Dr. Andrew Holmes, corresponding author, further discusses their findings, "Our study adds a new twist to [glutamate] research by showing that genetically disrupting a major regulator of glutamate's ability to communicate between nerve cells produces certain 'schizophrenia-like' features in mice and, moreover, that these abnormalities can be corrected by a highly promising new class of glutamate-targeting antipsychotic treatments." In fact, this class of drugs has already shown some preliminary efficacy in its ability to treat individuals suffering from schizophrenia.

John H. Krystal, M.D., Editor of Biological Psychiatry and affiliated with both Yale University School of Medicine and the VA Connecticut Healthcare System, comments: "The NMDA receptor antagonist model and the EAAT1 knockout animal push us to take a fresh look at the obstacles to treating cognitive impairments associated with schizophrenia, in other words, optimizing their cortical network function. This new look can lead us to drugs that would have been completely surprising as recently as 10 years ago, such as the group II metabotropic glutamate receptor agonists."

Dr. Holmes does note that further research is warranted, stating, "What is now needed is more research to get a better handle on how disrupting this gene affects the brain's neural wiring and molecular signaling pathways to produce the symptoms of schizophrenia." This finding could ultimately help scientists develop new or improved treatments for this schizophrenia. ***Notes to Editors:***

The article is "Loss of Glial Glutamate and Aspartate Transporter (Excitatory Amino Acid Transporter 1) Causes Locomotor Hyperactivity and Exaggerated Responses to Psychotomimetics: Rescue by Haloperidol and Metabotropic Glutamate 2/3 Agonist" by Rose-Marie Karlsson, Kohichi Tanaka, Markus Heilig, and Andrew Holmes. Drs. Karlsson and Heilig are affiliated with the Laboratory for Clinical and Translational Studies, National Institute on Alcoholism and Alcohol Abuse, National Institutes of Health, Bethesda, Maryland. Dr. Holmes is from the Section on Behavioral Science and Genetics, Laboratory for Integrative Neuroscience, National Institute on Alcoholism and Alcohol Abuse, National Institutes of Health, Rockville, Maryland. Dr. Tanaka is affiliated with the Laboratory of Molecular Neuroscience, School of Biomedical Science and Medical Research Institute, Tokyo Medical and Dental University Bunkyo-ku, Tokyo, Japan. The article appears in Biological Psychiatry, Volume 64, Issue 9 (November 1, 2008), published by Elsevier.

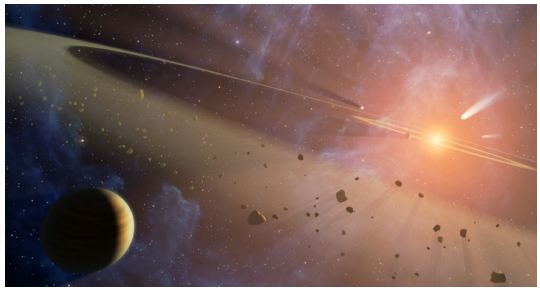
The authors' disclosures of financial and conflicts of interests are available in the article. Dr. Krystal's disclosures of financial and conflicts of interests are available

http://journals.elsevierhealth.com/webfiles/images/journals/bps/Biological_Psychiatry_Editorial_Disclosures_08_01_08.pdf

Full text of the article mentioned above is available upon request. Contact Jayne M. Dawkins at (215) 239-3674 or ja.dawkins@elsevier.com to obtain a copy or to schedule an interview.

Solar System's Young Twin Has Two Asteroid Belts

Cambridge, MA - Astronomers have discovered that the nearby star Epsilon Eridani has two rocky asteroid belts and an outer icy ring, making it a triple-ring system. The inner asteroid belt is a virtual twin of the belt in our solar system, while the outer asteroid belt holds 20 times more material. Moreover, the presence of these three rings of material implies that unseen planets confine and shape them.



The star Epsilon Eridani is slightly smaller and cooler than the Sun. It is located about 10.5 light-years from Earth in the constellation Eridanus. (A light-year is the distance light travels in one year, or about 6 trillion miles.) Epsilon Eridani is the ninth closest star to the Sun and is visible to the unaided eye. It is also younger than the Sun, with an approximate age of 850 million years.

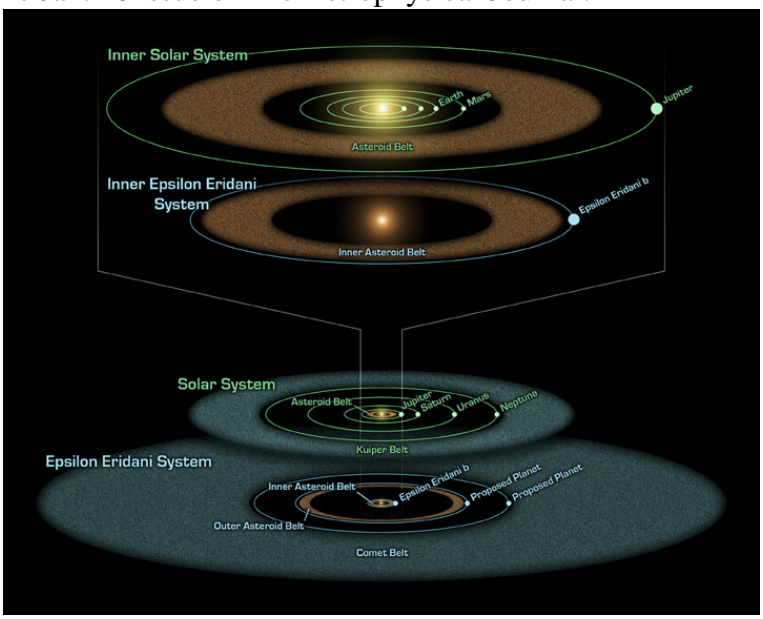
This artist's conception shows the closest known planetary system to our own, called Epsilon Eridani. Observations from NASA's Spitzer Space Telescope show that the system hosts two asteroid belts, in addition to previously identified candidate planets and an outer comet ring. The system's inner asteroid belt appears as the yellowish ring around the star, while the outer asteroid belt is in the foreground. The outermost comet ring is too far out to be seen in this view, but comets originating from it are shown in the upper right corner. **Credit: NASA/JPL-Caltech**

Epsilon Eridani and its planetary system show remarkable similarities to our solar system at a comparable age.

"Studying Epsilon Eridani is like having a time machine to look at our solar system when it was young," said Smithsonian astronomer Massimo Marengo (Harvard-Smithsonian Center for Astrophysics). Marengo is a co-author of the discovery paper, which will appear in the Jan. 10 issue of The Astrophysical Journal.

Lead author Dana Backman (SETI Institute) agreed, saying, "This system probably looks a lot like ours did when life first took root on Earth."

Our solar system has a rocky asteroid belt between Mars and Jupiter, about 3 astronomical units from the Sun. (An astronomical unit equals the average Earth-Sun distance of 93 million miles.) In total, it contains about 1/20 the mass of Earth's Moon. Using NASA's Spitzer Space Telescope, the team of astronomers found an identical asteroid belt orbiting Epsilon Eridani at a similar distance of 3 astronomical units.



They also discovered a second asteroid belt 20 astronomical units from Epsilon Eridani (about where Uranus is located in our solar system). The second asteroid belt contains about as much mass as Earth's Moon.

This artist's diagram compares the Epsilon Eridani system to our own solar system. The two systems are structured similarly, and both host asteroids (brown), comets (blue) and planets (white dots). Epsilon Eridani's inner asteroid belt is located at about the same position as ours, approximately three astronomical units from its star (an astronomical unit is the distance between Earth and the sun.). The system's second, denser belt lies at about the same place where Uranus orbits in our solar system, or 20 astronomical units from the star. Epsilon Eridani is thought to have planets orbiting near the rims of its two belts. The first of these planets was identified in 2000 via the radial velocity technique. The second planet orbiting near the rim of the outer asteroid belt at 20 astronomical units was inferred when Spitzer discovered the belt. A third planet might orbit in Epsilon Eridani at the inner edge of its outermost comet ring, which lies between 35 and 90 astronomical units. This planet was first hinted at in 1998 due to observed lumpiness in the comet ring. **Credit: NASA/JPL-Caltech**

A third, icy ring of material seen previously extends about 35 to 100 astronomical units from Epsilon Eridani. A similar icy reservoir in our solar system is called the Kuiper Belt. However, Epsilon Eridani's outer ring holds about 100 times more material than ours.

When the Sun was 850 million years old, theorists calculate that our Kuiper Belt looked about the same as that of Epsilon Eridani. Since then, much of the Kuiper Belt material was swept away, some hurled out of the solar system and some sent plunging into the inner planets in an event called the Late Heavy Bombardment. (The Moon shows evidence of the Late Heavy Bombardment - giant craters that formed the lunar seas of lava called mare.) It is possible that Epsilon Eridani will undergo a similar dramatic clearing in the future.

"Epsilon Eridani looks a lot like the young solar system, so it's conceivable that it will evolve similarly," said Marengo.

The Spitzer data show gaps between each of the three rings surrounding Epsilon Eridani. Such gaps are best explained by the presence of planets that gravitationally mold the rings, just as the moons of Saturn constrain its rings. "Planets are the easiest way to explain what we're seeing," stated Marengo.

Specifically, three planets with masses between those of Neptune and Jupiter would fit the observations nicely. A candidate planet near the innermost ring already has been detected by radial velocity studies. Those studies suggested that it orbited Epsilon Eridani on a highly elliptical path, characterized by an eccentricity of 0.7. The new finding rules out such an orbit, because the planet would have cleared out the inner asteroid belt long ago through gravitational disruption.

A second planet must lurk near the second asteroid belt, and a third at about 35 astronomical units near the inner edge of Epsilon Eridani's Kuiper Belt. Future studies may detect these currently unseen worlds, as well as any terrestrial planets that may orbit inside the innermost asteroid belt.

Healing process found to backfire in lung patients

A mechanism in the body which typically helps a person heal from an injury, may actually be causing patients with idiopathic pulmonary fibrosis (IPF) to get worse, researchers at the National Institute of Environmental Health Sciences (NIEHS), a part of the National Institutes of Health (NIH), and their collaborators have found.

"We identified a new mechanism that explains why some patients with IPF get more short of breath than others, in spite of similar levels of lung scarring," said Stavros Garantziotis, M.D., an NIEHS staff clinician and lead author on the new paper highlighted on the cover of the Nov. 1 issue of the American Journal of Respiratory and Critical Care Medicine.

Idiopathic pulmonary fibrosis is an incurable lung disease that affects approximately 50,000 people in the United States. In IPF, the lung tissue becomes scarred and patients have difficulty breathing, often resulting in death. The cause is unknown, though genes as well as environmental factors such as smoking and exposure to metal dust particles, are thought to raise the risk.

In healthy individuals, the body has a way of forming new blood vessels that can help heal an injury. For example, if you cut your finger, the body knows to deliver nutrients and cells to the injury site to promote wound healing. However, in patients with IPF, although there is a healing process that occurs, researchers say the process backfires or is disrupted and may be doing the patients more harm than good. Garantziotis explains that this involves a blood protein called inter-alpha-trypsin inhibitor (IaI), which binds with a connective tissue molecule called hyaluronan to make new blood vessels.

In people without IPF, this produces a healing process in the lungs. But Garantziotis says something different happens in people with IPF.

"Instead of building healthy new tissue to heal the scarring in the lungs, patients with higher IaI levels develop vessels that are far away from where they should be, pushing the blood away from the lung and bypassing the area where the body gets its oxygen, thus causing more shortness of breath," Garantziotis explains. Patients with IPF may suffer from low oxygen levels and shortness of breath beyond the actual effects of lung scarring itself.

The researchers applied a true bench-to-bedside approach for this study. Starting with basic research findings from in vitro cell and experimental animal studies, they were then able to demonstrate, in patients with IPF, that higher IaI serum levels were associated with less ability to take up oxygen, thus worsening the patients' condition.

The researchers say there are at least two reasons why this study is important. First, it demonstrates for the first time the important role that a blood circulating protein plays in lung function. Secondly, it identifies a potential new therapeutic target for IPF.

In addition to the NIEHS, other collaborators on the paper include the Angiogenesis Core Facility, National Cancer Institute, Gaithersburg, Md.; Duke University Medical Center, Durham, N.C.; Vanderbilt University Medical Center, Nashville, Tenn.; Institute for Molecular Science of Medicine, Aichi Medical University, Aichi, Japan; National Jewish Medical and Research Center, Denver; and the National Heart, Lung, and Blood Institute, Bethesda, Md.

Pain automatically activates facial muscle groups

Université de Montréal study on the facial responsiveness to pain

Montreal, October 27, 2008 -- A study has found that people who facially express pain in a more intense way are not exaggerating if their perception of a painful stimulation is controlled. The study conducted by Miriam Kunz is published in the November issue of Pain.

The study was conducted on 20 men and 20 women between the ages of 18 and 30. Kunz placed a heating device on their leg to provoke the painful stimulus. During the test, Kunz asked the test subjects to push a button when the heat became moderately painful as she filmed their facial expressions.

"Individuals who react to pain with intense facial expressions are in fact feeling more pain if we rely on quantitative verbal measures independent of the painful experience," says Kunz, a postdoctoral student at the Université de Montréal Faculty of Dentistry, Department of Stomatology, and the Institut universitaire de gériatrie de Montréal.

However, they have a lower tolerance for pain. "All test subjects with an intense facial reaction to pain estimated that the sensation was "moderately painful" between 45 and 47 degrees Celsius, while others had a higher threshold," she says.

All individuals have a non-verbal mode of communication influenced by culture, education, age, sex, etc. This mode relies on innate and universal programming. That is why a blind child knows how to smile, even if he has never seen his mother smile. "Pain, just like joy, sadness, fear, surprise, anger and disgust automatically activate certain muscle groups that make the expression appear on the face," says Kunz.

At 30, Kunz has already published 18 times which speaks volumes about her passion for the work. The current study is co-authored by Université de Montréal Professor Pierre Rainville, as well as, Camille Chantelle of the Université libre de Bruxelles and Stefan Lautenbacher from the Université Otto-Friedrich in Bamberg, Germany.

Pregnant women consuming flaxseed oil have high risk of premature birth

Université de Montréal study looks at the dangers of some natural products

A study has found that the risks of a premature birth quadruple if flaxseed oil is consumed in the last two trimesters of pregnancy. The research was conducted by Professor Anick Bérard of the Université de Montréal's Faculty of Pharmacy and the Sainte-Justine Hospital Research Center and Master's student Krystel Moussally.

In Canada, 50 percent of pregnant women take prescription medication. Yet many of them prefer to use natural health products during the pregnancy. "We believe these products to be safe because they are natural. But in reality, they are chemical products and we don't know many of the risks and benefits of these products contrarily to medication," says Bérard.

Bérard and Moussally set out to conduct one of the largest studies ever undertaken on by analyzing data from 3354 Quebec women. The first part of the research established that close to 10 percent of women between 1998 and 2003 used natural health products during their pregnancy. Before and after pregnancy they were respectively 15 and 14 percent to use these products. The increase means that about a third of women consuming natural health products stopped during the pregnancy.

The most consumed natural health products by pregnant women are chamomile (19 percent), green tea (17 percent), peppered mint (12 percent), and flaxseed oil (12 percent). Bérard and Moussally correlated these products to premature births and only one product had a very strong correlation: flaxseed oil.

"In the general population, the average rate of premature births is 2 to 3 percent. But for women consuming flaxseed oil in their last two trimesters that number jumps up to 12 percent," says Bérard. "It's an enormous risk."

The correlation existed only with flaxseed oil, yet women consuming the actual seed were unaffected. Even if more studies must be undertaken to verify these results, Bérard recommends caution when it comes to consuming flaxseed oil.

A face by any other name: Seeing racial bias

If Barack Obama had taken his mother's surname and kept his childhood nickname, American voters might literally see "Barry Dunham" as a quite different presidential candidate, a new study suggests. A name significantly changes our perception of someone's face and race, according to research in the journal, Perception.

Participants in the study - titled Barack Obama or Barry Dunham? - rated multi-racial faces with European names as looking significantly "more European" than exactly the same multi-racial faces when given Asian names. Earlier research had established that people tend to be better and more accurate at recognising faces of their own race than those of a different race, an effect called the own-race bias: colloquially, the feeling that people of a different race "all look the same to me".

This bias has far-reaching negative effects, most notably the observation that eyewitnesses to crimes are more likely to incorrectly identify a perpetrator of a different race. By gaining a better understanding of the mechanisms driving the bias, researchers are hoping to devise strategies to minimise its effects.

The study by researchers at the UNSW School of Psychology aimed to test the hypothesis that the presence of racially-suggestive names would influence participants' perception of identical multiracial faces, resulting in multiracial faces being judged to look more like the racial group suggested by their name.

In the experiment, 64 participants were asked to rate the appearance of Asian-Australian faces given typically Asian names, European-Australian faces given typically European names, multiracial faces given Asian names, and multiracial faces given European names. The participants comprised 32 Asian-Australian students and 32 European-Australian students.

Morphing the image of an Asian male with the image of a European male created the multiracial stimulus faces. Morphing together two Asian faces created the Asian stimulus faces, and morphing together two European faces created the European stimulus faces.

For each trial, after viewing the face and name for 3 seconds, participants rated the appearance of the face on a 9-point scale, where 1="very Asian-looking" and 9="very European-looking".

"The study reveals how socially derived expectations and stereotypes can influence face perception," says co-author and UNSW PhD student, Kirin Hilliar. "The result is consistent with other research findings suggesting that once people categorise a face into a racial group, they look for features consistent with that categorization."

For example, a 2001 study found that multiracial (half Hispanic, half African-American) composite faces given stereotypically African-American hairstyles were perceived by both African-American and Hispanic participants as having darker skin, wider mouths, and less protruding eyes compared to the same faces given Hispanic hairstyles.

"The own-race bias is often revealed in people being relatively poor at encoding and recalling the facial characteristics of an unfamiliar racial group," according to Dr Richard Kemp, a face-recognition expert and co-author. "This study reveals that non-physical features such as a name can influence people's interpretation of facial characteristics."

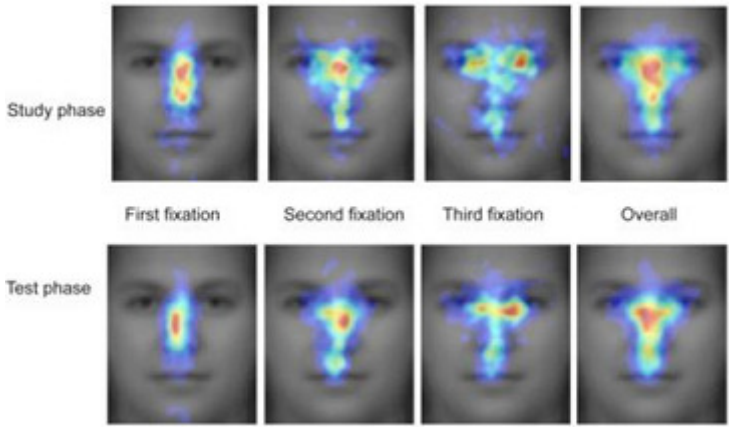
Ms Hilliar adds: "The next step in our research is to investigate whether these racially-suggestive names not only influence people's perception of multiracial faces, but also how well they will recognize these same faces later on."

When You Look at a Face, You Look Nose First

San Diego, CA, October 26, 2008 -- While general wisdom says that you look at the eyes first in order to recognize a face, UC San Diego computer scientists now report that you look at the nose first.

The nose may be the where the information about the face is balanced in all directions, or the optimal viewing position for face recognition, the researchers from UC San Diego's Jacobs School of Engineering propose in a paper recently published in the journal Psychological Science.

The researchers showed that people first look just to the left of the center of the nose and then to the center of the nose when trying to determine if a face is one they have seen recently. These two visual "fixations" near the center of the nose are all you need in order to determine if a face is one that you have seen just a few minutes before. Looking at a third spot on the face does not improve face recognition, the cognitive scientists found.



When asked to determine if the face that test subjects were looking at was one that they had just seen a few minutes prior, test subjects first "fixed" their eyes near the center of the nose, and when they moved their eyes to the second location on the face, it too was usually near the center of the nose. **Psychological Science, a journal of the Association for Psychological Science**

Understanding how the human brain recognizes faces may help cognitive scientists create more realistic models of the brain - models that could be used as tools to train or otherwise assist people with brain lesions or cognitive challenges, explained Janet Hsiao, the first author on the Psychological Science paper and a postdoctoral researcher in the computer science department at UC San Diego.

"The nice thing about models like neural nets is that - unlike computer programs - you can lesion them and they still run, which means you can test them in ways you could never test a human brain," said Garrison Cottrell an author on the paper and a computer science professor at UC San Diego's Jacobs School of Engineering. "Understanding how the brain works is the greatest mystery facing us in this century and that is just what we are trying to do," said Cottrell, who directs the NSF-funded Temporal Dynamics of Learning Center (TDLC) at UC San Diego.

Eye Tracking Leads to Discovery

In the experiments reported in Psychological Science, subjects were shown images of faces they had seen a few minutes prior and images of faces they had never seen. The subjects had to decide in a very short time whether they recognized each face or not. Meanwhile, the researchers used eye tracking technology to monitor where on each face the subjects looked - and how long their eyes stayed at each location.

In particular, the researchers employed an innovative eye tracking approach that allowed them to control how many different places on the face subjects could "fix" their eyes before the image disappeared.

When subjects were allowed to fix their eyes on two different face locations, they performed better on face recognition tasks than when they were given the same amount of time but could only look at one spot on the face. Allowing a third for fourth fixation did not improve performance on face recognition tasks.

In the paper, the authors suggest that "...the second fixation has functional significance: to obtain more information from a different location."

Cottrell expanded on the idea. "The location of the second fixation, like the first, was almost always near the center of the nose. This means you are just shifting the face you are looking at on your retina a bit. This shift changes which neurons are firing in your retina and therefore changes the neurons in the cortex that the visual pattern goes to."

Psychological Science paper: "Two Fixations Suffice in Face Recognition," by Janet Hui-wen Hsiao and Garrison Cottrell, Department of Computer Science and Engineering, University of California, San Diego.

This work was supported by the Perceptual Expertise Network which is a research network funded by the James S. McDonnell Foundation and the National Science Foundation (NSF); UC San Diego's NSF-funded Temporal Dynamics of Learning Center (TDLC), and the National Institute of Mental Health (NIMH).

Proto-humans mastered fire 790,000 years ago

* 16:32 27 October 2008 * NewScientist.com news service

*** David Robson**

The charred remains of flint from prehistoric firesides suggest our ancient ancestors had learned how to create fire 790,000 years ago. Previous research had shown that early humans – probably Homo erectus or Homo ergaster – from this period could manipulate and use fire, but it wasn't clear whether they had the ability to create the fire themselves, or whether they stole fire from natural occurrences like lightning strikes.

To investigate, Nira Alperson-Afil from the Hebrew University of Jerusalem, Israel, analysed archaeological remains from the shore of an ancient lake near the river Jordan.

The site includes 12 layers of remains from different groups of early humans covering a 100,000 year span, and has been dated back to 790,000 years ago, long before modern Homo sapiens evolved. As each society left the region, water from the lake washed over the site and buried the remains, preserving their tools for archaeologists to analyse.

The remains included 500,000 chips of broken flint, produced as the early humans crafted their stone axes and knives. Roughly 2% of these chips were cracked and charred by fire, and the team mapped where each burnt fragment came from.

The analysis revealed that the charred remains were tightly clustered around certain areas, suggesting the flint chips had fallen into a campfire as early humans honed their tools by the fireside. Because these charred remains exist in all 12 layers of the site, every society must have had access to fire. It's unlikely that all 12 societies would have been lucky enough to find a natural source of fire, says Alperson-Afil, so they must have been able to create it themselves.

"It seems the ability to create fire was embedded within their culture, together with their stone tools," she says. "If they were relying on nature, we wouldn't find these remains in such a repetitive way." This ability would have been essential for man's eventual migration from Africa to cold Europe. However, the exact technique still remains unclear, since no obvious means of ignition were found at the site.

Journal reference: Quaternary Science Reviews (DOI: 10.1016/j.quascirev.2008.06.009)

Biblical 'Solomon's mines' confirmed by dating

* 22:00 27 October 2008 * NewScientist.com news service

*** Catherine Brahic**

It's not every day that science and the Bible come together to tell a piece of history. Modern dating methods have determined that huge mines in Jordan are 3000 years old, supporting the idea that they were the Biblical mines of Edom ruled by King David and his son Solomon.

"The results are very, very consistent and leave no doubt as to the period [during which the mines were active]," says Tom Higham of the University of Oxford.

Higham and colleagues dated samples of charcoal used to smelt copper ore from the site.

The age of the Khirbat en-Nahas mines in the Faynan district of southern Jordan has been controversial for decades. The new evidence suggests that the site, one of the oldest, largest and best preserved mines in the world, really is the one mentioned in the Bible.

"We can't believe everything ancient writings tell us, but this research represents a confluence between the archaeological and scientific data and the Bible," says Thomas Levy of the University of California San Diego.

With Higham and a team of archaeologists, Levy has been excavating the site since 2002. In their latest study, they sampled charcoal from successive layers through a 6-metre-deep stack of smelting waste and dated them using carbon isotope ratios.

The building and layers above it date to the mid-9th century BC; slag deposits below the building date to the 10th century BC **(Image: Thomas Levy, UC San Diego)**

Egyptian invasion

The carbon right at the base of the pit, at the transition point between virgin earth and smelting waste is 3000 years old. "The first main phase of activity began just after 950 BC," explains Higham. "This phase lasted for probably 40 to 50 years, then a large building was constructed and copper production continued until around 840 BC, perhaps a little more recently."

At what would have been floor level of the building, the archaeologists found two ancient Egyptian stone and ceramic artefacts: a scarab and an amulet. Neither is made of local materials and the team believe they were brought in by the military campaign of the Egyptian pharaoh Sheshonq I, known as "Shishak" in the Old Testament.

The artefacts are contemporary with the building's construction and an abrupt change in the rate of copper production 3000 years ago. "This could be evidence of the role Sheshonq I may have played in the disruption of the largest known Iron Age copper factory in the eastern Mediterranean," says Levy.

He now wants to determine who actually controlled the mines – whether David or Solomon, or regional Edomite leaders who do not figure in Biblical texts. He also intends to study how mining on such a large scale would have affected the local environment.

Journal reference: Proceedings of the National Academy of Sciences (DOI: 10.1073/pnas.0804950105)

"Old Blood" Linked To Infection

Current Blood Storage Length Debated

(Philadelphia, PA, October 28, 2008) . Blood stored for 29 days or more, nearly 2 weeks less than the current standard for blood storage, is associated with a higher infection rate in patients who received transfusions with the blood. In a new study presented at CHEST 2008, the 74th annual international scientific assembly of the American College of Chest Physicians (ACCP), researchers found that patients who received transfusions with blood stored for 29 days or more were twice as likely to suffer from nosocomial infections, including pneumonia, upper respiratory infections, and sepsis, with the oldest blood being associated with the most infections. Currently, federal regulations allow red blood cells to be stored up to 42 days, after which they must be discarded.

“Stored red blood cells undergo changes that promote the release of a number of biochemical substances called cytokines, which can depress the recipients’ immune function and leave them more susceptible to infection,” said study author Raquel Nahra, MD, who conducted her research while at Cooper University Hospital, Camden, NJ. “Those changes start around 14 days of storage and reach a maximum after the blood is discarded at 42 days.”

Researchers from Cooper University Hospital examined the association between the age of packed red blood cells and the development of nosocomial infections (NOSO) in 422 patients receiving blood transfusions who were admitted to an ICU from July 2003 to September 2006. Researchers performed an analysis of the age of the first unit of blood, age of the “oldest” unit of blood (OL), the average age of the unit of blood, and the outcome of NOSO.

“Previous data indicate that the average age of transfused blood is around 17 days old,” said Dr. Nahra. “In our study, the average age of blood was 26 days, and 70 percent of all the blood transfused was older than 21 days, suggesting that a large pool of available blood is old blood with higher levels of cytokines and more potential for an immunosuppressive effect.”

The analysis showed that 11 percent of patients died, while 57 patients (13.5 percent) developed NOSO: 32 patients developed one NOSO, 21 developed two NOSO, and 4 developed 3 NOSO. Patients who developed

NOSO had a significantly higher OL (28.5 days vs. 32 days), and a significantly greater number of units of blood (2 U vs. 3 U). Patients who received transfusions with blood that was 29 days or older were twice as likely to develop NOSO as those receiving transfusions with blood stored for 28 days or less. When the outcome of "at least one infection" was analyzed, a higher number of units of blood (>5 U) was found to be an independent predictor of infection. Furthermore, while the age of the first unit of blood transfused appeared to be associated with the development of infection, the age of the oldest unit showed the strongest relationship.

Many institutions, including Dr. Nahra's, use the oldest available blood first, to ensure that it does not go to waste. Researchers speculate that if strict regulation of blood storage were to occur (ie, shorter maximum storage allowance), the overall blood supply may decrease.

"More cautious utilization of blood might help to alleviate, at in least part, a diminished blood supply that might result from such a change in policy," said study director and senior investigator David Gerber, DO, Cooper University Hospital. "More studies are needed, and the overall implications of any such potential changes need to be formally assessed before any major changes in blood storage policy can be proposed."

"The results of this study raise questions about current blood storage standards and transfusion practices and suggest additional research is needed in these areas," said James A. L. Mathers, Jr., MD, FCCP, President of the American College of Chest Physicians.

CHEST 2008 is the 74th annual international scientific assembly of the American College of Chest Physicians, held October 25-30 in Philadelphia, PA. ACCP represents 17,000 members who provide patient care in the areas of pulmonary, critical care, and sleep medicine in the United States and throughout the world. The ACCP's mission is to promote the prevention and treatment of diseases of the chest through leadership, education, research, and communication. For more information about the ACCP, please visit the ACCP Web site at www.chestnet.org.

Antiseizure Drug Could Be Fatal

Common Sedative Linked to Deaths in Patients With Prolonged Seizures (Philadelphia, PA, October 28, 2008) . Patients treated for their prolonged seizures with the sedative propofol may be at high risk for complications and even death. New research presented at CHEST 2008, the 74th annual international scientific assembly of the American College of Chest Physicians (ACCP), shows that the use of propofol as an antiepileptic agent in patients with refractory status epilepticus (RSE), prolonged seizures that do not respond to initial treatment, was associated with significant mortality and morbidity.

RSE is a difficult clinical problem seen in patients with primary epilepsy and in those with other conditions such as trauma, tumors, and infections affecting the brain. Although propofol is used to treat patients with RSE, it is more commonly used for sedation during surgeries or other patient procedures but at a much lower dose and shorter duration than that used for the control of seizures. "Patients with RSE treated with propofol are at high risk for propofol-related side effects because of the high propofol infusion rates and prolonged treatment duration necessary in these patients," said Vivek Iyer, MD, Mayo Clinic, Rochester, MN. "However, it is well described that propofol toxicity can occur even with brief exposure to the drug."

Dr. Iyer and his colleagues from Mayo Clinic reviewed 39 consecutive patients (median age of 54 years) from 1997 to 2007, who were admitted to the ICU with RSE, in order to examine the link between propofol use and related side effects, including propofol infusion syndrome (PRIS).

PRIS is a usually fatal complication of propofol use that has been reported especially at high infusion rates for prolonged periods. For this study, PRIS was defined by the unexplained presence of at least one or more of the following: metabolic acidosis, rhabdomyolysis, bradycardia, and/or cardiac arrest.

Propofol was used in 32 (82 percent) of the patients (group A) for a median of 63 hours and a median peak infusion rate of 67 mcg/kg/min. Other agents, such as midazolam and pentobarbital, were used in the other seven (18 percent) patients (group B). Within group A, three patients had sudden unexplained cardiac arrest while on propofol infusions, resulting in two deaths, while no deaths occurred in group B. Median hospital stay (12 days) and ICU length of stay (9 days) did not differ between the two groups. The overall occurrence of PRIS was 30 percent of patients in group

A (seven patients with bradycardia, three patients with sudden unexplained cardiac arrest) compared with less than 3 percent (one patient with bradycardia) in group B.

In light of the new data, Dr. Iyer advises that caution should be taken with the use of propofol to treat patients with RSE. "There are several other medications we can turn to in the case of uncontrolled seizures," he said. "Alternative agents should first be tried for patients with RSE, and propofol should only be used after exhausting all other options."

"With increasing awareness of the risks of propofol, physicians may become more cautious about using propofol for prolonged periods and at high doses," James A. L. Mathers, Jr., MD, FCCP, President of the American College of Chest Physicians.

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Statin use associated with reduction in prostate specific antigen levels

Use of cholesterol-lowering statins is associated with a statistically significant decline in prostate specific antigen (PSA) levels, according to a report in the October 28 online issue of the Journal of the National Cancer Institute.

Previous studies examined whether statin use was associated with a reduction in prostate cancer risk. The results, however, have been inconsistent. Few studies have examined the association between statins and PSA level.

In the current study, Stephen Freedland, M.D., of the Durham Veterans Affairs Medical Center and Duke University School of Medicine in Durham, N.C., and colleagues examined computerized medical records of 1,214 men who were prescribed statins between 1990 and 2006 at the Durham Veterans Affairs Medical Center. To learn whether statin use was associated with changes in PSA, the investigators compared PSA values taken up to two years before initiation of statin therapy and PSA values measured within one year after initiation of statin use.

The researchers saw a median decline in PSA of 4.1% and a 27.5% median decline of low-density lipoprotein (LDL) in the participants, both of which were statistically significant changes. Moreover, men with higher initial PSA levels had, on average, larger declines after starting on statins than men who had low initial PSA levels; the PSA declines correlated with the magnitude of the LDL decrease. Specifically, among men most likely to be under consideration for prostate biopsy (pre-statin PSA levels ≥2.5 ng/mL) those with the biggest declines (highest quartile) in LDL after starting a statin experienced a 17% decline in PSA. The decline in PSA also strongly correlated with the dose of statin and this dose-dependency was associated with PSA even after the researchers accounted for drop in LDL.

"The PSA declines with statin use that we observed may represent objective evidence of statins influence on prostate biology in support of epidemiological studies suggesting statins reduce overall or advanced prostate cancer risk. More importantly, this PSA decline, if confirmed in future studies, may complicate prostate cancer screening because cancers may be missed due to the lower PSA levels, and this fact should be kept in mind when evaluating men taking statins," the authors write. The impact of such a change on prostate cancer mortality, the authors note, is unclear because there is no level 1 evidence to indicate that PSA screening lowers prostate cancer mortality.

In an accompanying editorial, Ian Thompson, M.D., of the University of Texas Health Science Center in San Antonio and colleagues suggest that the new data should be interpreted with caution. While it is possible that statins alter prostate biology, a reduction in PSA does not necessarily correlate with a reduction in cancer risk. Moreover, the observational study design used by Freedland and colleagues could lead to unintended bias in the results. Finally, although the 4.1% drop in median PSA is statistically significant, it may not be clinically meaningful.

Therefore, further studies are needed to better understand the impact of statins on a prostate cancer, the editorialists conclude. "If statins do lower PSA, only a randomized trial with histological endpoints can determine whether statins affect a man's risk of prostate cancer," they write.

Pneumococcal vaccine could prevent numerous deaths, save costs during a flu pandemic, model predicts

A new predictive model shows that vaccinating infants with 7 valent pneumococcal conjugate vaccine (PCV7)--the current recommendation--not only saves lives and money during a normal flu season by preventing related bacterial infections; it also would prevent more than 357,000 deaths during an influenza pandemic, while saving $7 billion in costs.

Keith P. Klugman, PhD, professor of global health at Emory University's Rollins School of Public Health, will present results of the research using the predictive model at the joint ICAAC/IDSA meeting in Washington, DC, Oct. 25-28. (Interscience Conference on Antimicrobial Agents and Chemotherapy/Infectious Disease Society of America.

Bacterial infections, particularly pneumococcal disease, can follow a viral illness such as flu and cause secondary infections that worsen flu symptoms and increase influenza-related risk. Bacterial infections may have been the cause of nearly half of the deaths of young soldiers during the 1918 flu pandemic.

"We've known for years that bacterial infections can develop after influenza," says Klugman. "Unlike the 1918 flu pandemic, which preceded the antibiotic era, we now have vaccines that can prevent these types of pneumococcal infections. This model shows what a dramatically different outcome we could expect with standard PCV vaccination."

Klugman and colleagues at Harvard University, i3 Innovus in Medford, Ma. and Wyeth Research constructed a model to estimate the public health and economic impact of current pneumococcal vaccination practices in the context of an influenza pandemic.

Since 2000 the Centers for Disease Control and Prevention (CDC) Immunization Practices Advisory Committee (ACIP) has been recommending PCV vaccinations for infants and children.

The new predictive model was used to compare the results of no PCV vaccination to the current routine vaccination of infants less than two years old. The researchers assessed the effect of vaccination policies under both normal and pandemic influenza conditions. They included both direct vaccination effects in vaccinated individuals and indirect vaccination effects (called herd immunity) in the unvaccinated. For manifestations of pneumococcal disease, they included invasive pneumococcal disease (meningitis or bacteremia), all-cause pneumonia and all-cause acute otitis media (ear infections). The model's estimates were based on the 1918 pandemic.

The new model predicted that current pneumococcal vaccination practices reduce costs in a typical flu season by $1.4 billion and would reduce costs by $7 billion in a pandemic. In a pandemic, they would prevent 1.24 million cases of pneumonia and 357,000 pneumococcal-related deaths.

"Our research shows that routine pneumococcal vaccination is a proactive approach that can greatly reduce the effects of a future flu pandemic," says Klugman. Countries that have not yet implemented a pneumococcal vaccination program may want to consider this as part of their pandemic flu preparedness."

The research was funded by Wyeth Research.
Dr. Klugman is a paid consultant for Wyeth Pharmaceuticals.

Psychological Study Reveals That Red Enhances Men's Attraction to Women

A groundbreaking study by two University of Rochester psychologists to be published online Oct. 28 by the Journal of Personality and Social Psychology adds color - literally and figuratively - to the age-old question of what attracts men to women.

Through five psychological experiments, Andrew Elliot, professor of psychology, and Daniela Niesta, post-doctoral researcher, demonstrate that the color red makes men feel more amorous toward women. And men are unaware of the role the color plays in their attraction.

The research provides the first empirical support for society's enduring love affair with red. From the red ochre used in ancient rituals to today's red-light districts and red hearts on Valentine's Day, the rosy hue has been tied to carnal passions and romantic love across cultures and millennia. But this study, said Elliot, is the only work to scientifically document the effects of color on behavior in the context of relationships.

"It's only recently that psychologists and researchers in other disciplines have been looking closely and systematically at the relationship between color and behavior. Much is known about color physics and color physiology, but very little about color psychology," said Elliot. "It's fascinating to find that something as ubiquitous as color can be having an effect on our behavior without our awareness."

Although this aphrodisiacal effect of red may be a product of societal conditioning alone, the authors argue that men's response to red more likely stems from deeper biological roots. Research has shown that nonhuman male primates are particularly attracted to females displaying red. Female baboons and chimpanzees, for example, redden conspicuously when nearing ovulation, sending a clear sexual signal designed to attract males.

"Our research demonstrates a parallel in the way that human and nonhuman male primates respond to red," concluded the authors. "In doing so, our findings confirm what many women have long suspected and claimed – that men act like animals in the sexual realm. As much as men might like to think that they respond to women in a thoughtful, sophisticated manner, it appears that at least to some degree, their preferences and predilections are, in a word, primitive."

To quantify the red effect, the study looked at men's responses to photographs of women under a variety of color presentations. In one experiment, test subjects looked at a woman's photo framed by a border of either red or white and answered a series of questions, such as: "How pretty do you think this person is?" Other experiments contrasted red with gray, green, or blue.

When using chromatic colors like green and blue, the colors were precisely equated in saturation and brightness levels, explained Niesta. "That way the test results could not be attributed to differences other than hue."

In the final study, the shirt of the woman in the photograph, instead of the background, was digitally colored red or blue. In this experiment, men were queried not only about their attraction to the woman, but their

intentions regarding dating. One question asked: "Imagine that you are going on a date with this person and have $100 in your wallet. How much money would you be willing to spend on your date?"
Under all of the conditions, the women shown framed by or wearing red were rated significantly more attractive and sexually desirable by men than the exact same women shown with other colors. When wearing red, the woman was also more likely to score an invitation to the prom and to be treated to a more expensive outing.

The red effect extends only to males and only to perceptions of attractiveness. Red did not increase attractiveness ratings for females rating other females and red did not change how men rated the women in the photographs in terms of likability, intelligence or kindness.

Although red enhances positive feelings in this study, earlier research suggests the meaning of a color depends on its context. For example, Elliot and others have shown that seeing red in competition situations, such as written examinations or sporting events, leads to worse performance.

The current findings have clear implications for the dating game, the fashion industry, product design and marketing.

To view the full text of the paper, visit the Journal of Personality and Social Psychology Web site at: http://www.apa.org/journals/psp/.

New cell division mechanism discovered

A novel cell division mechanism has been discovered in a microorganism that thrives in hot acid. The finding may also result in insights into key processes in human cells, and in a better understanding of the main evolutionary lineages of life on Earth. The study is published today in the online version the American National Academy of Sciences, PNAS.

The research group at the Department of Molecular Evolution at Uppsala University has identified a completely cell division machinery. The discovery was made in Sulfolobus acidocaldarius, a microorganism belonging to the third domain of life, the Archaea, which originally was isolated from a hot spring in Yellowstone national park in Wyoming, USA. Because of the extreme conditions, in which the cells grow optimally in acid at 80ºC, the organism is of interest for a wide range of issues.

- They represent exciting model systems in theories for how life once may have originated in hot environments on early Earth, as well as in the search for life in extreme environments on other planets, Professor Rolf Bernander explains. He is the scientist behind the study, together with colleagues Ann-Christin Lindås, Erik Karlsson, Maria Lindgren and Thijs Ettema.

The researchers have identified three genes that are activated just prior to cell division. The protein products from these genes form a sharp band in the middle of the cell, between newly segregated chromosomes, and then gradually constrict the cell such that two new daughter cells are formed.

- This is the first time in decades that a novel cell division mechanism has been discovered, and the gene products display no similarity to previously known division proteins, Rolf Bernander says.

Two of the three proteins are instead related to eukaryotic so-called ESCRT- proteins, which play important roles in vesicle formation during intracellular transport processes, and which also have been implicated in virus budding, including HIV, from the cell surface. The results are, thus, important not only for an increased understanding of the cell biology of archaea and extremophiles, but also for key cellular processes in human and other higher organisms, and for issues related to the origin and evolutionary history of these processes.

More information on Uppsala University website: http://artedi.ebc.uu.se/molev/resarch/archaea.html

Brain's 'hate circuit' identified

People who view pictures of someone they hate display activity in distinct areas of the brain that, together, may be thought of as a 'hate circuit', according to new research by scientists at UCL (University College London).

The study, by Professor Semir Zeki and John Romaya of the Wellcome Laboratory of Neurobiology at UCL, examined the brain areas that correlate with the sentiment of hate and shows that the 'hate circuit' is distinct from those related to emotions such as fear, threat and danger – although it shares a part of the brain associated with aggression. The circuit is also quite distinct from that associated with romantic love, though it shares at least two common structures with it.

The results, published today in PLoS One, are an extension of previous studies on the brain mechanisms of romantic and maternal love from the same laboratory. Explaining the idea behind the research, Professor Zeki said: "Hate is often considered to be an evil passion that should, in a better world, be tamed, controlled, and eradicated. Yet to the biologist, hate is a passion that is of equal interest to love. Like love, it is often seemingly irrational and can lead individuals to heroic and evil deeds. How can two opposite sentiments lead to the same behaviour?"

To compare their present results with their previous ones on romantic love, Zeki and Romaya specifically studied hate directed against an individual. Seventeen subjects, both female and male, had their brains scanned

while viewing pictures of their hated person as well as that of neutral faces with which they were familiar. Viewing a hated person showed activity in distinct areas of the brain that, together, may be thought of as a 'hate circuit'.

The 'hate circuit' includes structures in the cortex and in the sub-cortex and has components that are important in generating aggressive behaviour, and translating this into action through motor planning, as if the brain becomes mobilised to take some action. It also involves a part of the frontal cortex that has been considered critical in predicting the actions of others, probably an important feature when one is confronted by a hated person.

The subcortical activity involves two distinct structures, the putamen and insula. The former, which has been implicated in the perception of contempt and disgust, may also be part of the motor system that is mobilised to take action, since it is known to contain nerve cells that are active in phases preparatory to making a move.

Professor Zeki added: "Significantly, the putamen and insula are also both activated by romantic love. This is not surprising. The putamen could also be involved in the preparation of aggressive acts in a romantic context, as in situations when a rival presents a danger. Previous studies have suggested that the insula may be involved in responses to distressing stimuli, and the viewing of both a loved and a hated face may constitute such a distressing signal.

"A marked difference in the cortical pattern produced by these two sentiments of love and hate is that, whereas with love large parts of the cerebral cortex associated with judgment and reasoning become de-activated, with hate only a small zone, located in the frontal cortex, becomes de-activated. This may seem surprising since hate can also be an all-consuming passion, just like love. But whereas in romantic love, the lover is often less critical and judgmental regarding the loved person, it is more likely that in the context of hate the hater may want to exercise judgment in calculating moves to harm, injure or otherwise extract revenge.

"Interestingly, the activity in some of these structures in response to viewing a hated face is proportional in strength to the declared intensity of hate, thus allowing the subjective state of hate to be objectively quantified. This finding may have legal implications in criminal cases, for example."

Unlike romantic love, which is directed at one person, hate can be directed against entire individuals or groups, as is the case with racial, political, or gender hatred. Professor Zeki said that these different varieties of hate will be the subject of future studies from his laboratory.

Notes for Editors

1.) For further information, or to arrange an interview with Professor Zeki, please contact Ruth Metcalfe in the UCL Media Relations Office on tel: +44 (0)20 7679 9739, mobile: +44 (0)7990 675 947, out of hours: +44 (0)7917 271 364, e-mail: r.metcalfe@ucl.ac.uk

2.) 'Neural Correlates of Hate' will be published in PLoS ONE with the press embargo ending at 00.00 UK Time Tuesday 28th October 2008 (17.00 Pacific Time/20.00 Eastern). On publication, the paper will be available online at http://dx.plos.org/10.1371/journal.pone.0003556 Journalists seeking advance copies should contact UCL Media Relations using the details above.

Geisinger research: Anti-malarial drug prevents diabetes in arthritis patients

Study presented at ACR meeting

DANVILLE, PA - The use of an antimalarial medication may prevent the onset of diabetes in patients with rheumatoid arthritis, new Geisinger research shows.

Researchers examined the records of 2,093 Geisinger patients who received treatment for rheumatoid arthritis from 2000 to 2008. The study looked at, among other things, use of the medication hydroxychloroquine (HCQ) and the development of new cases of diabetes in these patients. HCQ was developed to treat malaria but it has also been used to treat rheumatoid arthritis and other autoimmune diseases.

In patients with rheumatoid arthritis, use of HCQ was associated with a 53 percent reduction in the development of new cases of diabetes, the study found. "Given the relative safety and low cost of this generic drug, HCQ may be useful in preventing diabetes in other high risk groups," said lead study investigator and Geisinger rheumatologist Androniki Bili, MD, MPH.

Researchers don't know how exactly HCQ prevents diabetes onset but it's suspected that HCQ improves glucose tolerance.

Dr. Bili presented the study's findings Monday at the American College of Rheumatology Annual Scientific Meeting in San Francisco.

About 23.6 million Americans have diabetes, while 1.3 million have rheumatoid arthritis. People with rheumatoid arthritis are at increased risk for diabetes due to more sedentary lifestyle, chronic inflammation and use of steroid medications that can cause weight gain.

"We should revisit HCQ in the treatment of rheumatoid arthritis because, in addition to its disease-modifying properties, it might prevent the development of diabetes in this high risk group," Dr. Bili said.

Octogenarians can be good candidates for heart surgery

Open-heart surgery should remain a viable treatment option for people in their 80s, according to experts at the MUHC

Montreal, October 28, 2008 - Patients 80 years and older who are in overall good health are perfectly able to withstand open-heart surgery, according to the latest study of Dr. Kevin Lachapelle of the McGill University Health Centre (MUHC). His findings were presented this morning in Toronto during the 2008 Canadian Cardiovascular Congress.

"Age should not be a reason for doctors to rule out the possibility of heart surgery for their octogenarian patients," explained Dr. Lachapelle. "If patients with heart problems are otherwise in good health, this surgery can significantly improve their quality of life."

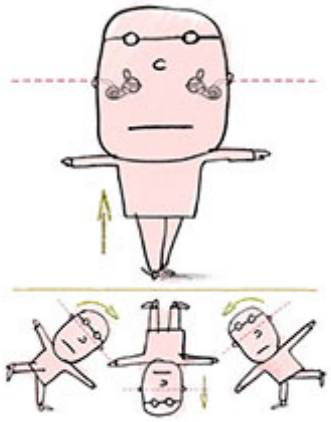
This study conclusion is based on the follow-up of 185 patients who underwent open-heart surgery at the MUHC for a cardiac valve replacement. Five years after the operation, 60% of these patients were still alive and 90% of the survivors were leading active and independent lives. "This outcome is extremely positive," said Dr. Lachapelle. "It proves that age alone should not be a factor in ruling out this type of surgery: feasibility must be assessed by a surgeon based on the patient's overall state of health."

Quality of life is a major concern for octogenarians, a growing segment of the Quebec population. It is therefore important to evaluate all possible treatments according to each patient's specific needs and limitations in order to provide everyone with the best possible care. "Pediatricians account for children's specific needs, as they differ from those of adults. The elderly also have specific issues that must be objectively assessed and not considered based on pre-conceived notions," explained Dr. Lachapelle.

Basics

The Unappreciated, Holding Our Lives in Balance

By NATALIE ANGIER



Serge Bloch

If you want to glimpse the handiwork of one of your body's unsung sensory heroes, try this little experiment. Hold your index finger a few inches in front of your face and sweep it back and forth at a rate of maybe once or twice a second. What do you see? A blurry finger. Now hold your finger steady and instead shake your head back and forth at the same half-second pace. This time, no blur, no Marcel Duchamp's "Nude Descending a Staircase" effect. The finger stays in focus even as your head vigorously pantomimes its denial.

And it's a good thing, too. If the brain couldn't distinguish between movements of the viewer and movements of the view, if every time you turned around or walked across the room the scenery appeared to smear or the walls to lurch your way, you soon might cease to move at all, uncertain of external threats, unaided by any internal compass marked You.

Essential to a fully embodied sense of self is the vestibular system, a paired set of tiny sensory organs tucked deep into the temporal bone on either side of the head, right near the cochlea of the inner ear. The vestibular system isn't a high-profile, elitist sense like the famed five of vision, hearing, touch, taste and smell. It's more of a Joe Sixth-Sense, laboring in anonymity and frequently misunderstood. Even its name is a blooper encapsulated, the result of early anatomists thinking the organ merely served as an entrance, or vestibule, to the inner ear.

Despite its humble reputation, the vestibular system has lately won fans among neuroscientists, who marvel at its sophistication and sensitivity, and how it tells us where we are and what we're doing and why we should never again embarrass ourselves by going roller skating. They praise the machine-tool precision of its parts, the way the vestibular system discovered the laws of Newtonian mechanics some 400 million years before Newton and then put those principles to use to provision the head with little organic gyroscopes and linear accelerometers.

As evidence of the organ's rising cachet, the first edition of the highly regarded college textbook, "Sensation and Perception" (Sinauer, 2005), barely mentioned the vestibular system; but in the new edition appearing this month, a standalone chapter on the subject closes the book. "I don't want to sound ungrateful," said Daniel Merfeld, director of the vestibular physiology lab at Massachusetts Eye and Ear Infirmary and associate professor at Harvard Medical School, who wrote the chapter. "I'm just glad to be included now."
Doctors are also learning to better identify the symptoms associated with a dysfunctional vestibular system, and to distinguish among a variety of distinct disorders that were previously lumped together as Meniere's disease.

One such syndrome is mal de debarquement, in which people who have spent time aboard a ship, plane or other moving vehicle still feel that they are rocking, dipping and swaying long after they've returned to solid ground.

The syndrome has become more prominent given the popularity of cruiseliner vacations, and though most episodes are mild and short-lived, severe cases can last months to years and be accompanied by what sufferers call a brain fog, a sense of cognitive slowing so debilitating that they may end up with careers, relationships, lives in ruin.

It remains baffling and difficult to treat, said Dr. Yoon-Hee Cha, a neurologist at the University of California, Los Angeles, "but I'd like to emphasize that it is a real disorder, and that physicians shouldn't discount what their patients may be telling them."

The vestibular system may be ancient and found in all vertebrates, but it is not primitive and has arguably assumed even greater importance in us than it ever did in our fish forebears. Its primary mission is to keep track of where the head is, and from that knowledge much wisdom and strategic planning may follow.

Take our proud bipedalism. Whenever we stand up and arrange our calves, thighs, torso and head into a stable, vertical configuration, Dr. Merfeld said, we are unconsciously juggling six inverted pendulums, six mechanically independent units with masses above the pivot point - a feat that amounts to balancing six pencils on your palm simultaneously. Bipedalism is largely a top-down operation overseen by the vestibular system, which gauges the head position relative to the floor and signals the brain to adjust the downstream pivot points accordingly. Should the vestibular system be impaired by, for example, too much alcohol, the imbiber will begin to wobble around all those pivot points, just like a toddler learning to walk.

Joe Sixth-Sense is also something of a Joe the Plumber, a pipeline between sensory systems. When you shake your head as you did in the finger-watching experiment, or as you chronically, unconsciously twitch and wiggle it throughout the day, the vestibular system cues the eyeballs to move in compensation, and it reassures the brain that, not to worry, the head is being a jerk as always, disregard any flutters in the incoming visual stream and interpret the vista as though the head were trapped in a vise.

The vestibular hardware is small and transparent and can be difficult to find. "It's basically a cavity in the skull, filled with fluid and lined with membranes," Dr. Merfeld said. "It's almost the absence of something rather than the presence."

Yet the arrangement of membranes and fluids is highly structured, forming five distinct sense organs in each of the two pea-size bony pits. Three of the organs are designed to detect twisting movements of the head, by sensing the discrepancy between the angular momentum of the membranes, which are attached to the bone, and that of the free-floating fluid, which lags slightly behind. The other two organs have tiny stones of calcium carbonate, which rise and fall like flakes in a snow globe and so detect the effects of gravity and of linear head motions, if you're walking forward, for example, or up stairs.

All five sentinels pass their findings along to the brain the same way, by bending whiskerlike projections on nearby hair cells, which translate the mechanical signals into the electrical pulses that neurons can decipher and then decide what to do.

Maybe it's time to give your vestibular system a rest. Why not break out the six-pack? Joe, this one's for you.

The Mysterious Cough, Caught on Film

By DENISE GRADY

In Roald Dahl's novel "The B.F.G.," the title character, a big friendly giant, captures dreams in glass jars. At Pennsylvania State University, a professor of engineering has captured something less whimsical but no less ephemeral - a cough - on film.

The image, published online Oct. 9 by The New England Journal of Medicine, was created by schlieren photography, which "takes an invisible phenomenon and turns it into a visible picture," said the engineering professor, Gary Settles, who is the director of the university's gas dynamics laboratory.

A cough. **Gary Settles/Pennsylvania State University**

Schlieren is German for "streaks"; in this case it refers to regions of different densities in a gas or a liquid, which can be photographed as shadows using a special technique.

"In my lab we use this technique a lot," Dr. Settles said. "Often it's used for other things, like in supersonic wind tunnels, to show shock waves around high-speed aircraft."

The process involves a small, bright light source, precisely placed lenses, a curved mirror, a razor blade that blocks part of the light beam and other tools that make it possible to see and photograph disturbances in the air. In the world of gas dynamics, a cough is merely "a turbulent jet of air with density changes." Though coughs

spread tuberculosis, SARS, influenza and other diseases, surprisingly little is known about them. “We don’t have a good understanding of the air flow,” Dr. Settles said.

To map a cough, he teamed up with Dr. Julian Tang, a virus expert from Singapore. A healthy student provided the cough. The expelled air, traveling at 18 miles per hour, mixed with cooler surrounding air and produced “temperature differences that bend light rays by different amounts,” Dr. Settles said.

He went on: “The next thing is, you get a couple of people in front of the mirror talking, or one coughs on another, and you see how the air flow moves, how people infect one another. Or you look at how coughing can spread airborne infection in a hospital. This is really a suggestion for how we might study all that. The techniques used in wind tunnels can be used to study human diseases.”

Other schlieren images show the churning air and shock waves that emanate from a pistol’s firing; an Airedale sniffing a small flower; and the unseen, shimmering world around a candle burning in a breeze.

The final photograph, in a full-scale mock-up of an aircraft cabin, captures in microseconds the flash of an explosion under a mannequin in an airplane seat and the propagation of shock waves into the cabin. The blast was a re-creation of a terrorist’s attempt in 1994 to bring down a Philippine Airlines flight with a nitroglycerin bomb. The plane did not crash, but the explosion did kill the passenger seated over the bomb. The simulation used a less intense explosion than the actual bombing.

“The simulation helps to understand how the energy of an onboard blast reverberates around the cabin,” Dr. Settles said, “and it is also useful to check the results of computer blast simulations.”

NASA Probe Shows Mercury More Dynamic Than Thought

By THE ASSOCIATED PRESS

WASHINGTON (AP) -- Earth's first nearly full look at Mercury reveals that the tiny lifeless planet took a far greater role in shaping itself than was thought, with volcanoes spewing "mysterious dark blue material."

New images from NASA's Messenger space probe should help settle a decades-old debate about what caused parts of Mercury to be somewhat smoother than it should be. NASA released photos Wednesday, from Messenger's fly-by earlier this month, that gave the answer: Lots of volcanic activity, far more than signs from an earlier probe.

Astronomers used to dismiss Mercury, the planet closest to the sun, as mere "dead rock," little more than a target for cosmic collisions that shaped it, said MIT planetary scientist Maria Zuber.

"Now, it's looking a lot more interesting," said Zuber, who has experiments on the Messenger probe. "It's an awful lot of volcanic material."

The image on the left is what Mercury looks like to the naked eye. The image on the right includes information from both the visible and near-infrared wavelengths of light. **NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington**

New images of filled-in craters -- one the size of the Baltimore-Washington area and filled in with more than a mile deep of cooled lava -- show that 3.8 to 4 billion years ago, Mercury was more of a volcanic hotspot than the moon ever was, Zuber said.

But it isn't just filled-in craters. Using special cameras, the probe showed what one scientist called "the mysterious dark blue material." It was all over the planet. That led Arizona State University geologist Mark Robinson to speculate that the mineral is important but still unknown stuff ejected from Mercury's large core in the volcanic eruptions.

That material was seen with NASA's first partial view of Mercury by Mariner 10 in the 1970s. It was spotted again in Messenger's first images of Mercury's unseen side earlier this year. The latest Messenger images, added to earlier photos show about 95 percent of the planet, and the blue stuff was in many places, more than astronomers had anticipated.

Although Robinson described the material as "dark blue," it only looks that way to special infrared cameras. In normal visible light, it would have "a soft blue tinge and it would be less red" than the rest of Mercury, he said.

It's too early to tell what that material is, but it may have iron in it, Robinson said. That would be a surprise because Mariner 10 didn't find much iron, he said.

On the Net: *NASA's Mercury mission: http://www.nasa.gov/mission--pages/messenger/main/index.html*

Phoenicians Left Deep Genetic Mark, Study Shows

By JOHN NOBLE WILFORD

The Phoenicians, enigmatic people from the eastern shores of the Mediterranean, stamped their mark on maritime history, and now research has revealed that they also left a lasting genetic imprint.

Scientists reported Thursday that as many as 1 in 17 men living today on the coasts of North Africa and southern Europe may have a Phoenician direct male-line ancestor.

These men were found to retain identifiable genetic signatures from the nearly 1,000 years the Phoenicians were a dominant seafaring commercial power in the Mediterranean basin, until their conquest by Rome in the 2nd century B.C.

The Phoenicians who founded Carthage, a great city that rivaled Rome. They introduced the alphabet to writing systems, exported cedars of Lebanon for shipbuilding and marketed the regal purple dye made from the murex shell. The name Phoenica, for their base in what is present-day Lebanon and southern Syria, means “land of purple.”

Then the Phoenicians, their fortunes in sharp decline after defeat in the Punic Wars, disappeared as a distinct culture. The monumental ruins of Carthage, at modern Tunis, are about the only visible reminders of their former greatness.

The scientists who conducted the new research said this was the first application of a new analytic method for detecting especially subtle genetic influences of historical population migrations. Such investigations, supplementing the traditional stones-and-bones work of archaeology, are contributing to a deeper understanding of human mobility over time.

The study was directed by the Genographic Project, a partnership of the National Geographic Society and IBM Corporation, with additional support from the Waitt Family Foundation. The international team described the findings in the current American Journal of Human Genetics.

“When we started, we knew nothing about the genetics of the Phoenicians,” Chris Tyler-Smith, a geneticist at the Wellcome Trust Sanger Institute in Cambridge, England, said in an announcement. “All we had to guide us was history: we knew where they had and hadn’t settled.”

It proved to be enough, Dr. Tyler-Smith and Spencer Wells, a geneticist who directs the Genographic Project, said in telephone interviews.

Samples of the male Y-chromosome were collected from 1,330 men now living at six sites known to have been settled in antiquity as colonies and trading outposts of the Phoenicians. The sites were in Cyprus, Malta, Morocco, the West Bank, Syria and Tunisia.

Each participant, whose inner cheek was swabbed for the samples, had at least three generations of indigenous ancestry at the site. To this was added data already available from Lebanon and previously published chromosome findings from nearly 6,000 men at 56 sites throughout the Mediterranean region. The data were then compared with similar research from neighboring communities having no link to Phoenician settlers.

From the research emerged a distinctive Phoenician genetic signature, in contrast to genetic traces spread by other migrations, like those of late Stone-Age farmers, Greek colonists and the Jewish Diaspora. The scientists thus concluded that, for example, one boy in each school class from Cyprus to Tunis may be a descendant of Phoenician traders.

“We were lucky in one respect,” Pierre A. Zalloua, a geneticist at Lebanese American University in Beirut who was a principal author of the journal report, said in an interview. “So many Phoenician settlement sites were geographically close to non-Phoenician sites, making it easier to distinguish differences in genetic patterns.”

In the journal article, the researchers wrote that the work “underscores the effectiveness of Y-chromosomal variability” in tracing human migrations. “Our methodology,” they concluded, “can be applied to any historically documented expansion in which contact and noncontact sites can be identified.”

Dr. Zalloua said that with further research it might be possible to refine genetic patterns to reveal phases of the Phoenician expansion over time - “first to Cyprus, then Malta and Africa, all the way to Spain.” Perhaps, he added, the genes may hold clues to which Phoenician cities - Byblos, Tyre or Sidon - settled certain colonies.

Dr. Wells, a specialist in applying genetics to migration studies who is also an explorer-in-residence at the National Geographic Society, suggested that similar projects in the future could investigate the genetic imprint from the Celtic expansion across the European continent, the Inca through South America, Alexander’s march through central and south Asia and multicultural traffic on the Silk Road.

Researchers find new chemical key that could unlock hundreds of new antibiotics

Chemistry researchers at The University of Warwick and the John Innes Centre, have found a novel signalling molecule that could be a key that will open up hundreds of new antibiotics unlocking them from the DNA of the Streptomyces family of bacteria.

With bacterial resistance growing researchers are keen to uncover as many new antibiotics as possible. Some of the Streptomyces bacteria are already used industrially to produce current antibiotics and researchers have developed approaches to find and exploit new pathways for antibiotic production in the genome of the Streptomyces family. For many years it was thought that the relatively unstable butyrolactone compounds represented by "A-factor" were the only real signal for stimulating such pathways of possible antibiotic production but the Warwick and John Innes teams have now found a much more stable group of compounds that may have the potential to produce at least one new antibiotic compound from up to 50% of the 1000 or so known Streptomyces family of bacteria.

Colonies of bacteria such as Streptomyces naturally make antibiotics as a defence mechanism when those colonies are under stress and thus more susceptible to attack from other bacteria. The colonies need to produce a compound to spread a signal across the colony to start producing their natural antibiotic weapons.

The amounts of such signalling material produced are incredibly small. Only micrograms of these compounds can be isolated by Chemists and usually the available instrumentation needs at least milligrams of material to make a useful analysis. However the Warwick team was able to make use of the University of Warwick's 700 MHz NMR machine to get a close look at just micrograms of 5 new possible signalling compounds identified as 2-alkyl-4-hydroxymethylfuran-3-carboxylic acids (or AHFCAs).

The researchers, led by Dr Christophe Corre, and Professor Greg Challis from the University of Warwick's Department of Chemistry were able to combine their new insight into these compounds with the relatively new full genetic sequences now available of some Streptomyces bacteria. They became convinced that the AHFCA group of compounds could play a role in stimulating the production of known and novel antibiotics. When they added AHFCAs to Streptomyces coelicolor W81 they were proved correct as it stimulated the production of methylenomycin antibiotics.

While the methylenomycins were already known as antibiotics, the researchers think it likely that novel pathways for antibiotic production are also under the control of AHFCAs. The AHFCAs should be relatively easy to make in significant quantity in a lab and could be used as a new tool for discovery of antibiotics. The researchers are now seeking funding to explore the AHFCAs and develop a novel approach for drug discovery. Introducing a variety of AHFCAs to various Streptomyces bacteria could activate hundreds of pathways for antibiotic production.

The lead researcher on the paper Dr Christophe Corre, from the University of Warwick's Department of Chemistry said: "Early results also suggest that this approach could switch on novel antibiotic production pathways in up to 50% of Streptomyces bacteria. With thousands of known members of the Streptomyces family that could mean that AHFCAs could unlock hundreds of new antibiotics to replenish our dwindling arsenal of effective antibiotic drugs."

Note for editors: *The full paper is entitled: "2-Alkyl-4-hydroxymethylfuran-3-carboxylic acids, antibiotic production inducers discovered by Streptomyces coelicolor genome mining" by Christophe Corre, Lijiang Song, Sean O'Rourke, Keith F. Chater and Gregory L. Challis and will be published in PNAS's online edition in the week beginning 27th October 2008*

Predatory bacterial swarm uses rippling motion to reach prey

Like something from a horror movie, the swarm of bacteria ripples purposefully toward their prey, devours it and moves on. Researchers at the University of Iowa are studying this behavior in Myxococcus xanthus (M. xanthus), a bacterium commonly found in soil, which preys on other bacteria.

Despite its deadly role in the bacterial world, M. xanthus is harmless to humans and might one day be used beneficially to destroy harmful bacteria on surfaces or in human infections, said John Kirby, Ph.D., associate professor of microbiology in the UI Roy J. and Lucille A. Carver College of Medicine.

"It may be that we can modify this predator-prey relationship or apply it to medically relevant situations," Kirby said. "It would be amazing if we could adapt its predatory ability to get rid of harmful bacteria that reside in places we don't want them, including in hospitals or on medical implants."

M. xanthus lives in a multi-cellular unit that can change its structure and behavior in response to changing availability of prey. This adaptive ability to control movement in response to an environmental stimulus is called chemotaxis, and the research team coined the term predataxis to describe M. xanthus behavior in response to prey.

In earlier studies, Kirby and James Berleman, Ph.D., a postdoctoral fellow in Kirby's lab, showed that the presence of prey causes M. xanthus to form parallel rippling waves that move toward and through prey bacteria.

Now, how the bacteria organize to form these traveling waves in response to the presence of prey is the subject of the UI team's latest study, which was published online Oct. 24 in Proceedings of the National Academy of Sciences (PNAS) Early Edition.

"When an M. xanthus aggregate is placed inside a colony of E. coli bacteria, the M. xanthus proceeds to eat the colony from the inside out and creates a rippling pattern as the swarm moves through the prey cells," Kirby said. "We now know that this rippling pattern is the highly organized behavior of thousands of cells working in concert to digest the prey."

Unlike the random motion M. xanthus exhibits at low levels of prey, the study shows that during predation, individual M. xanthus cells line up perpendicular to the axis of the ripple and move back and forth. This motion of individual cells, known as cell reversal produces an alternating pattern of high and low cell density like crests and troughs of waves, and the overall motion of the wave formation is directed toward prey.

Image shows swarm of M. xanthus bacteria (left) invading a colony of prey bacteria (right). The rippling pattern is the highly organized behavior of thousands of M. xanthus cells working in concert to digest the prey. **John Kirby, University of Iowa Carver College of Medicine**

The UI team also showed that the ripple wavelength is adaptable and dependent of how much prey is available. At high prey density, M. xanthus forms ripples with shorter wavelengths. As prey density decreases, the ripple wavelength gets longer. Eventually, when there is no more prey, the rippling behavior dissipates.

"The rippling appears to enhance predation by keeping more M. xanthus cells in the location of the prey cells," Kirby said.

Finally, the UI study found that the bacteria use a chemotaxis-like signaling pathway to regulate multi-cellular rippling during predation.

Individual M. xanthus cells move by shooting rope-like projections called pili from either end of the cell. These pili attach to surfaces allowing cells to pull themselves forward or backward in a "spiderman" type motion known as cell reversal. The genes that regulate this cell reversal process are chemotaxis-like genes.

The UI team mutated two genes in this pathway to study their effect on the predatory ability of the bacterium. One mutant strain rippled continuously even in the absence of prey, and individual cells exhibited a hyper-reversing action. Conversely, the second mutation produced bacteria that were not able to ripple at all.

Both mutants were unable to respond to changes in the amount of available prey and both mutant strains were deficient in predation. "Our study really connects the stimulus to the behavioral response through this molecular machinery," Kirby said.

In addition the potential medical application of M. xanthus to destroy harmful bacteria, what Kirby learns about the molecular mechanisms used by the bacterium may also provide insights into the workings of a rarer, but potentially useful, bacterial cousin. The related bacterium, Anaeromyxobacter dehalogenans, has been found at superfund sites and it can transform soluble uranium, which can leach into the water supply, into insoluble uranium, which still is radioactive, but is stable and trapped in the soil where it can be more safely stored until the radioactivity decays.

In addition to Kirby and Berleman, the UI team included Jodie Scott and Tatiana Chumley.
The research was funded in part by the National Institutes of Health.

The upside to allergies: cancer prevention

A new article in the December issue of The Quarterly Review of Biology provides strong evidence that allergies are much more than just an annoying immune malfunction. They may protect against certain types of cancer.

The article, by researchers Paul Sherman, Erica Holland and Janet Shellman Sherman from Cornell University, suggests that allergy symptoms may protect against cancer by expelling foreign particles, some of which may be carcinogenic or carry absorbed carcinogens, from the organs most likely to come in with contact them. In addition, allergies may serve as early warning devices that let people know when there are substances in the air that should be avoided.

Medical researchers have long suspected an association between allergies and cancer, but extensive study on the subject has yielded mixed, and often contradictory, results. Many studies have found inverse associations between the two, meaning cancer patients tended to have fewer allergies in their medical history. Other studies have found positive associations, and still others found no association at all.

In an attempt to explain these contradictions, the Cornell team reexamined nearly 650 previous studies from the past five decades. They found that inverse allergy-cancer associations are far more common with cancers of organ systems that come in direct contact with matter from the external environment - the mouth and throat, colon and rectum, skin, cervix, pancreas and glial brain cells. Likewise, only allergies associated with tissues that are directly exposed to environmental assaults - eczema, hives, hay fever and animal and food allergies - had inverse relationships to cancers.

Such inverse associations were found to be far less likely for cancers of more isolated tissues like the breast, meningeal brain cells and prostate, as well as for myeloma, non-Hodgkins lymphoma and myelocytic leukemia.

The relationship between asthma and lung cancer, however, is a special case. A majority of the studies that the Cornell team examined found that asthma correlates to higher rates of lung cancer. "Essentially, asthma obstructs clearance of pulmonary mucous, blocking any potentially prophylactic benefit of allergic expulsion," they explain. By contrast, allergies that affect the lungs other than asthma seem to retain the protective effect.

So if allergies are part of the body's defense against foreign particle invaders, is it wise to turn them off with antihistamines and other suppressants? The Cornell team says that studies specifically designed to answer this question are needed.

"We hope that our analyses and arguments will encourage such cost/benefit analyses," they write. "More importantly, we hope that our work will stimulate reconsideration…of the current prevailing view … that allergies are merely disorders of the immune system which, therefore, can be suppressed with impunity."

Sherman, Paul W., Erica Holland, Janet Shellman Sherman, "Allergies: Their Role In Cancer Prevention," The Quarterly Review of Biology December 2008

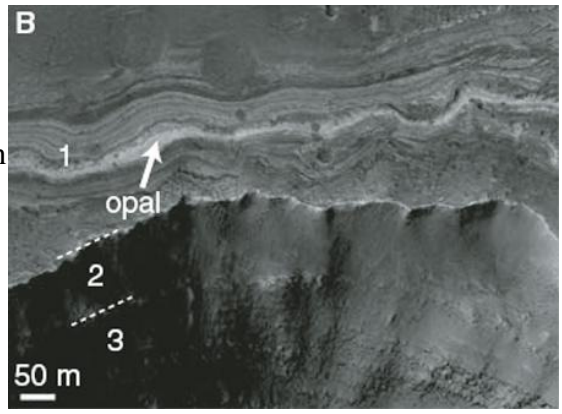
Opal hints at persistence of water on Mars

17:15 29 October 2008 NewScientist.com news service

*** Maggie McKee**

Opal, a mineral that needs water to form, is widespread in Martian terrain younger than 2.5 billion years old, new spacecraft observations suggest. The discovery offers the most recent mineralogical evidence yet of liquid water on the planet's surface – and suggests an intriguing new target for future searches for Martian life.

Two other types of water-containing, or hydrated, minerals have previously been found on Mars – clays and hydrated sulphates. Since scientists can date the age of a particular terrain by studying the number and sizes of its craters, they found that the two mineral types seem to have originated from different periods in the planet's history.



The spectral signature of opal was found in the Vallis Marineris canyon system using the high-resolution CRISM spectrometer aboard NASA's MRO spacecraft. Since the mineral appears in narrow outcrops, previous spectrometers did not have the resolving power needed to find the mineral's signature **(Image: Milliken et al./NASA/Geology)**

Opal valley

Clays, or phyllosilicates, are thought to have formed more than 3.5 billion years ago, when igneous rock came into contact with relatively abundant, neutral-pH water. As Mars gradually dried up, its water became more and more acidic. From 3.5 billion to 3 billion years ago, hydrated sulphate salts formed as that water evaporated. Since then, Mars was thought to have been the frozen world it is today, with water making few chemical changes to its rocks.

Now, Ralph Milliken at NASA's Jet Propulsion Laboratory in Pasadena, California, and colleagues report finding evidence of such recent chemical changes in the form of hydrated silica, or opal. The mineral – essentially quartz with water in its crystal structure – precipitates out when basaltic rock is dissolved in water.

Using the CRISM spectrometer aboard NASA's Mars Reconnaissance Orbiter, the team identified opal's spectral signature in and around the gargantuan canyon system known as Vallis Marineris, in terrain less than 2.5 billion years old.

"It's definitely in terrains that are younger than the terrains where we find clay minerals or sulphates," Milliken told New Scientist. "It suggests water was interacting with the surface longer than previously thought."

NASA's Spirit rover has previously detected the mineral in Gusev Crater; the new discovery suggests the minerals are widespread on Mars, says Milliken.

More clay?

Mark Bullock, a planetary scientist at the Southwest Research Institute in Boulder, Colorado, says he is not convinced that the observed spectral lines are indeed from opal. "They may just be seeing another flavour of clay," he told New Scientist.

But if further analysis confirms the detection, he says, it might suggest that the liquid water that carved Vallis Marineris's huge flood channels between 1 billion and 2 billion years ago might not have been just an ephemeral 'flash in the pan'.

"This work shows that the younger water had a significant impact on the chemistry of the surface, ie the production of opal and iron sulphates," Bullock says. "So maybe that younger water was around for a longer time than it took to carve the flood channels, and was able to chemically alter rocks," he says. "Maybe it even involved rainfall and runoff in this region of Mars."

Cold and dry?

Phil Christensen at Arizona State University in Tempe, says the new study does not solve the mystery of whether Mars was warm and wet in the past, or as he believes, mostly cold and dry, punctuated by rare flooding events lasting weeks or months. "What caused [the minerals'] formation, how long this period lasted, and when it occurred remain unclear," Christensen told New Scientist.

Milliken agrees. "The water cycle on Mars and how the water interacts with the surface is quite complex." "This doesn't necessarily mean there was water standing there for thousands or millions of years," Milliken continues. "But certainly the detection suggests there must have been liquid water involved at whatever time these rocks were deposited. That in itself would imply that Mars was warmer then than it is today."

Life preservers

Milliken says the opal deposits – which probably look like flinty beds of chert on Earth's ocean floors rather than lustrous gemstones – would make good targets for future hunts for Martian life.

The next rover to be sent to the Red Planet, NASA's Mars Science Laboratory, is set to lift off in 2009. But its list of possible landing sites does not include any of the newly-found opal deposits.

"For MSL, it's too late in the game for these to be considered," says Milliken. "But for future rovers, these are certainly excellent places to go." Since the minerals reveal where water persisted on the planet most recently, says Milliken: "They would be good places for preserving organic material if it existed on Mars."

Journal reference: Geology (vol 36, p 847)

An iron will runs in the family

THE iron will you need to bounce back and win in sport, or pass exams even when the chips are down, may be largely inherited. Tenacious winners - such as cyclist Lance Armstrong (pictured), who recovered from testicular cancer and went on to win the Tour de France seven times - are naturally tough, a new study suggests, and it may be difficult to boost people who are not naturally resilient.

Tony Vernon at the University of Western Ontario in London, Canada, led a questionnaire-based study of 219 pairs of twins which probed the genetic and environmental contributions of four traits associated with mental toughness: control over life, commitment, confidence and the ability to face new challenges.

The analysis found that 52 per cent in the variation of mental toughness was down to genetics (Personality and Individual Differences, DOI: 10.1016/j.paid.2008.09.009). It also correlated strongly with extroversion. In contrast, being neurotic or anxious indicated a reduced likelihood of possessing mental toughness.

"It's about not letting setbacks destroy you," says Peter Clough at the University of Hull, UK, who designed the questionnaire. Clough agrees mental toughness is mostly inherited, but says that natural worriers can deal with anxiety by learning to purge negative thoughts.

Newly Identified Fungus Implicated in White-Nose Syndrome in Bats

Mysterious Bat Disease Decimates Colonies in the Northeast

A previously undescribed, cold-loving fungus has been linked to white-nose syndrome, a condition associated with the deaths of over 100,000 hibernating bats in the northeastern United States. The findings are published in this week's issue of Science.

The probable cause of these bat deaths has puzzled researchers and resource managers urgently trying to understand why the bats were dying in such unprecedented numbers. Since the winter of 2006-07, bat declines at many surveyed hibernation caves exceeded 75 percent.

The fungus—a white, powdery-looking organism—is commonly found on the muzzles, ears and wings of afflicted dead and dying bats, though researchers have not yet determined that it is the only factor

causing bats to die. Most of the bats are also emaciated, and some of them leave their hibernacula—winter caves where they hibernate—to seek food that they will not find in winter.

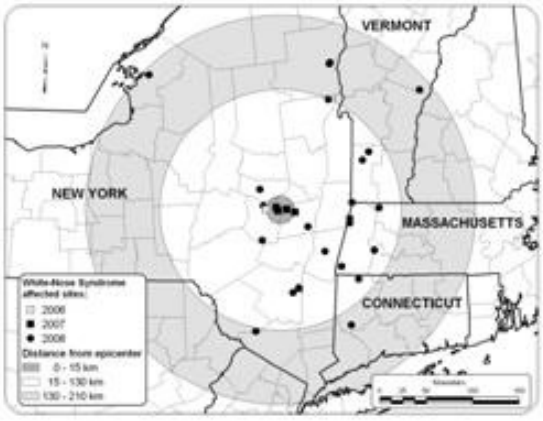
USGS microbiologist and lead author David Blehert isolated the fungus in April 2008, and identified it as a member of the group Geomyces. The research was conducted by U.S. Geological Survey scientists in collaboration with the New York State Department of Environmental Conservation, the New York State Department of Health, and others.

Geomyces are a group of fungi that live in soil, water and air and are capable of growing and reproducing at refrigerator-level temperatures. Although the new fungus is a close genetic relative of known Geomyces, it does not look like a typical member of this group under the microscope. "We found that this fungus had colonized the skin of 90 percent of the bats we analyzed from all the states affected by white-nose syndrome," Blehert said.

Researchers don't know yet if white-nose syndrome emerged because this newly identified fungus was introduced into caves or whether the fungus already existed in caves and began infecting bats after they were already weakened from some other cause. "This fungus may have been recently introduced to bat hibernation caves and, if so, human and animal movements among these caves are causes that need to be considered," says Blehert. "Data show the occurrence of white-nose syndrome radiating outward from the site of its first appearance, and genetic identity among fungal isolates from distant caves argues for a recent introduction of this microbe. Before the identification of white-nose syndrome, mass mortality events in bats as a result of disease were very rare."

WNS was first seen in New York during the winter of 2006. Since then, populations of cave-hibernating bats have been drastically declining in New York, Vermont, Massachusetts and Connecticut. Affected species include little brown bats, northern bats, tricolored bats, Indiana bats, small-footed myotis and big brown bats.

Worldwide, bats play critical ecological roles in insect control, plant pollination and seed dissemination, and the decline of North American bat populations would likely have far-reaching ecological consequences, the researchers wrote. They noted that parallels can be drawn between the threat posed by WNS and chytridiomycosis, a lethal fungal skin infection that has recently caused precipitous global amphibian population declines.



Map showing affected areas

"Right now," said Blehert, "we are uncertain about the long-term effects of white-nose syndrome on North American bats, but we are quite concerned about future effects on bat populations wherever environmental conditions are conducive to growth of the fungus. To manage and perhaps halt this disease, we have to first better understand it."

Keys Can be Copied From Afar, Jacobs School Computer Scientists Show

San Diego, CA, October 30, 2008--UC San Diego computer scientists have built a software program that can perform key duplication without having the key. Instead, the computer scientists only need a photograph of the key.

“We built our key duplication software system to show people that their keys are not inherently secret,” said Stefan Savage, the computer science professor from UC San Diego’s Jacobs School of Engineering who led the student-run project. “Perhaps this was once a reasonable assumption, but advances in digital imaging and optics have made it easy to duplicate someone’s keys from a distance without them even noticing.”

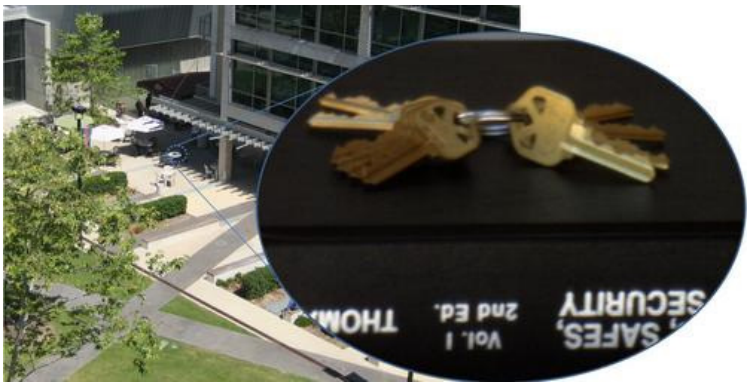
Professor Savage presents this work on October 30 at ACM’s Conference on Communications and Computer Security (CCS) 2008, one of the premier academic computer security conferences.

The bumps and valleys on your house or office keys represent a numeric code that completely describes how to open your particular lock. If a key doesn’t encode this precise “bitting code,” then it won’t open your door. In one demonstration of the new software system, the computer scientists took pictures of common residential house keys with a cell phone camera, fed the image into their software which then produced the information needed to create identical copies. In another example, they used a five inch telephoto lens to capture images from the roof of a campus building and duplicate keys sitting on a café table about 200 feet away.

“This idea should come as little surprise to locksmiths or lock vendors,” said Savage. “There are experts who have been able to copy keys by hand from high-resolution photographs for some time. However, we argue that the threat has turned a corner—cheap image sensors have made digital cameras pervasive and basic computer vision techniques can automatically extract a key’s information without requiring any expertise.”

Professor Savage notes, however, that the idea that one's keys are sensitive visual information is not widely appreciated in the general public. "If you go onto a photo-sharing site such as Flickr, you will find many photos of people's keys that can be used to easily make duplicates. While people generally blur out the numbers on their credit cards and driver's licenses before putting those photos on-line, they don't realize that they should take the same precautions with their keys," said Savage.

As for what to do about the key duplication threat, Savage says that companies are actively developing and marketing new locking systems that encode electromagnetic secrets as well as a physical code. "Many car keys, for example, have RFID immobilizer chips that prevent duplicated keys from turning the car on," he says. In the meantime, he suggests that you treat your keys like you treat your credit card and "keep it in your pocket unless you need to use it."



Scenes from one of the proof-of-concept telephoto experiments. The computer scientists successfully decoded this key image, captured at a distance of 195 feet.

How it works

The keys used in the most common residential locks in the United States have a series of 5 or 6 cuts, spaced out at regular intervals. The computer scientists created a program in MatLab that can process photos of keys from nearly any angle and measure the depth of each cut. String together the depth of each cut and you have a key's bitting code, which together with basic information on the brand and type of key you have, is what you need to make a duplicate key.

The chief challenge for the software system, called "Sneakey," is to adjust for a wide range of different angles and distances between the camera and the key being captured. To do so, the researchers relied on a classic computer vision technique for normalizing an object's orientation and size in three dimensions by matching control points from a reference image to equivalent points in the target image.

"The program is simple. You only need to click a few control points in the image of the key and the 'Sneakey' program does the rest. It normalizes the key's size and position so that each pixel then corresponds to a known distance. From this information, the height of each of the key cuts can easily be computed and likewise the bitting code can be extracted," explained Benjamin Laxton, the first author on the paper who wrote the Sneakey program and recently earned his Master's degree in computer science from UC San Diego.

The researchers have not released their code to the public, but they acknowledge that it would not be terribly difficult for someone with basic knowledge of MatLab and computer vision techniques to build a similar system.

"Technology trends in computer vision are at a point where we need to consider new risks for physical security systems," said Kai Wang, a UC San Diego computer science graduate student and author on the new paper. Wang is a computer vision researcher working on the creating systems capable of reading text on product packaging. This is part of a larger project on creating a computerized personal shopping assistant for the visually impaired from the lab of computer science professor Serge Belongie.

As a computer security expert, Savage said he particularly enjoyed working on a project with computer vision students. "UC San Diego is very supportive of interdisciplinary work. There are many opportunities for students and faculty to get their hands dirty in fields they may not know much about a lot at first," said Savage.

***Paper citation**: "Reconsidering Physical Key Secrecy: Teleduplication via Optical Decoding ," by Benjamin Laxton, Kai Wang, and Stefan Savage from the Department of Computer Science and Engineering at UC San Diego's Jacobs School of Engineering. ACM CCS 2008, Alexandria, VA, October 2008.*

Interferon could be a key to preventing or treating multiple sclerosis

Multiple sclerosis (MS) results when the body's own defense system attacks nerve fibers in the brain and spinal cord. Now scientists led by John Russell, Ph.D., at Washington University School of Medicine in St. Louis have shown that interferon-gamma plays a deciding role in whether immune cells attack and injure the central nervous system (brain and spinal cord) in mice.

Interferon-gamma is an immune system protein that helps the body defend itself from invaders. In their latest research, which appeared in the October issue of the Journal of Experimental Medicine, the researchers show that interferon-gamma determined whether activated immune cells - previously primed to go after nerve cells - would actually cause nerve damage in experimental mice.

The researchers found that in the cerebellums and brainstems of the mice, interferon-gamma was protective. However, in the spinal cord, interferon-gamma had the opposite effect, permitting nerve cell damage.

"Some studies show that the most serious cases of MS in people occur when the immune system specifically targets the cerebellum, a part of the brain responsible for sensory perception, coordination and movement control," says Russell, professor of developmental biology. "Our study suggests that researchers need to look at the amount of interferon-gamma produced in the cerebellum and other brain regions in people with MS."

The researchers studied mice genetically engineered to be physiologically "blind" to interferon-gamma — the mice had none of the usual receptors on their cells that recognize and respond to interferon-gamma. So in these mice it was as though interferon-gamma didn't exist.

In the interferon-insensitive mice, immune cells primed to attack nerves and then injected into the mice's veins were able to get into the cerebellum and brain stem and initiate nerve cell damage leading to MS-like disease.

In comparison, in mice with normal interferon-gamma recognition, immune cells were prevented from entering the brain and causing problems. The exact mechanism to account for this is still under study.

"Down the road, we would like to investigate whether we can prevent disease in the cerebellum in mice if we promote interferon production in that brain region," Russell says. "One way to do that would be to use gene therapy to insert a gene that would increase interferon in the mice's brains. Then we would test the mice to see if they gained protection against MS-like disease."

In contrast to its protective role in the brain, in the spinal cord interferon-gamma helped instigate nerve damage. In mice with intact interferon-gamma recognition, activated and injected immune cells were able to enter the spinal cord and cause injury. In mice without interferon recognition, the immune cells were unable to initiate spinal cord inflammation, and no damage occurred.

"Our research shows that certain characteristics inherent in different regions of the brain and spinal cord can provoke immune attacks on nerve cells," Russell says. "An understanding of the mechanisms involved in immune system invasion of the nervous system may allow development of better models for determining prognosis and treating many neurological diseases such as multiple sclerosis."

This latest research bolsters Russell's central hypothesis about MS and related disorders, which goes against some widely held assumptions. He holds that in physiological circumstances that ultimately lead to MS, the central nervous system itself allows or even aids immune system attacks.

"A scientifically popular view of how MS occurs is that the immune system somehow gets armed against normal brain antigens and attacks neurons," Russell says. "In that view, brain cells have a passive role. But in this and previous research, we've shown that there's a 'conversation' between the immune system and the central nervous system and that molecular signals passed between them are involved in the development of MS-like disease in mice."

Lees JR, Golumbek PT, Sim J, Dorsey D, Russell JH. Regional CNS responses to IFN-γ determine lesion localization patterns during EAE pathogenesis. Journal of Experimental Medicine. 2008 Oct 27;205(11):2633-2642.

Funding from the National Multiple Sclerosis Society and the National Institutes of Health supported this research.

Real Robinson Crusoe: Evidence Of Alexander Selkirk's Desert Island Campsite

ScienceDaily (Oct. 30, 2008) - Cast away on a desert island, surviving on what nature alone can provide, praying for rescue but fearing the sight of a boat on the horizon. These are the imaginative creations of Daniel Defoe in his famous novel Robinson Crusoe. Yet the story is believed to be based on the real-life experience of sailor Alexander Selkirk, marooned in 1704 on a small tropical island in the Pacific for more than four years, and now archaeological evidence has been found to support contemporary records of his existence on the island.

An article in the journal Post-Medieval Archaeology presents evidence from an archaeological dig on the island of Aguas Buenas, since renamed Robinson Crusoe Island, which reveals evidence of the campsite of an early European occupant. The most compelling evidence is the discovery of a pair of navigational dividers which could only have belonged to a ship's master or navigator, as evidence suggests Selkirk must have been. Indeed Selkirk's rescuer, Captain Woodes Rogers' account of what he saw on arrival at Aguas Buenas in 1709 lists 'some practical pieces' and mathematical instruments amongst the few possessions that Selkirk had taken with him from the ship.

A scene from Robinson Crusoe, showing Crusoe and Friday. **(Credit: iStockphoto/Duncan Walker)**

The finds also provide an insight into exactly how Selkirk might have lived on the island. Postholes suggest he built two shelters near to a freshwater stream, and had access to a viewpoint over the harbour from where he would be able to watch for approaching ships and ascertain whether they were friend or foe. Accounts written shortly after his rescue describe him shooting goats with a gun rescued from the ship, and eventually learning to outrun them, eating their meat and using their skins as clothing. He also passed time reading the Bible and singing psalms, and seems to have enjoyed a more peaceful and devout existence than at any other time in his life.

David H Caldwell, National Museums Scotland, is pleased with the results of the dig: "The evidence uncovered at Aguas Buenas corroborates the stories of Alexander Selkirk's stay on the island and provides a fascinating insight into his existence there. We hope that Aguas Buenas, with careful management, may be a site enjoyed by the increasing number of tourists searching for the inspiration behind Defoe's masterpiece."

Alexander Selkirk was born in the small seaside town of Lower Largo, Fife, Scotland in 1676. A younger son of a shoemaker, he was drawn to a life at sea from an early age. In 1704, during a privateering voyage on the Cinque Ports, Selkirk fell out with the commander over the boat's seaworthiness and he decided to remain behind on Robinson Crusoe Island where they had landed to overhaul the worm-infested vessel. He cannot have known that it would be five years before he was picked up by an English ship visiting the island.

Published in 1719, Robinson Crusoe is one of the oldest and most famous adventure stories in English literature. Whilst it is unclear whether Defoe and Selkirk actually met, Defoe would certainly have heard the stories of Selkirk's adventure and used the tales as the basis for his novel.

Journal reference:

1. Takahashi et al. Excavation at Aguas Buenas, Robinson Crusoe Island, Chile, of a gunpowder magazine and the supposed campsite of Alexander Selkirk, together with an account of early navigational dividers. Post-Medieval Archaeology, 2007; 41 (2): 270 DOI: 10.1179/174581307X236157

Dramatic fall in number of malaria deaths along Kenyan coast

A study out today shows a dramatic fall in the number of people dying from malaria infection in coastal Kenya. The research, funded by the Wellcome Trust and the Kenya Medical Research Institute (KEMRI), highlights the importance of the prevention and rapid treatment of malaria infection in preventing a potential resurgence of the disease.

Malaria is one of the world's biggest killers, responsible for over a million deaths every year, mainly in children and pregnant women in Africa and south east Asia. It is caused by the malaria parasite, which is injected into the bloodstream from the salivary glands of infected mosquitoes.

In areas where transmission rates of malaria are high, death occurs most frequently in young children, usually as a result of severe anaemia. Surviving children rapidly develop immunity to the disease and severe malaria is rarely seen in older children. Where transmission rates are lower, the proportion of older children infected with malaria increases – in older children, malaria can lead to even more serious complications as the parasites reach the brain.

Researchers from the KEMRI-Wellcome Trust programme in Kilifi, eastern Kenya, have analysed eighteen years of detailed hospital surveillance data in a large endemic area of the Kenyan coast to look at whether incidence of malaria have been falling and what impact this will have on disease and mortality in the population. The results are published today in the journal The Lancet.

Whilst the researchers found that transmission rates for malaria have been steadily falling over the past ten years, the number of cases of severe malaria only began to fall more recently. However, the past five years have seen a remarkable fall of over 75% in the number of severe malaria deaths from malaria, down from 10.8 per 10,000 to 1.2 per 10,000.

"These are incredibly positive findings and reflect what is being seen along the east African coast," says Professor Kevin Marsh, head of the KEMRI Wellcome Trust programme and a researcher at the University of Oxford. "It gives us hope that tackling malaria across the continent is an achievable goal."

Professor Marsh and colleagues believe that a number of reasons may be behind this dramatic reduction in incidence of the disease, reflecting the success of control measures and early treatment. These include changes since the mid '90s in the first line therapy, with new drugs replacing the previously widely-used treatment, chloroquine, which had become ineffective due to drug-resistance.

Other factors that may have contributed to the decline include the increasing use of insecticide-treated bednets and better management of mosquito breeding sites.

Researchers had predicted that falling transmission rates would have left older children unexposed to malaria and therefore with no immunity, resulting in an increase in cases of cerebral malaria. In fact, whilst they indeed

found a small rise in the number of cases of cerebral malaria, this was more than offset by the marked decrease in severe malarial anaemia and other forms of malaria.

"There are many factors that may have contributed to this dramatic reduction in malaria deaths, but one thing is clear: we must not become complacent," says Professor Marsh. " As transmission rates continue to fall, younger children are growing up with less exposure to malaria. It's essential that we maintain control measures, look for new ones and emphasise early treatment to prevent a resurgence of this deadly disease."

The findings have been welcomed by Dr Mark Walport, Director of the Wellcome Trust.

"These are important results - they show that malaria can be controlled in parts of the world where for centuries it has been a major killer of children and pregnant women," says Dr Walport. "These findings should provide encouragement to those dedicated to the control and ultimately the eradication of malaria."

Dramatic fall in malaria in the Gambia raises possibility of elimination in parts of Africa

The incidence of malaria has fallen significantly in The Gambia in the last 5 years, according to a study carried out by experts there with support from scientists based in London.

The findings from the study, which was funded by the UK Medical Research Council, appear in today's Lancet, and raise the possibility of eliminating malaria as a public health problem in parts of Africa.

Malaria is a major cause of illness and death in Africa, including The Gambia. Investigations into ways of controlling malaria have been underway in The Gambia for more than 50 years and, since 2003, efforts to deliver malaria interventions to pregnant women and children under 5 – including intermittent preventive treatment, the use of insecticide-treated bed nets (ITNs) and indoor residual spraying - have been stepped up considerably.

The authors sought to investigate the changes that have occurred in The Gambia over the past nine years, their potential causes, and public health significance. They analysed original records in order to establish the numbers and proportions of malaria inpatients, deaths and blood-slide examinations at one hospital over nine years (January 1999-December 2007) and at four health facilities in three different administrative regions over seven years (January 2001-December 2007). They obtained additional data from single sites for haemoglobin concentrations in paediatric admissions and for the age distribution of malaria admissions.

At each of the four sites with complete slide examination records, they found that the proportions of malaria-positive slides had decreased by 82%, 85%, 73% and 50% respectively between 2003 and 2007. Meanwhile, during the same period at the three sites with complete admission records, the proportions of malaria admissions fell by 74%, 69% and 27%. Proportions of deaths attributed to malaria in two hospitals fell by more than 90%.

The team also recorded a substantial shift in the average age of children who were admitted to one hospital with malaria after 2004, with far fewer under 5s being admitted after that year. The average age until 2004 was similar to that recorded ten years previously, so the finding of a trend towards older ages of malaria cases was new. A more substantial decrease of malaria admissions in younger children is likely to be largely due to increased use of ITNs, since this intervention is targeted at children under 5, but it may also reflect a situation in which children are taking longer to acquire immunity.

The team considered possible reasons for the decrease of malaria in The Gambia. Changes in rainfall cause some fluctuations in malaria from year to year, but could not account for the progressive reduction recorded since 2003, while socio-economic changes, improvements in communications and access to education may also have helped, although these factors tend to have a more gradual impact rather than the rapid changes reported at the different sites. A change in chemotherapy is likely to have played a substantial role – until 2004, chloroquine alone was mainly used but as parasite resistance to this drug had increased to high levels, the first-line treatment of choice became sulphadoxine plus pyrimethamine (SP) combined with chloroquine, from early 2005 onwards. SP has prophylactic as well as curative properties which may have been important.

The most substantial change in measures to prevent malaria has been the increase of coverage of ITNs, which thanks to well-publicised initiatives from the Global Fund, UNICEF and WHO increased threefold between 2000 and 2006 (49% of under 5s in The Gambia are now reported to be sleeping under ITNs – the highest reported coverage in Africa).

David Conway, of the London School of Hygiene & Tropical Medicine, who is based at the Medical Research Council Laboratories in Banjul in The Gambia, is one of the study's authors. He comments: 'These findings support the proposal that increased investment in malaria interventions in Africa can have a major effect on reducing morbidity and mortality from the disease. We need to consider the possibility of future elimination of malaria from some areas in Africa, but we also emphasise the importance of continuous surveillance, and there is no room for complacency with this disease'.

Odor ID not disguised by diet

Personal odor may someday be used to identify individuals

PHILADELPHIA (October 30, 2008) -- Reporting in the October 31 issue of the online journal PLoS ONE, scientists from the Monell Center present behavioral and chemical findings to reveal that an individual's underlying odor signature remains detectable even in the face of major dietary changes.

"The findings using this animal model support the proposition that body odors provide a consistent 'odorprint' analogous to a fingerprint or DNA sample," said Gary Beauchamp, PhD, a behavioral biologist at Monell and one of the paper's senior authors. "This distinctive odor can be detected using either an animal's nose or chemical instruments."

Mammals such as mice and humans are known to have unique genetically-determined body odors, called 'odortypes.' Thought to be identity biomarkers that help distinguish individuals from one another, odortypes are determined in part by genes of the major histocompatability complex (MHC). The same genes also are involved in the immune system.

Odortype information is transmitted through body fluids such as sweat and urine, which contain numerous airborne chemical molecules known as volatile organic compounds, or VOCs, many of which are odorous.

The type of food eaten also can influence an individual's body odor; garlic, for example can be detected by smell when consumed in large amounts. As such, dietary changes potentially could obstruct detection of genetically-determined odortype and thus mask individual identity. To address this question, the researchers conducted a series of behavioral and chemical experiments.

In behavioral tests, 'sensor' mice were trained to use their sense of smell to choose between pairs of test mice that differed in MHC genes, diet or both. Chemical analyses used instrumentation to examine the array of VOC's in urine of mice having different MHC backgrounds and fed different diets.

The results indicate that genetically-determined odortypes persist regardless of diet, even though dietary changes do strongly influence odor profiles of individual mice. Changing diet ingredients did not obscure detection of underlying odortypes using either behavioral or chemical methods.

"These findings indicate that biologically-based odorprints, like fingerprints, could be a reliable way to identify individuals. If this can be shown to be the case for humans, it opens the possibility that devices can be developed to detect individual odorprints in humans," said lead author Jae Kwak, PhD, a Monell chemist.

According to Beauchamp, similar approaches are being used to investigate body odor differences associated with disease. Such research could lead to the development of electronic sensors for early detection and rapid diagnosis of disorders such as skin and lung cancer and certain viral diseases.

Also contributing to the study were Monell researchers Koichi Matsumura, Maryanne Curran Opiekun, Weiguang Yi (currently at the University of Georgia), George Preti, and Kunio Yamazaki, and Alan Willse (Battelle – Pacific Northwest Division, currently at Monsanto Company).

Mud eruption 'caused by drilling'

By James Morgan Science & Environment reporter, BBC News

The eruption of the Lusi mud volcano in Indonesia was caused by drilling for oil and gas, a meeting of 74 leading geologists has concluded. Lusi erupted in May 2006 and continues to spew out boiling mud, displacing around 30,000 people in East Java. Drilling firm Lapindo Brantas denies a nearby well was the trigger, blaming an earthquake 280km (174 miles) away.

Around 10,000 families who have lost their homes are awaiting compensation, which could run as high as $70m (£43m). After debating new evidence at a conference in South Africa, most geologists voted drilling as the cause. Correspondents describe the result a significant development in the tug-of-war to establish liability for the disaster.

Mud slinging

The debate on the cause of the eruption took place at a meeting of the American Association of Petroleum Geologists, in Cape Town. It was the first time the two opposing sides had agreed to debate before an international conference of independent experts. The contest was chaired by a professional football referee - Professor John Underhill, an Edinburgh University geologist, who is also a match official in the Scottish Premier League.

The dispute centres on some newly released data - measurements taken from the Banjar-Panji-1 exploration well during the final 24 hours leading up to the eruption.

Professor Richard Davies, of Durham University in the UK, argued that these readings clearly point to a build up of pressure, causing fractures which propagated from the bore hole to the surface 150m away, resulting in the eruption.

However, Rocky Sawolo, senior drilling adviser of Lapindo Brantas, used the same primary data to argue the opposite - the pressure within the well was within acceptable limits.

His colleague Dr Adriano Mazzini, of the University of Oslo, testified that the fracture was triggered by a magnitude 6.3 earthquake two days earlier, centred on Yogyakarta, some 280km away.

But these claims were directly contradicted by Dr Mark Tingay from Curtin University, Australia, a geological pressure and rock mechanics expert.

The earthquake "was at least an order of magnitude too small," he said, stressing that the force felt at the Lusi site would have been "very small" - comparable to the effect of a heavy truck passing overhead.

Satellite photo showing the devastation caused by the Lusi mud volcano

Judgment call

When the vote was called, 42 out of the 74 scientists in the audience were convinced that the drilling was the trigger of the eruption. Only three voted for the earthquake.

A further 16 scientists believed the evidence was inconclusive, and the remaining 13 felt that a combination of earthquake and drilling was to blame.

"The geologists voted overwhelmingly that drilling was the most likely cause," said Prof Underhill.

"The atmosphere was very tense, so all credit to them for not sitting on their hands.

"Hopefully this will be a catalyst for taking things forward. To my mind the result demonstrates that at the very least, the drilling company have a case to answer."

Prof Davies said: "I remain convinced that drilling was the cause of the mud volcano.

"The opinion of the international scientists adds further weight to my conviction."

For two years, the Lusi crater has been oozing mud - enough to fill 50 Olympic size swimming pools every day.

The eruption began at 0500 on 29 May 2006 in the Porong subdistrict of Sidoarjo, Eastern Java, close to Indonesia's second city of Surabaya. All efforts to stem the flow have failed - including a network of dams; channelling into the sea; and an ambitious plan to plug the crater with concrete balls. Some geologists believe Lusi could continue to erupt for decades. The mud flow has razed four villages and 25 factories. Thirteen people have died, as a result of a rupture in a natural gas pipeline underneath one of the holding dams.

THE AFTERMATH

A police investigation is underway to identify the trigger and to determine whether the drillers are liable for compensating 10,000 families, amounting to 700 billion Indonesian Rupias (US$77; £47m).

If the earthquake is judged responsible, as claimed by Lapindo, then the Indonesian government will have the burden of supporting the victims.

There is no dispute that seismic activity can provoke mud volcanoes, and both are common in East Java.

Nevertheless, in June 2008 Prof Davies published a paper in the journal Earth and Planetary Science Letters, in which he concluded with "99% certainty" that Lapindo's drilling caused the mudflow.

He argues that the 2,500m-deep bore hole ruptured limestone rock, containing pressurised water. As the lower part of the borehole was not protected by casing, this forced water and mud into the rocks surrounding the well. At the conference, he produced fresh records of the changes in pressure in the 24 hours leading up to Lusi's eruption.

The pressure plots were introduced by drilling engineer Susila Lusiaga, who works with the Indonesian police investigation team. "The pressure in the well went way beyond what it could tolerate... and it triggered the mud volcano," he said.

The new records "provide a compelling tape recording of the well as it started to leak," said Prof Davies.

"This is the data we wanted to get out - the data I have never been able to show before.

"It clearly shows that the well failed. And this failure was the driver for a the breakdown of the rocks - it was the trigger for the mud volcano."

The well took a huge influx of fluid the day before the eruption, he said, resulting in intolerable pressures, and fractures which propagated until the surface was breached.

"We see the pressure building, then suddenly we see a massive drop at 9.30pm on May 28th - the night before the eruption began. “This is evidence that a fracture has opened up. It's like a tyre bursting - the pressure

inside bleeds away. He added: "This may be evidence that Lusi actually started at 9.30pm the night before - not 5am the next morning."

"Now the data has been released, I would like to get it out to independent drilling experts, who can then go through it," said Prof Davies, a geologist. "We are particularly grateful to Lapindo, who were widely applauded at the meeting for their willingness to take part. We are now starting to make some headway."

Sticking point

However, despite the vote, the drilling firm strenuously denies that its activities were in any way responsible for the disaster. From the same primary data, they calculate that the pressures under the ground did not go beyond critical levels.

"We presented clear and indisputable facts that none of the four required factors for the well to have been responsible for triggering the eruption occurred," a spokesman for Lapindo Brantas said.

"Specifically: there was no uncontrolled 'kick'. The casing shoe was not breached and the well was intact.

"There was no underground blowout. There was no sustained pressure to propagate a fracture."

Study reveals marriage dowry as major cause of poverty in Bangladesh

More than 35 million people in Bangladesh, around a quarter of its population, face acute poverty and hunger. Dowry payments of more than 200 times the daily wage and costly medical expenses are major causes of this chronic poverty says research from the University of Bath.

Dr Peter Davis, of the Centre for Development Studies based in the University's Department of Economics & International Development, has been investigating the issues forcing families into poverty as part of a long-term study in collaboration with the International Food Policy Research Institute (IFPRI), the Chronic Poverty Research Centre (CPRC), and Data Analysis and Technical Assistance Ltd., Dhaka (DATA).

The research found that those households with lower levels of education, that owned less land, had fewer assets and had many young children and elderly relatives, faced the most difficulty in escaping poverty.

The custom of paying a dowry to the future husband's family when a daughter is married is illegal in Bangladesh, but is still practised by most families living in rural areas. Payment is normally upwards from 20,000 Taka (around £190) and since typical earnings are only 100 Taka (94 pence) per day, this can be a major contributor to poverty for many families with daughters.

Dr Davis found that medical expenses involved in the care of elderly relatives were also a common issue for families living in poverty.

"Some families face a 'double whammy', having to pay wedding expenses and dowry for their daughters at the same time in life when elderly relatives are needing more expensive medical care," said Dr Davis, who spent several months in the country training and working with researchers from DATA Bangladesh to conduct interviews with families for the study. "Measures such as improving education, employment and health services could play a really significant role in alleviating poverty in these families. "The government in Bangladesh has already taken positive steps in increasing the enrolment of girls in schools, which should decrease the practice of giving and demanding dowry."

The researchers surveyed 2,000 households based in 102 rural villages across Bangladesh, that were originally interviewed between eight and 14 years ago, to assess the changes in poverty and well-being that occurred over time. They found that almost half moved out of poverty during this time, but around one fifth remained chronically poor and a small percentage fell into poverty.

Uniquely, the researchers combined household data with about 300 individual life histories to provide a deeper understanding of the causes of chronic poverty in the country, rather than purely using quantitative conventional research approaches.

Dr Davis explained: "This research is different because it is qualitative as well as quantitative, so it doesn't just measure the trends, but also finds out the stories behind the trends.

"The life histories collected for this study show that many poor people's lives improve and decline in a 'saw-tooth' pattern, where slow improvements are reversed by sharp declines caused by events such as illness, large medical expenses, wedding expenses and legal disputes. "This contrasts with the smooth pattern of progress or decline which is often suggested by more conventional research approaches."

Dr Davis presented the findings with collaborators Agnes Quisumbing from IFPRI and Bob Baulch from the Chronic Poverty Research Centre at a workshop in August in Dhaka, Bangladesh.

The workshop was chaired by the director of the Bangladesh Institute of Development Studies and was attended by more than 100 senior government officials, international donors and civil society representatives.

Dr Davis added: "We've had a lot of very positive feedback on the research we presented at the workshop and we are planning to hold further meetings with senior government officials and policy makers after the December elections."

If it's hard to read, it's hard to do: Study shows difficult to read instructions decrease motivation

It is not surprising that people are more willing to participate in a task if it does not require too much effort. What is interesting, however, is the way we determine just how easy a task will be and therefore, how motivated we are to complete it. New research from University of Michigan psychologists Hyunjin Song and Norbert Schwarz investigates how thinking about a task (i.e., how complex or simple it will be) affects our attitude toward the task itself.

The researchers tested this by trying to motivate a group of college students to exercise regularly by providing them with directions on how to implement an exercise regimen. Half of the students received the directions written in standard, easy-to-read Arial font. The remaining students received the directions typed in Brush font (which looks like it has been written with a paintbrush and is difficult to read). The students were then asked to estimate how long the exercise routine would take and if they would make it part of their daily routine. In the second experiment, students were provided with a recipe detailing how to prepare sushi. As before, half of the group received an easy to read recipe while the remaining students received a recipe typed in a difficult to read font and all of the students were asked how difficult they thought it would be to make the sushi.

The results, reported in the October issue of Psychological Science, a journal of the Association for Psychological Science, are intriguing. The students who received the exercise instructions written in the easy to read, Arial font, believed that the workout regimen would take less time and feel easier compared to the students who received the directions in the harder to read font. More importantly, when the instructions were written in an easy to read font, the students were more willing to make exercise a part of their daily routine. The results of the second experiment were similar. Again, the students who read the recipe in an easy to read font determined it would take a shorter time to prepare and not require a lot of culinary skill to complete. In addition, the students who received the easy to read recipe were more willing to attempt the recipe than the group who had the difficult to read directions.

Overall, these results show that people equate the ease of reading and processing directions with how complex the task itself will be. In other words, if the directions are difficult (or in this case, presented in a difficult-to-read style), the task will be viewed as being difficult, taking a long time to complete and perhaps, not even worth trying.

Optimal Dose of Vitamin E Maximizes Benefits, Minimizes Risk

Corvallis, Oregon – October 29, 2008 -- Vitamin E has been heralded for its ability to reduce the risk of blood clots, heart attack, and sudden death. Yet in some people, vitamin E causes bleeding. Scientists have known for more than 50 years that excess vitamin E promotes bleeding by interfering with vitamin K, which is essential in blood clotting. However, they haven't been able to pinpoint how the two vitamins interact. Nutrition researcher Maret Traber of Oregon State University reviews studies of possible explanations of the interaction in an article published recently in Nutrition Reviews.

One of the most compelling studies of the benefits of vitamin E is the Women's Health Study, in which 40,000 healthy women, 45 and older, took 600 IU vitamin E supplements or a placebo every other day for 10 years. Women taking the supplements had 24 percent fewer deaths from heart disease. Vitamin E's protective effect appeared even stronger in women 65 and older. Those taking the vitamin experienced a 26 percent reduction in cardiovascular events and a 49 percent reduction in cardiovascular deaths.

"That's a significant benefit," Traber said. Yet, she added, "In some people high doses of vitamin E increase the tendency to bleed. Women enrolled in the study had an increase in nose bleeds."

To lessen the bleeding risk, the U.S.-based Food and Nutrition Board in 2000 set the upper tolerable limit for daily vitamin E intake at 1500 I.U.

Research Traber reviewed suggests that a shared metabolic pathway in the liver causes vitamins E and K to interact. Vitamin K in the liver appears to diminish as vitamin E increases.

"Several different explanations could account for the interaction between the two vitamins," Traber said. "We need more research to understand the delicate balance between vitamins E and K."

Special Article

Vitamin E and K interactions – a 50-year-old problem

Maret G Traber 1

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KEYWORDS *5C-aglycone metabolite • CEHC • menaquinone • phylloquinone • tocopherol*
ABSTRACT
The mechanisms by which vitamin E interferes with vitamin K activity, especially blood clotting, are not known, but hypothetically this interference may involve metabolic pathways. Phylloquinone (K1) must be converted to menaquinone (MK-4, the most potent extrahepatic tissue vitamin K) by truncation of the K1 side chain and replacement with geranylgeranyl. Possible mechanisms for the vitamin E and K interaction include: 1) vitamin E competes for the yet undiscovered enzyme that truncates the K1 side chain; 2) vitamin E competes with K1 for the hypothetical cytochrome P450 enzyme that ω-hydroxylates the K1 side chain, thereby preventing its β-oxidation and its removal for MK-4 formation; or 3) vitamin E increases xenobiotic pathways that increase hepatic metabolism and excretion of all vitamin K forms. Currently, the pathway for K1 conversion to MK-4 is unknown, the process for regulating vitamin K metabolism to urinary excretion products is unknown, and why vitamin E supplements have such a dramatic effect, causing bleeding in some individuals and not in others, remains a mystery.

While prevalent, sexual problems in women not always associated with distress

The largest such study ever published finds that, while about 40 percent of women surveyed report having sexual problems, only 12 percent indicate that those issues are a source of significant personal distress. The report led by a Massachusetts General Hospital (MGH) physician appears in the November issue of Obstetrics & Gynecology.

"Sexual problems are common in women, but problems associated with personal distress, those which are truly bothersome and affect a woman's quality of life, are much less frequent." says Jan Shifren, MD, of the MGH Obstetrics and Gynecology Service, who led the study. "For a sexual concern to be considered a medical problem, it must be associated with distress, so it's important to assess this in both research studies and patient care."

Several studies and surveys of sexual problems in women have found problems with low desire, diminished arousal or difficulties with orgasm in approximately 40 percent of women, but few of those have asked about levels of distress associated with those problems. The current study surveyed 32,000 women aged 18 to over 100 from across the U.S. using a well-established survey of sexual function supplemented by a validated measure of a woman's distress related to her sex life – including feelings of anger, guilt, frustration, and worry.

Some level of sexual problem was reported in 43 percent of respondents – with 39 percent reporting low levels of desire, 26 percent problems with arousal and 21 percent difficulties with orgasm. But distress related to any of these problems was reported by only 12 percent of study participants. Although the prevalence of sexual problems was highest in women over 65, that group reported the lowest levels of distress, while distress was reported most frequently in women aged 45 to 64. The youngest group – those from 18 to 44 – had lower levels of both problems and distress. Women with depression were more than twice as likely to report distress over any type of sexual problem as those not suffering from depression.

"Although sexual problems were very common in women over age 65, these problems often weren't associated with distress," Shifren says. "Several factors could be behind the lower levels of distress in the oldest group. If their partners also have low desire, it may not be looked on as a problem, or additional health issues could be of greater concern.

"While distressing sexual problems are much less common in women than sexual problems overall, they still affect approximately one in eight adult women," she adds. "As part of a thorough health assessment, it's important that health care providers ask their female patients if they have sexual concerns and if those problems are associated with distress. Although this study did not examine treatments for sexual problems, effective options are available – including relationship counseling, treatment of associated medical conditions and sex therapy." Shifren is an associate professor of Obstetrics, Gynecology and Reproductive Biology at Harvard Medical School.

Co-authors of the study, which was funded by Boehringer Ingelheim International, are Brigitta Monz, MD, Boehringer Ingelheim; Patricia Russo, PhD, PRC Health Service Research Management and Consulting; Anthony Segreti, PhD, ASG, Inc., and Catherine Johannes, PhD, RTI Health Solutions.

Crucial hormonal pathway to bone building uncovered

Study authors find a novel mechanism for how parathyroid hormone signaling selectively stimulates bone formation

BIRMINGHAM, Ala. – Scientists have discovered a crucial step in hormone-triggered bone growth, a finding that could lead to new osteoporosis drugs and better bone-building therapies, according to a new study.

The research was performed at the University of Alabama at Birmingham (UAB). It showed that parathyroid hormone (PTH) given intermittently enhances the body's own bone-building action through a specific "co-receptor" on the surface of bone cells.

Previously, PTH was known to stimulate bone formation, but the exact mechanism was unknown, the UAB researchers said. The findings are published in the journal Genes and Development.

"Our study uncovers a novel mechanism for how parathyroid hormone signaling selectively stimulates bone formation," said Xu Cao, Ph.D., UAB professor of pathology and senior author on the study. "We have identified the protein co-receptor crucial to the whole process."

The UAB researchers focused on PTH signals in mice, testing to see which cell receptors actively recruited calcium from the blood. They uncovered the one co-receptor responsible for turning on bone building, said Mei Wan, Ph.D., UAB associate professor of molecular and cellular pathology and first author on the study.

Previously, the exact mechanism of PTH-signaled bone formation was shrouded by the joint production of osteoblasts and osteoclasts, said Jay McDonald, M.D., pathology professor and director of UAB's Center for Metabolic Bone Disease. Both types of cells are instrumental in regulating a healthy skeleton – osteoblasts by forming new bone, and osteoclasts by resorbing old and brittle bone.

Many osteoporosis drugs now target both osteoblasts and osteoclasts, which can lead to zero or minimal bone formation, McDonald said.

"The ideal would be to have one drug to shut down the osteoclasts and turn on the osteoblasts to effectively build bone. We don't have that yet, but this study shows us the path to get there," he said.

FORTEO® is the only approved PTH drug for use in postmenopausal women with osteoporosis, and in men with hormone-linked osteoporosis. Many experts hope the approved drug is part of the next wave of medicines that work to build back bone, reduce bone loss and minimize fracture risks in the aging.

The study was a partnership between UAB and researchers at Children's Hospital Boston, Harvard Medical School in Boston and Shihezi Medical College in Xinjiang, China. Funding came from the U.S. National Institutes of Health.

'Opt out' system could solve donor organ shortage, says researcher

A system of presumed consent for organ donation - where people have to opt out of donating their organs when they die - is the best way to tackle a growing waiting list for transplant. That is the opinion of Dr John Troyer, an expert in organ donation and the illegal trade of body parts, who has recently joined the University of Bath's Centre for Death & Society.

There are more than 7,500 patients in the UK currently on the waiting list for organ donations. Whilst nearly 16 million people in the UK, a quarter of the population, are registered as organ donors, bereaved families have the final say as to whether the organs of their loved ones are used in a transplant. This can lead to delays and can sometimes mean that the deceased person's organs are not used.

Dr John Troyer, who started a RCUK fellowship at the University in September, said: "In the UK we currently have an 'opt in' system of organ donation, where donors can register their consent for their organs to be used after their death. "I believe a better alternative to this would be an 'opt out' or so-called presumed consent system where organs are used unless the person has specified their wish otherwise. This would encourage people to talk to their loved ones about donating their organs when they die and could have a real impact on the huge waiting list."

Dr Troyer says there is currently an illegal global trade in most body parts, with teeth, nails and bones being sold on the black market to be used as pharmaceutical products and skin being used to treat burns victims.

Organs such as kidneys are also being sold by living donors for large sums of money, with organs from the third world sometimes being used for first world patients who are desperate for a life-saving operation.

Some experts are calling for the selling of organs to be regulated rather than outlawed, to try and increase organ donation and to ensure a fair price to donors and their families. However, Dr Troyer believes this would be a dangerous step to take.

He said: "The reasoning behind regulating the organ trade is that by increasing the domestic supply of organs, the trade on the black market could be reduced.

"Another suggestion is that, instead of cash, families of deceased potential donors could be offered incentives to allow organ donation such as health insurance, funeral expenses or a gift to a charity. "I believe that organ donation should remain altruistic – like blood donation – with the choice to opt out if preferred. This would make a big difference to the number of organs available and reduce the demand on the black market. It will also reduce the exploitation of poor people who sell their organs and endanger their health because they are desperate for money."

"Currently, the US has central organ database that matches available organs to patients on the waiting list. Whilst the UK has a national register of potential donors, there is no fast and easy way for doctors to check which organs are available."

He added: "Discussing death and dying is always going to be a taboo subject. The British are typically uncomfortable discussing death – the only time people seem to want to talk about it is around Halloween!

“My father was in funeral industry so I grew up around dead bodies, which probably explains why I was drawn to studying the field I do. “But having my background I almost feel it's my obligation to start the debate and get people thinking about the difficult issues surrounding death and dying.”

Earlier this year, ministers backed proposals to overhaul the donation system, although presumed consent was not amongst the proposals. However, over the next two weeks, the Welsh Assembly is holding a series of public debates to discuss the need to introduce a system of presumed consent.

Nations that launch: Where new technologies and products take-off

New study identifies world's most innovative nations; technologies take off fastest in Japan, Norway

BETHLEHEM, PA (October 31, 2008)—A new study published in the September/October issue of the journal Marketing Science reveals the world's most innovative countries, with Japan and the Nordic countries earning top spots and the United States finishing in sixth. The study, which evaluates 31 countries based on the time it takes for new products to takeoff, is among the most comprehensive research of its kind. Wherever applicable, researchers analyzed 16 different product categories over a time span of 50 years. The report was co-authored by Deepa Chandrasekaran, assistant professor of marketing at Lehigh University, and Gerard J. Tellis, director of the Center for Global Innovation and professor of marketing at the University of Southern California's Marshall School of Business.

"The changing dynamics of the global marketplace are redefining the concept of innovativeness," says Chandrasekaran. "More products are being introduced at a quick rate, and the ability of a nation to embrace those changes is a true indicator of how innovative it has become."

New products takeoff faster in Japan (5.4 years) than any other nation, closely followed by Norway and its north European neighbors of Sweden, Netherlands and Denmark. The United States (6.2 years), Switzerland and Austria ranked high, as well. The results also revealed that newly developed or developing countries, like South Korea and Venezuela, saw faster product takeoff times than more established Mediterranean nations with longer histories of industrialization.

The authors find that takeoff is driven by culture and wealth, in addition to product class, product vintage and prior takeoffs. More importantly, "time-to-takeoff" is shortening over time and converging across developed countries. "What we're learning is that culture plays a significant role in influencing how quickly a country is willing to embrace new products and technology, but it's not an exclusive indicator," says Tellis. "Differences in wealth are also contributing factors. Taken together, we can get a pretty clear snapshot of a nation's innovativeness and its ability to adapt to the changing environment."

Chandrasekaran and Tellis examined products split between two categories: those that were fun, used for information or entertainment, and those that were used only for work. Fun products included such technologies as cell phones, MP3 players, digital cameras, broadband and internet use. Work products—essentially household appliances—were microwave ovens, dishwashers, freezers, tumble dryers and washing machines.

The study indicated that takeoff was significantly shorter for fun products (seven years) than work products (12 years) across-the-board—a discrepancy that merits different product launch strategies, according to the co-authors. They argue that fun products like gadgets could be introduced simultaneously across nations (a "sprinkler" strategy), while the introduction of appliances and other work-related technologies should be staggered ("waterfall") for maximum impact.

Other findings of the study, titled, "The Global Takeoff of New Products: Culture, Wealth, or Vanishing Differences," include:

* Japan, Norway, Sweden, Netherlands, and Denmark rounded out the top five; India, Philippines, Indonesia, Vietnam and China were ranked lowest of the 31 surveyed countries.

* Japan and the U.S. are the best countries for managers who wish to launch new products in innovative and larger markets.

* The Nordic cluster, along with Switzerland and Austria, offer smaller but highly innovative test markets.

* South Korea has a relatively short time-to-takeoff of new products and leads the world in penetration of Broadband and 3G technologies.

Patience during stalled labor can avoid many c-sections, UCSF study shows

Pregnant women whose labor stalls while in the active phase of childbirth can reduce health risks to themselves and their infants by waiting out the delivery process for an extra two hours, according to a new study by researchers at the University of California, San Francisco.

By doing so, obstetricians could eliminate more than 130,000 cesarean deliveries – the more dangerous and expensive surgical approach – per year in the United States, the researchers conclude. The study examined the health outcomes of 1,014 pregnancies that involved active-phase arrest – two or more hours without cervical

dilation during active labor – and found that one-third of the women achieved a normal delivery without harm to themselves or their child, with the rest proceeding with a cesarean delivery.

The findings appear in the November, 2008 issue of "Obstetrics and Gynecology," the official journal of the American College of Obstetricians and Gynecologists (ACOG).

While ACOG already recommends waiting at least two hours with adequate contractions in the setting of no progress in active labor, it is routine practice in many clinical settings to proceed with a cesarean for "lack of progress" before those ACOG criteria have been met, according to Aaron Caughey, MD, PhD, an associate professor in the UCSF Department of Obstetrics, Gynecology and Reproductive Sciences, Division of Maternal-Fetal Medicine, and senior author on the paper.

"One third of all first-time cesareans are performed due to active-phase arrest during labor, which contributes to approximately 400,000 surgical births per year," said Caughey, who is affiliated with the UCSF National Center of Excellence in Women's Health. "In our study, we found that just by being patient, one third of those women could have avoided the more dangerous and costly surgical approach."

The cesarean delivery rate reached an all-time high in 2006 of 31.1 percent of all deliveries, according to the UCSF study. Arrest in the active phase of labor has been previously shown to raise the risk of cesarean delivery between four- and six-fold.

"Cesarean delivery is associated with significantly increased risk of maternal hemorrhage, requiring a blood transfusion, and postpartum infection," Caughey said. "After a cesarean, women also have a higher risk in future pregnancies of experiencing abnormal placental location, surgical complications, and uterine rupture."

The ten-year study identified all women who experienced what is known as active-phase arrest during their delivery at UCSF from 1991 to 2001. The study only included women with live, singleton deliveries who were delivered full-term.

The researchers examined maternal outcomes such as maternal infection, endomyometritis, postpartum hemorrhage and the need for blood transfusions. It also examined the infant's Apgar score, rates of infection and frequency of admission to the neonatal intensive care unit, among other health indicators.

The study found an increased risk of maternal health complications in the group that underwent cesarean deliveries, including postpartum hemorrhage, severe postpartum hemorrhage and infections such as chorioamnionitis and endomyometritis, but found no significant difference in the health outcomes of the infants.

It concluded that efforts to continue with a normal delivery can reduce the maternal risks associated with cesarean delivery, without a significant difference in the health risk to the infant.

"Given the extensive data on the risk of cesarean deliveries, both during the procedure and for later births, prevention of the first cesarean delivery should be given high priority," Caughey said.

Co-authors on the paper were Dana E.M. Henry, MD; Yvonne W. Cheng, MD, MPH; Brian L. Shaffer, MD; Anjali J. Kaimal, MD; and Katherine Bianco, MD, all from the UCSF Department of Obstetrics, Gynecology and Reproductive Sciences, Division of Maternal-Fetal Medicine.

Funding for these studies came from research funds from the National Institutes of Health for Henry and Kaimal. Caughey is supported by a National Institute of Child Health and Human Development grant and the Robert Wood Johnson Foundation. The authors have no potential conflicts of interest to disclose.

Japanese quake was huge trampoline

* 11:31 31 October 2008
* NewScientist.com news service
*** Emma Young**

Earthquakes not only shake the ground from side to side but can bounce it up and down as if it was jumping on a trampoline.

It's no surprise to hear that ground moves up and down during a quake, but during the magnitude 6.9 Iwate-Miyagi earthquake that struck Japan on 14 June, the ground accelerated upwards at nearly 4 g - an unprecedented level.

This acceleration was twice that of the horizontal movements, which normally account for most of the ground shaking in a quake. Evidence of the violent jolt was found in data from the quake by a team led by Shin Aoi at the National Research Institute for Earth Science and Disaster Prevention in Tsukuba, Japan.

The team also found that the ground was shoved upwards much more powerfully than it fell back down. This cannot be explained by existing ground motion models. So they suggest that during the upward motion, the compressed soil behaved elastically, but on the way down, the particles separated and fell back relatively slowly. An analogy would be a person bouncing on a trampoline, they say, where the upward force of the trampoline is larger than the downward force of gravity.

Not a one-off

The team also analysed data from about 6800 other Japanese earthquakes and found another two with unusually strong upward movements. "We think this occurs only under conditions of very large shaking," says Aoi. "But we can't judge whether it is common or not under these conditions because we don't have enough records."

The team doesn't know what ground conditions are required to produce the phenomenon, but in principle it could happen in other countries as well as Japan, says Aoi. A full explanation would help with earthquake hazard assessment studies, he adds.

Most quake-proof structures are designed to withstand only horizontal shaking, but strong vertical shaking could also damage buildings, says Daniel O'Connell, a geophysicist at consulting firm William Lettis & Associates in Golden, Colorado, who wrote a commentary on the research. However, foundations for buildings compact soil, which might prevent the "trampoline effect". A larger-scale deployment of motion sensors at the foundation level of buildings is needed to find out, O'Connell says.

Journal references: Science, (DOI: 10.1126/science.1163113; 10.1126/science.1166149)

Is cannabis being doped with Viagra?

THAT illegal drugs are not always pure is no surprise, but is cannabis being laced with a Viagra-like compound?

Dries de Kaste and colleagues at the National Institute of Public Health and the Environment in Bilthoven, the Netherlands, analysed a liquid that police found being sold on the streets of Utrecht as a "marijuana adulterant".

They found compounds called homosildenafil (HS) and thiohomosildenafil (THS) in it, which belong to the same class of compounds as sildenafil, sold as Viagra. All three inhibit the breakdown of an enzyme that dilates blood vessels in the penis, increasing blood flow.

De Kaste does not know why HS and THS are being added to cannabis, but speculates that it could be to enhance the uptake of its psychoactive constituents, or to exploit a perception that marijuana use affects libido.

HS and THS were not destroyed when they were "smoked" using a laboratory simulator (Forensic Science International, DOI: 10.1016/j.forsciint.2008.09.002). The health effects of inhaling such "erectogenics" - and the compounds they produce when burned - are unknown.

Invention: Treatment for Fragile X

* 14:27 31 October 2008
* NewScientist.com news service
*** Justin Mullins**

Fragile X syndrome, the most commonly inherited form of learning disability, is caused by mutation of a gene called FMRl on the X chromosome. This mutation prevents the brain from developing properly, leading to a form of mental retardation that has long been considered untreatable.

That may be about to change, however. Julie Lauterborn and colleagues at the University of California, Irvine, say there may be a way to improve and even restore cognitive function in people suffering from fragile X as well as in people with other cognitive impairments.

Their idea is based on the surprising discovery that a naturally occurring protein called brain-derived neurotrophic factor, which is involved in nerve growth, may improve and even restore cognitive function in people whose mental abilities are impaired.

The team says it has had promising results after injecting the protein into the brains of mice with fragile X syndrome. But no tests have been done in humans.

In theory, the treatment needn't be limited to people with fragile X. The team says it could be used on individuals with other conditions that lead to learning disabilities, such as Down's syndrome and autism. However, they caution, much more work is needed before the full implications for humans can be understood.

Read the full mental retardation treatment patent application here.

Dark matter may shine with invisible 'dark light'

* 17:31 31 October 2008
* NewScientist.com news service
*** Stephen Battersby**

Mysterious dark matter could be shining with its own private kind of light. This "dark radiation" would be invisible to us, but could still have visible effects. Astronomers usually assume that dark matter particles barely interact with each other.

Lotty Ackerman and colleagues at Caltech in Pasadena decided to test this assumption by supposing there is a force between dark matter particles that behaves in the same way as the electromagnetic force. That would imply a new form of radiation that is only accessible to dark matter.

Their calculations showed that it could have as much as 1% of the strength of the electromagnetic force and not conflict with any observations. If the force is close to this strength, its effects might be detectable, as it should affect how dark matter clumps together.

"It might even help with some niggling problems we have now," says team member Sean Carroll. For example, it might explain why there are fewer dwarf galaxies than models predict.

Carroll even speculates that more complex dark matter might exist, forming dark matter atoms with their own chemistry – and maybe biology.

ENT doctors release national guideline on treatment for common cause of dizziness

Evidenced-based diagnosis and clinical treatment for benign paroxysmal positional vertigo

Alexandria, VA - The American Academy of Otolaryngology – Head and Neck Surgery Foundation (AAO-HNSF) will issue a comprehensive clinical guideline to help healthcare practitioners identify and treat patients with benign paroxysmal positional vertigo (BPPV), one of the most common underlying conditions that cause dizziness. The guideline emphasizes evidence-based recommendations on managing BPPV, the most common vestibular (inner ear) disorder in adults.

BPPV is a disorder that causes feelings of vertigo, dizziness, and nausea. Episodes of BPPV can be brought on by abrupt changes in movement, like standing up or turning the head suddenly. The condition usually begins to affect people after the age of 50, but it can affect younger patients.

"Approximately 5.6 million medical appointments per year in the United States can be attributed to complaints of dizziness," said Neil Bhattacharyya, MD, chair of the multidisciplinary BPPV Guideline Panel. "We know now that anywhere from 17 to 42 percent of these patients will ultimately receive a diagnosis of BPPV. Unfortunately, proper diagnosis and treatment for those suffering is often delayed due to a lack of standardized diagnostic steps and relative unawareness of effective treatment options."

The primary purposes of the new AAO-HNSF guideline, for patients 18 years and older, are to improve quality of care and outcomes for BPPV by improving the accurate and efficient diagnosis of the condition, reducing the inappropriate use of suppressant medications, decreasing the inappropriate use of ancillary tests such as radiographic imaging and vestibular testing, and to promote the use of effective repositioning maneuvers for treatment.

Expenses relating to the diagnosis and treatment of BPPV cost the U.S. healthcare system approximately $2 billion per year. Additionally, 86 percent of patients suffer some interrupted daily activities and lost days at work because of BPPV. Fortunately, BPPV can be readily diagnosed by clinicians in an outpatient setting most of the time without complicated testing. Once a proper diagnosis has been made, simple, effective treatment options are available to relieve symptoms quickly.

Some of the key recommendations of the guideline include:

* A strong recommendation for clinicians to diagnose posterior semicircular canal BPPV with an office-based diagnostic test (the Dix-Hallpike maneuver, detailed within the guideline).

* A recommendation for clinicians to also test patients for a second type of BPPV affecting the lateral semicircular canal when initial testing is not conclusive (using the supine roll test).

* Clinicians should differentiate BPPV from other causes of imbalance, dizziness, and vertigo.

* Clinicians should question patients with BPPV for factors that modify management including impaired mobility or balance, CNS disorders, a lack of home support, and increased risk for falling. These recommendations will help prevent some of the dangerous morbidities from BPPV.

* Clinicians should not obtain radiographic imaging or vestibular testing in a patient diagnosed with BPPV, unless the diagnosis is uncertain or there are additional symptoms or signs unrelated to BPPV that warrant testing.

* Clinicians should not routinely treat BPPV with vestibular suppressant medications such as antihistamines or benzodiazepines.

* For patients who are initial treatment failures, clinicians should evaluate them for persistent BPPV or underlying peripheral vestibular or CNS disorders.

* Clinicians should counsel patients regarding the impact of BPPV on their safety, the potential for disease recurrence, and the importance of follow-up.

The guideline was created by a multidisciplinary panel of clinicians representing the fields of otolaryngology, audiology, emergency medicine, physical medicine and rehabilitation, geriatrics, physical therapy, family physicians, neurology, and chiropractics.

"Clinical Practice Guideline on Benign Paroxysmal Positional Vertigo" will appear as a supplement to the November 2008 issue of Otolaryngology – Head and Neck Surgery, the peer-reviewed scientific journal of the American Academy of Otolaryngology – Head and Neck Surgery Foundation (AAO-HNSF) and the American Academy of Otolaryngic Allergy.

Mayo Clinic's new imaging technology accurately identifies a broad spectrum of liver disease

ROCHESTER, Minn. -- A new study shows that an imaging technology developed by Mayo Clinic researchers can identify liver fibrosis with high accuracy and help eliminate the need for liver biopsies. Liver fibrosis is a common condition that can lead to incurable cirrhosis if not treated in time.

The technology, called magnetic resonance elastography (MRE), produces color-coded images known as elastograms that indicate how internal organs, muscles and tissues would feel to the touch. Red is the stiffest; purple, the softest. Other imaging techniques do not provide this information.

"Knowing the liver's elasticity or stiffness is invaluable in diagnosing liver disease," says Jayant Talwalkar, M.D., M.P.H., a Mayo Clinic hepatologist and co-investigator on the study. "A healthy liver is very soft, while a liver with early disease begins to stiffen. A liver with cirrhosis, advanced liver disease, can be rock hard."

The study, which included 113 patients, will be presented Nov. 3 at The Liver Meeting, an annual gathering of the American Association for the Study of Liver Disease, in San Francisco. Study participants had undergone liver biopsy in the year preceding the study and had a wide variety of liver diseases, including nonalcoholic and alcoholic fatty liver disease, hepatitis C, hepatitis B, autoimmune hepatitis, primary biliary cirrhosis and primary sclerosing cholangitis. Patients ranged in age from 19 to 78, and their body weight ranged from normal to severely obese.

"Results showed that elastography was highly accurate in detecting moderate-to-severe hepatic fibrosis even with the variety in age, types of liver disease and body size," says Dr. Talwalkar. Among the study's findings:

* The detection of cirrhosis by MRE when compared to liver biopsy results was 88 percent accurate.

* Patients with nonalcoholic fatty liver disease and no significant inflammation or fibrosis were identified with 97 percent accuracy.

"Using MRE, we can confidently avoid liver biopsies for patients with no evidence of advanced fibrosis, as well as for patients with cirrhosis," says Dr. Talwalkar.

Liver biopsies, conducted by extracting tissue samples with a needle, can underestimate the degree of hepatic fibrosis about 20 to 30 percent of the time because of the patchy distribution of fibrosis that occurs in the liver. Another drawback is that since liver biopsy is invasive, patients may be reluctant to have a biopsy performed and sometimes delay the procedure when liver disease is first suspected, says Dr. Talwalkar.

"Our goal in hepatology is to be able to diagnose liver disease early so that novel as well as established therapies can be provided to our patients," says Dr. Talwalkar. Treatment and lifestyle changes can help stop the progression of hepatic fibrosis to liver cirrhosis and liver failure, which would eventually require a liver transplant.

The incidence and prevalence of chronic liver disease is increasing in the United States. Nonalcoholic fatty liver disease has become the most common liver disease and is linked to the growing numbers of patients with obesity and diabetes. The number of patients seeking medical care for hepatitis C is also increasing. This disease, spread by coming into contact with blood contaminated by the virus, slowly damages the liver over decades.

MRE research began at Mayo Clinic about 10 years ago. The technology measures low-frequency acoustic waves transmitted into the abdomen. The wave motions measured are miniscule, 0.01 of the width of a human hair. The noninvasive procedure takes seconds to conduct. Mayo Clinic is already using MRE to diagnose patients with liver conditions. Research is under way to study how MRE might aid in the diagnosis of Alzheimer's disease and some cancers.

VIDEO ALERT: Additional audio and video resources, including excerpts from an interview with Dr. Talwalkar describing the research, are available on the Mayo Clinic News Blog (http://newsblog.mayoclinic.org/2008/10/27/new-mre-imaging-for-liver-disease/), with password: j2a4y7

Also involved in the study were Mayo Clinic researchers John Gross, M.D.; Meng Yin, Ph.D.; James Glockner, M.D.; Naoki Takahashi, M.D.; Michael Charlton, M.D.; Patrick Kamath, M.D.; and Richard Ehman, M.D.

Pakistan introduces vaccine to prevent top child killer

5 million children each year to receive their first shot of pentavalent vaccine

This month, Pakistan is introducing a new combination vaccine that will protect its children against the bacterium Haemophilus influenzae type b (Hib) and four other common childhood diseases.

Hib, a bacterium that can cause deadly meningitis and pneumonia, is one of the top killers of young children in the developing world. Even with treatment, an estimated 23,000 children die of Hib disease in Pakistan every year. Survivors are often permanently disabled—paralyzed, deafened or brain damaged. Globally, over 1,000 children under 5 years of age die from Hib-related diseases each day.

"This is excellent news for generations of Pakistani children and their families. Pakistan is the largest country to date of all developing countries to introduce Hib vaccine into their national immunization program," said Dr. Rana Hajjeh, Director of the Hib Initiative. "The government's decision to introduce Hib-containing pentavalent vaccine will protect millions of infants against some of the most dangerous childhood infections, including one of the major causes of pneumonia and meningitis."

Hib is estimated to cause about 20 percent of life-threatening pneumonia cases, and it is the most common cause of life-threatening meningitis in children under 5 years of age both worldwide and in Pakistan. According to UNICEF and WHO, two million children die from pneumonia every year, making it the top child killer worldwide. Ninety-two thousand of child pneumonia deaths occur in Pakistan alone.

Although health indicators are steadily improving in Pakistan, the nation is still far from achieving its child health-related Millennium Development Goal (MDG) targets by 2015. 1 in 10 children still do not survive their fifth birthday. Most child deaths are due to pneumonia, diarrhea, and other vaccine-preventable diseases. "The introduction of the pentavalent vaccine represents a major stride toward enabling Pakistan's 160 million inhabitants to make further progress towards the MDGs," said Nina Schwalbe, Deputy Executive Secretary, Director of Policy of the GAVI Alliance.

"The arrival of pentavalent will be a new chapter in the history of Pakistan," said Dr. Hussain Bux Memon, Pakistan's programme manager of the Expanded Programme on Immunisation (EPI). "This vaccine will help us to save the lives of many children."

The Hib vaccine will be administered through a one-shot immunization called the pentavalent vaccine that also protects against four other deadly diseases: diphtheria, tetanus, pertussis, and hepatitis B. The Pakistan campaign follows a highly successful movement in other parts of the world to combat Hib. "The GAVI-supported vaccine has virtually eliminated Hib meningitis as a public health problem in Uganda. Other African countries like the Gambia, Kenya and Malawi are also reported to have seen tremendous decline" said Ms. Schwalbe. "We are hoping to see similar successes in Pakistan and in other countries where the vaccine is being introduced."

In Pakistan, it promises to save the nation's most vulnerable: the children of its poorest families. The government is providing the vaccine free of charge at rural health centers, basic health units, and state-run hospitals, as part of its national immunization program. Pakistan will be the first low-income country in South Asia to introduce the Hib vaccine.

Hib vaccine is a safe, effective and highly cost-effective intervention used for more than 18 years in developed and many developing countries, where it has virtually eliminated Hib disease. It is being purchased with funding from the GAVI Alliance. Since 2000, GAVI has provided funding support and supplies for Hib vaccine under the pentavalent form to the poorest countries in the world. The organization committed US $465 million for the introduction of the vaccine.