

Major river basins have enough water to sustainably double food production in the coming decades

Extensive study of water resources in Asia, Africa and Latin America views efficiency, not scarcity, as core concern; Africa farms using only 4 percent of available water

RECIFE, BRAZIL – While water-related conflicts and shortages abound throughout the rapidly changing societies of Africa, Asia and Latin America, there is clearly sufficient water to sustain food, energy, industrial and environmental needs during the 21st century, according to two special issues of the peer-reviewed journal, *Water International* (Volume 35, Issue 5 and Volume 36, Issue 1), released today at the XIV World Water Congress.

The report from the Challenge Program on Water and Food (CPWF) of the CGIAR finds that the "sleeping giant" of water challenges is not scarcity, but the inefficient use and inequitable distribution of the massive amounts of water that flow through the breadbaskets of key river basins such as the Nile, Ganges, Andes, Yellow, Niger and Volta.

"Water scarcity is not affecting our ability to grow enough food today," said Alain Vidal, director of the CPWF. "Yes, there is scarcity in certain areas, but our findings show that the problem overall is a failure to make efficient and fair use of the water available in these river basins. This is ultimately a political challenge, not a resource concern." "Huge volumes of rainwater are lost or never used," he added, "particularly in the rain-fed regions of sub-Saharan Africa. With modest improvements, we can generate two to three times more food than we are producing today.

While Africa has the biggest potential to increase food production, researchers identified large areas of arable land in Asia and Latin America where production is at least 10 percent below its potential. For example, in the Indus and Ganges, researchers found 23 percent of rice systems are producing about half of what they could sustainably yield.

The analysis – which involved five years of research by scientists in 30 countries around the world – is the most comprehensive effort to date to assess how, over vast regions, human societies are coping with the growing need for water to nurture crops and pastures, generate electricity, quench the thirst of rapidly growing urban centers, and sustain our environment. The findings also present a picture of the increasingly political role of water management in addressing these competing needs, especially in dealing with the most pressing problem facing humanity today: doubling food production in the developing world to feed a surging population, which, globally, is expected to expand from seven to 9.5 billion people by 2050.

The 10 river basins that were studied include: the Andes and São Francisco in South America; the Limpopo, Niger, Nile and Volta basins in Africa; and the Ganges, Indus, Karkheh, Mekong, and Yellow in Asia. The basins – distinct and gargantuan geographic areas defined by water flows from high-ground to streams that feed major river systems – cover 13.5 million square kilometers and are home to some 1.5 billion people, 470 million of whom are amongst the world's poorest.

According to Vidal, the 10 basins were selected for study because they embody the full measure of water-related challenges in the developing world. The research examines the role of policy and governance in managing water resources in ways that reduce poverty and improve living standards for the greatest number of people

"The most surprising finding is that despite all of the pressures facing our basins today, there are relatively straightforward opportunities to satisfy our development needs and alleviate poverty for millions of people without exhausting our most precious natural resource," said Dr. Simon Cook, of the International Center for Tropical Agriculture (CIAT) and Leader of the CPWF's Basin Focal Research Project (BFRP).

For example, Cook and his colleagues found that if donors and government ministries put more emphasis on supporting rain-fed agriculture, food production can increase substantially and rapidly. In Africa, it was found that the vast majority of cropland is rainfed and researchers found that only about four percent of available water is captured for crops and livestock. "With a major push to intensify rainfed agriculture, we could feed the world without increasing the strain on river basins systems," said Cook.

The authors also note that boosting food production in the basins studied requires looking beyond crops to consider more efficient uses of water to improve livestock operations and fisheries. Water policies often ignore the role livestock and fish play in local livelihoods and diets. For example, the researchers found that in the Niger basin, freshwater fisheries support 900,000 people while 40 million people in the Mekong depend on fisheries for at least part of the year. In the Nile, researchers note that almost half of the water in the basin flows through livestock systems.

"The basin perspective is critical in order to assess the upstream and downstream impacts of water allocation policies, and to determine opportunities for optimizing the sum of benefits across many residents," said Dennis Wichelns, Deputy Director General at the International Water Management Institute (IWMI), which was a major partner in the research.

The researchers contrast the poor use of water resources within river basins observed in many areas – which they refer to as "dead spots" for agriculture development – to "bright spots" of water efficiency. They said bright spots can be found in the large areas of the Ganges, Nile and Yellow River basins, where farmers and governments have responded to development challenges by vastly improving the amount of food produced from available water. They also single out "hot spots" – which can be found in the in the Indus, Yellow, Nile and Limpopo river basins – where there is mounting concern and conflict over sharing water resources and reaching consensus on development approaches.

Confronting the "Complete Fragmentation" of Water Management

Cook and his colleagues caution that while globally there is enough water to sustain human development and environmental needs, water-related conflicts will continue if particular issues like food security and energy production are considered in isolation from one another. Cook observed that in most areas there is a "complete fragmentation of how river basins are managed amongst different actors and even countries where the water needs of different sectors – agriculture, industry, environment and mining – are considered separately rather than as interrelated and interdependent."

"In many cases, we need a complete rethink of how government ministries take advantage of the range of benefits coming from river basins, rather than focusing on one sector such as hydropower, irrigation or industry," the authors stated.

The CGIAR Challenge Program on Water and Food (CPWF) was launched in 2002 as a reform initiative of the CGIAR. The CPWF aims to increase the resilience of social and ecological systems through better water management for food production (crops, fisheries and livestock). The CPWF does this through an innovative research and development approach that brings together a broad range of scientists, development specialists, policymakers and communities to address the challenges of food security, poverty and water scarcity. The CPWF is currently working in six river basins globally: Andes, Ganges, Limpopo, Mekong, Nile and Volta (www.waterandfood.org).

Editor's Note: For research documents, background materials, photos and videos, please visit <http://sn.im/basins>.

http://www.eurekalert.org/pub_releases/2011-09/uot-pob092611.php

Prevention of bedsores in long-term care homes cost-effective, study shows

For all long-term care residents, pressure reduction foam mattresses were cost-effective 82% of the time compared to standard mattresses, with average savings of \$115 per resident, the researchers showed.

Foam cleansers for incontinence care would be cost-effective 94% of the time compared to soap and water, saving an average of \$179 per resident. The clinical benefits of foam cleansers for bedsores, or "pressure ulcers," however, require confirmation through more research, the team noted.

"These results provide specific evidence to support practice guidelines, which recommend reducing risk factors and improving skin health to prevent pressure ulcers," said Ba' Pham, lead author on the study and a senior research associate with the Toronto Health Economics and Technology Assessment (THETA) Collaborative. "We encourage all providers of long-term care to consider these changes," said Pham, who is completing his doctorate at U of T's Department of Health Policy, Management and Evaluation.

The Archives of Internal Medicine published the study in its current online edition.

In Ontario, there are approximately 72,000 long-term care residents in 89 facilities. As part of their study, the researchers conducted a phone survey with directors of care at 26 of those facilities, and found that only half their beds have pressure reduction foam mattresses. As well, roughly half of incontinence-care cleanings were performed with soap and water rather than foam cleansers.

This slow uptake of quality improvements in pressure ulcer care in Ontario may be connected to the condition's low profile relative to other diseases. "It's one of those diseases that's kind of silent," said Prof. Murray Krahn, principal investigator on the study who is a Professor in the Department of Medicine and the Faculty of Pharmacy at U of T, and Director of THETA.

"Unlike HIV or breast cancer, there are no advocacy groups marching for pressure ulcers. The patients are seniors with co-morbidities and low mobility in long-term care," said Krahn.

Compounding the condition's visibility problem is that it doesn't belong to a particular clinical group. Patients are cared for by nurses, surgeons, infectious disease specialists, general practitioners and internists, so no one group is well-positioned to champion the cause effectively.

Yet, the disease burden for pressure ulcers is huge. From 5% to 10% of all residents in long-term care facilities have pressure ulcers, and a study published this year in the journal Health Affairs, cited by Pham and

Krahn, pegged their treatment costs in all health-care settings—including hospitals and home care—at \$3.3 billion U.S. annually. "We've estimated, crudely, that the economic burden for pressure ulcers is similar to diabetes. It's absolutely enormous," said Krahn.

The researchers also evaluated two other strategies for dealing with pressure ulcers: emollients to reduce dry skin, and oral nutritional supplements. They found some evidence that emollients were moderately cost-effective, and that supplements were not cost-effective, although both have been associated with clinical benefits.

Krahn attributes the range and strength of the study's results to the policy-oriented research model for pressure ulcers developed by his colleagues. "It's the work of about 15 people over two years looking at Ontario-specific data, and it's by far the best model in the world in this area," said Krahn.

That model, said Krahn, has produced a very clear message: "There's something relatively easy that can be done about pressure ulcers that will have a relatively large impact."

In addition to Ba' Pham and Prof. Krahn, the following authors contributed to the study: Anita Stern (THETA); Wendong Chen (THETA); Beate Sander (THETA, U of T's Dept. of Health Policy, Management and Evaluation); Ava John-Baptiste (THETA, HPME, University Health Network); Hla-Hla Thein (THETA, HPME, Dalla Lana School of Public Health); Tara Gomes (Ontario Ministry of Health and Long-Term Care); Walter Wodchis (THETA, HPME, Institute for Clinical Evaluative Sciences, Toronto Rehabilitation Institute); Ahmed Bayoumi (THETA, HPME, Li Ka Shing Knowledge Institute); Márcio Machado (THETA); Steven Carcone (THETA).

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http://www.eurekalert.org/pub_releases/2011-09/ctco-cts092611.php

Cell Transplantation study shows bone growth from implanted tooth and dental pulp stem cells

Researchers in Japan have completed a study showing that stem cells derived from deciduous canine teeth and dental pulp can be grafted and produce bone regeneration between parents and offspring.

Tampa, Fla. – "Bone defects can occur for a number of reasons, and autogenous bone grafting - using the patient's own bone - has been a standard approach to treatment," said study corresponding author Dr. Yoichi Yamada of the Center for Genetic and Regenerative Medicine at the Nagoya University School of Medicine. "However, considering severe invasiveness in self-donor bone sites, and the limited supply of autogenous bone, alternative donor sources are needed."

The researchers note that previous studies have shown that oral and maxillofacial dental tissues contain a variety of stem cells, such as dental pulp stem cells and stem cells from deciduous teeth. Stem cells, they note, can be easily extracted from deciduous teeth, which are routinely lost in childhood and generally discarded. Their results are published in the current issue of *Cell Transplantation* (20:7), now freely available on-line.

"Stem cells from human exfoliated deciduous teeth were identified as a novel population of stem cells, capable of differentiating into various cell types, such as osteoblasts, odontoblasts, adipocytes and neural cells," explained Dr. Yamada.

Their study extracted deciduous teeth from canine puppies and grafted them onto parent canine mandibles as an allograft. After four weeks, bone defects were prepared on both sides of the host mandible. The newly formed bone was evaluated at two, four and eight weeks. When compared to controls, the study group demonstrated well-formed mature bone and neovascularization.

The researchers reported that stem cells derived from dental pulp "display increased immunosuppressive activity when compared to bone marrow mesenchymal cells" and will likely have "immunosuppressive activity with potential clinical applications in allogenic in vivo stem cell transplantation, particularly for calcified tissue reconstruction."

Their pre-clinical study could pave the way for stem cell therapy in orthopedics and oral maxillofacial reconstruction, concluded Dr. Yamada.

"This study highlights the promise of obtaining stem cells from unusual sources, such as teeth, and their potential benefit in familial treatments for bone reconstruction" said Dr. Julio Voltarelli, professor of Clinical Medicine and Clinical Immunology at the University of Sao Paulo, Brazil, and section editor for *Cell Transplantation*. "Due to their potential to also become other cell types such as neural cells, it will be interesting to see what future studies reveal about the possible uses of these cells."

Citation: Yamada, Y.; Ito, K.; Nakamura, S.; Ueda, M.; Nagasaka, T. Promising cell-based therapy for bone regeneration using stem cells from deciduous teeth, dental pulp, and bone marrow. *Cell Transplant.* 20(7):1003-1013; 2011.

Peruvian Cacao Collection Trip Yields Treasures

A stand of very old trees, in an unexpected location, has yielded a coveted type of cacao tree.

Chocolates are always in demand—from Valentine’s Day and beyond. In the chocolate world, the fastest growing segment of the industry is fine-flavor, high-end chocolates. Until now, the source of these specialized confections has been largely limited to small regions of Venezuela and Ecuador.

A stand of very old trees, in an unexpected location, has yielded a coveted type of cacao tree. Usually, cacao trees are found along rivers, but these gems were found at a higher altitude than normal, and in Peru instead of Ecuador or Venezuela. Collection expeditions in 2008 and 2009 through the Amazon Basin of Peru uncovered the exceptional find, along with other distinctive new populations of cacao.

Agricultural Research Service researchers at the Sustainable Perennial Crops Laboratory (SPCL) and the Systematic Mycology and Microbiology Laboratory (SMML) in Beltsville, Maryland, and Peruvian collaborators came away with hundreds of new cacao tree samples from these trips. One of these, discovered by additional collaborators from Marañón Chocolate, was Pure Nacional—an old, very rare, and highly coveted variety that has garnered a great deal of interest from makers of fine-flavor chocolates.

SPCL research leader Lyndel Meinhardt, SPCL geneticist Dapeng Zhang, and SMML mycologist Gary Samuels (now retired) collaborated with the Instituto de Cultivos Tropicales (ICT), a research center in San Martín, Peru, to identify the new varieties of cacao. The researchers are studying 342 cacao specimens collected from 12 watersheds and categorizing the DNA of the specimens. The group has identified new cacao types with unique flavors that are distinctly Peruvian, which may one day be marketed in the same way as wine—by geographical provenance.

Start from the Beginning

The cacao tree, *Theobroma cacao*, produces beans that provide the raw material to make chocolate. The tree is cultivated in some tropical countries with the right environmental conditions. The origin of cacao is the Amazon region of South America. Like many tropical tree crops, seeds of this plant lose their viability quickly after being harvested. For this reason, varieties or types of cacao must be maintained in living germplasm banks.

“The majority of the material in cacao germplasm banks was collected prior to the 1940s. There are more than 5,000 different varieties of cacao currently in collections around the world,” says Meinhardt. “While this sounds like a large amount, most are breeding lines derived from a small number of types, so it actually represents a small fraction of the genetic diversity that still exists in the wild, especially in the center of origin of this species.” To address this limitation, expeditions were begun in 2008 to explore the upper Amazon River area in Peru. The purpose of these trips was to find and collect wild cacao trees and attempt to establish them in a living germplasm bank in Tarapoto, Peru, Meinhardt says. These trips were jointly funded by the U.S. Department of Agriculture and INCARGO, Peru’s Ministry of Agriculture.

“In 2008, 7 river systems were explored, and 190 cacao trees were sampled. Of the initial 190 trees collected, 128 were successfully reestablished in the germplasm bank. In 2009, 5 more river systems were explored in 2 expeditions and a total of 152 trees were collected and reestablished in the germplasm bank in Tarapoto,” explains Meinhardt. “From the 12 river systems explored, we have identified 3 completely new populations of cacao that were not previously known to science.” These expeditions collectively represent one of the largest efforts ever conducted to search for wild cacao.

New Flavors and Disease Resistance?

These new populations could be sources of diseases resistance or could have potential new flavor traits. The fine-flavor chocolate industry is keenly interested in obtaining new and unique flavor sources.

“Our results combined with the needs of the fine-flavor chocolate industry have led to new collaborations that will look at the primary gene pool of cacao. Together with industry we will attempt to gather information on the genetic diversity of wild cacao from all of the countries in South America within the center of diversity,” says Meinhardt.

Niche chocolates from South America are not new. The varieties Arriba, from Ecuador, and Porcelana, from Venezuela, are two of the most famous. Arriba has a strong, complex taste that stays on your tongue for a long time, while Porcelana features a unique light fruit flavor. ARS and ICT are helping Peru create its own niche in the chocolate industry by working with San Martín’s Oro Verde cooperative and Marañón Chocolate. Peru’s tropical conditions—60 percent of the country is covered in tropical forest—make it ideal for producing exceptional chocolates.

Witches’ Broom Watch

During the 2008 collection trip to Peru, Meinhardt also recorded the incidence of the devastating witches’ broom disease (WBD) in wild cacao trees in the upper Amazon region. The scientists studied areas along the

Aypena, Charupa, Nucuray, Pastaza, Ungumayo, Ungurahui, and Urituyacu Rivers and determined the overall severity of WBD infection based on the percentage of symptoms on flower cushions, flushes (new stem growth), and fruits.

A team of scientists, including ARS's Zhang, Meinhardt, and Samuels and ICT plant pathologist Enrique Arevalo, found that 14.7 percent of flower cushions and 13.7 percent of trunks were infected, and 9.1 percent of the trees along the Aypena River were infected. The other river areas had similar results. The incidence of WBD observed during the survey suggests that there is a high level of WBD resistance in these wild Peruvian cacao populations. The scientists are now studying the samples to determine which are best suited for both unique flavor and WBD resistance. WBD can cause yield losses of 75 percent in susceptible varieties.

Friendly Fungi

In addition to collecting cacao germplasm, the team isolated other fungi from disease-free leaves and trunks of the wild cacao trees. This large collection of "endophytic" fungi—fungi that occur in disease-free tissues of all plants—may provide protection against diseases such as WBD either by stimulating the immune system of the plants or through direct parasitism or antibiotic effects against pathogens. Samuels found that several fungal species previously unknown to science were found in the cacao tissues. The potential for biological control using these endophytic fungi is being evaluated at Beltsville by SPCL scientists Bryan Bailey and Ron Collins.

The genome for WBD has been sequenced, and it may hold clues for developing control measures to reduce its impact in the future. This was reported in the journal *Biomed Central Genomics* in 2008.

While scientists have the genomes of some cacao populations in hand and are working diligently to improve production and disease resistance, improvements can sometimes lead to unintended consequences, like a change in flavor, according to Meinhardt. "There are a lot of great chocolate sources; the task is to find them and preserve them before they are lost," says Meinhardt. "Mother Nature has done a great job of creating these exceptional cacao trees."—By Sharon Durham, Agricultural Research Service Information Staff.

This research is part of Plant Genetic Resources, Genomics, and Genetic Improvement (#301), Plant Diseases (#303), and Crop Protection and Quarantine (#304), three ARS national programs described at www.nps.ars.usda.gov.

http://www.eurekalert.org/pub_releases/2011-09/jaaj-hfi092311.php

Hip fracture is associated with increased short-term death rates for some older women ***Hip fracture is associated with an increase in short-term mortality (death within one year) for women ages 65 to 79 years and healthy women ages 80 years and older***

Hip fracture is associated with an increase in short-term mortality (death within one year) for women ages 65 to 79 years and healthy women ages 80 years and older, although the risk returns to previous levels after one year for women ages 70 years and older, according to a report published online first by *Archives of Internal Medicine*, one of the JAMA/Archives journals.

Nearly 300,000 hip fractures occur each year in the United States, causing substantial short- and long-term disability and increased mortality. Previous research to determine the mortality risk associated with hip fracture has not always accounted for differences in health status.

"Such methodological limitations have made it difficult to determine whether the noted increase in mortality after hip fracture is the result of underlying poor health or the hip fracture itself," according to the authors. Additionally, studies that explored the influence of age on mortality after hip fracture have conflicting results. The researchers sought to determine the short-term (one year or less), intermediate-term (between one and five years) and long-term (between five and 10 years) mortality associated with hip fracture, as well as whether healthy women ages 80 years and older would have increased mortality associated with hip fracture when compared with healthy controls of the same age.

Erin S. LeBlanc, M.D., M.P.H., from the Center for Health Research, Kaiser Permanente Northwest, Portland, Ore., and colleagues prospectively studied participants in the Study of Osteoporotic Fractures, a large community-based, multicenter study. Participants were recruited between 1986 and 1988 and followed until December 2005; the mean (average) follow-up was 14.4 years. The researchers selected 1,116 women with hip fracture and matched each with four control participants of the same age who did not have hip fracture (n = 4,464) for a total of 5,580 participants. Through a healthy older subset (n = 960) of participants ages 80 years or older who attended a 10-year follow-up examination and reported good or excellent health, the researchers were able to examine the association with health status. The authors determined incident (new-onset) hip fractures by examining radiology reports, and used death certificates to confirm participant deaths.

For participants with hip fracture, the odds of death were twice as high in the year after the fracture as were controls (16.9 percent vs. 8.4 percent). The odds of short-term mortality increased in participants ages 65 to 70 years (16.3 percent vs. 3.7 percent) and 70 to 79 years (16.5 percent vs. 8.9 percent); an increase was also observed in women ages 80 years or older with good or excellent health (15.1 percent vs. 7.2 percent). After

one year following fracture, participants with fracture and controls had similar mortality, except those with fracture ages 65 to 70 years who continued to have an increase in mortality.

The authors noted that, because the risk of hip fracture increases with age, hip fractures may become an even larger public health issue as the population ages. According to the results of the study, an association exists between age, health status (in those ages 80 years and older), and short-term mortality after hip fracture.

"If our findings are replicated, they would suggest that research should focus on hip fracture prevention and interventions in these groups that could decrease mortality during that high-risk period," they write. "Women who are 65 to 70 years of age continue to have an increased risk of mortality for up to five to 10 years; therefore, prevention of hip fractures in these women should be of high priority."

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<http://www.scientificamerican.com/article.cfm?id=the-hedonic-nose>

The Hedonic Nose: Pleasure May Organize Your Sense of Smell ***The nose really might "know" good from bad, even before the brain does***

By Sarah Fecht | Monday, September 26, 2011

The nose has long been viewed as a disorganized sensory organ, its odor receptors strewn about with very little rhyme or reason. A study in *Nature Neuroscience*, published online September 25, challenges that notion. It suggests that odor receptors are grouped by the pleasantness of the odors they detect. (Scientific American is part of Nature Publishing Group.)

The findings are creating "more than just a shake-up" among researchers who study olfaction, says Marion Frank from the University of Connecticut Health Center Graduate School. "It's a tornado."

Olfactory organization is especially obscure in humans. Rats' odor receptors appear to be sorted by gene family, creating four distinct zones within the nostril. It is unknown whether those zones exist in the human nose, because to search for them would require tagging odor receptors with toxic chemicals. The human brain's olfactory bulb is activated differently depending on where a smell hits the nostril, indicating that odor receptor organization is not uniform. However, most scientists agree that there is a large degree of randomness in receptor distribution.

By inserting a Teflon-coated wire into the nostrils of nearly 60 volunteers, neurobiologist Noam Sobel from the Weizmann Institute of Science in Israel, measured how small patches of the nasal lining respond to a variety of smells. Sobel's team piped a variety of chemicals into the participants' nostrils while the wire electrode recorded the reactions of neurons connected to the odor receptors. The participants evaluated the pleasantness of each smell: amyl acetate, which smells like bananas, received the highest overall rating for pleasantness. Garliclike diethyl sulfide received one of the lowest. Other chemicals, such as acetic acid (vinegar's main component) elicited mixed reactions.

Sobel's team administered one scent at a time to determine the responsive portions of the nasal lining. Some sites responded to the probe smell, whereas others did not, which reinforced the idea that odor receptors are not uniformly distributed. But what was most interesting was that if a pleasant odor was used to find the location, other pleasant smells had significantly strong neurological reactions at that site, too. Conversely, if an aversive smell was used to locate the recording site, subsequent noxious smells elicited strong reactions there as well. Furthermore, the smells that were rated most different in their degree of pleasantness also had the largest differences in neurological measurements.

These findings suggest that smell receptors are organized by the pleasantness of the aromas they detect—similarly to how retinas and ear cells are organized by spatial information and tone, respectively.

"I really didn't want to believe it, but the data look strong," says Don Wilson, who studies rat olfaction at New York University Langone Medical Center. In the past he and Sobel have disagreed over whether the molecules themselves provide information about the pleasantness of an odor, or whether it was the role of the brain to interpret scents. Wilson was surprised by the findings. "If you performed a similar experiment in vision, the equivalent results would be that we could use retinal activity to predict whether the eye is viewing a pleasant scene or an ugly one," he says.

As Sobel points out, beauty is not all in the eye of the beholder—at least for the nose. "The popular notion that odorant pleasantness is subjective is wrong," Sobel says. Just as a color or auditory tone is determined by the physical structure of its wavelength, scientists can predict an odor's pleasantness based on its physical and

chemical properties. The perception of an odor's pleasantness or aversiveness is remarkably consistent across people and populations, Sobel says, and it's one of the most important evaluations an organism can make about a smell.

Richard Doty, director of the University of Pennsylvania's Smell and Taste Center, says the results should be taken with a grain of salt. "Pleasantness correlates with other psychological concepts, such as edibility and attraction or repulsion," he says. He also said that future experiments should control for odor intensity, which can determine how pleasant or unpleasant an odor is. "For example, people who like the licorice odor anethole find it more pleasant as its concentration increases, whereas those who do not like licorice find it less pleasant as its concentration increases."

If the odor receptors play a role in processing hedonic information, it is important to remember that the brain still plays a modulating role, Wilson says. "If I take isovaleric acid and tell you it's going to smell like Parmesan cheese, you'll smell Parmesan cheese, which will most likely be pleasant. But if I tell you it's going to smell like vomit, you're going to find it repugnant. It's the same molecule, but your expectations influence how you perceive it." Similarly to how the perception of a color is affected by the colors that surround it, the perception of a smell appears to be context-dependent.

The axis of pleasantness explains only part of the organization of olfactory receptors, Sobel cautions. Researchers are many years away from creating a topographic map of the nostril, but Sobel intends to be a part of that process. Currently, he and his team are rebuilding their electrode to have four probes, in order to take multiple measurements simultaneously. He'll also approach it in a more systematic fashion, instead of just poking around to find an active region.

"Either the nose is not as clearly organized as other organs, or we're not probing it properly enough," he says.

<http://news.discovery.com/human/miracle-fruit-berry-everything-taste-sweet-110926.html>

Miracle Fruit's Trippy Effects Explained

The West African berry causes sour foods to taste incredibly sweet.

By Jessica Marshall | Mon Sep 26, 2011 03:00 PM ET

Pop the red, cranberry-sized miracle fruit in your mouth and chew it for a while, allowing its juices to coat your mouth. It doesn't taste like much. But what follows "is just a miracle or a kind of magic" according to Keiko Abe, of the University of Tokyo, as you sample other foods. "Beer tastes like sweet juice. Lemon tastes like sweet orange."

Sour foods are perceived as trippily sweet when tasted for up to an hour after consuming the berry. This effect has led curious folks in the U.S. and elsewhere to seek the miracle fruit for "flavor-tripping" parties: pop the fruit with friends, then sample a smorgasbord of sour-leaning snacks: limes, goat cheese, beer, grapefruit, vinegar, pickles and more.



This red berry, native to West Africa, can make anything taste sweet. And now scientists know why. Keiko Abe/Science

"To me it was very exhilarating. It really is a very joyous experience," said writer Adam Gollner of trying the fruit. Gollner is author of *The Fruit Hunters*, which includes a chapter on the miracle fruit. "It's almost like this thing that you can't understand that is happening to you. That sense of incomprehensibility is a great feeling."

Abe and his colleagues report this week exactly how the wacky effect of the miracle fruit works. The team used a novel system of cultured cells that allowed them to test human taste receptors at various pHs to uncover the mechanism. The key ingredient in the fruit, a protein known as miraculin, binds strongly to the sweet taste receptors on our tongues, Abe reported, but it does not activate the receptors at neutral pH.

When acid is introduced, the miraculin protein changes shape in such a way that it turns on the sweet receptors it is bound to, creating a sensation of ultra-sweet without affecting the other flavors in the food.

After the acidic food is swallowed, miraculin returns to the inactive shape, but it remains bound to the sweet receptor for up to an hour, ready to receive a new acid trigger. The strong binding explains the molecule's lasting effect.

While flavor-tripping has driven demand for the miracle fruit, which grows natively in West Africa, its ability to make things taste sweet without the calories that accompany sugar, makes it an intriguing candidate for a non-calorie sweetener. The new findings show "the sweetness of miraculin at acidic pH in the mouth is the strongest of almost all the known sweeteners," Abe noted. "This will lead to industrial use of this non-calorie sweetener."

Miracle fruit is bred for sale in Japan, where it is served in some restaurants, and production of the purified miraculin protein is being pursued, Abe said. Meanwhile, its status in the U.S. is murky. Sale of purified miraculin was disallowed in 1974 by a Food and Drug Administration ruling. But Gollner's numerous efforts to clarify the legal status of the whole fruit ended in frustration.

Nonetheless, the fruit is available, for example via miraclefruitman.com, along with miracle fruit gum and lollipops. The site advertises the fruit's suitability for diabetics, since it provides sweetness with no sugar. It also claims to be useful for chemotherapy patients, whose taste is often distorted by an unpleasant metallic cast. The miracle fruit may improve the taste of foods for some patients.

http://www.eurekalert.org/pub_releases/2011-09/ki-toc092711.php

Treatment of common virus can reduce tumour growth

Researchers at Karolinska Institutet in Sweden have demonstrated for the first time that it is possible to inhibit the growth of brain tumours by treating the common Cytomegalovirus (CMV).

The virus, which is found in a wide range of tumour types, offers a possible route towards controlling tumour growth and reducing the size of the tumour as a complement to conventional cytotoxin-based therapies.

The CMV is a common virus that is found in 70-75 per cent of the adult population. Normally it is dormant and goes unnoticed, but when a cancer develops in the body, the virus seems to control many of the mechanisms in the cancer cells. Brain tumours, breast cancer, colon cancer and prostate cancer are some of the cancer forms in which CMV may play a central role. By studying medullablastomas, the most common form of childhood brain tumour, researchers at Karolinska Institutet have been able to show for the first time the presence of CMV in these tumours and that treatment for CMV can reduce tumour growth.

"We show in this study that CMV is found in 92 per cent of tumours from medullablastoma patients," says Professor Cecilia Söderberg-Nauclér. "We also show in experimental systems that we can inhibit the growth of these tumours with antiviral drugs, which opens up a new potential therapeutic approach to certain tumours in the future."

Earlier studies have shown that many forms of tumour also have a higher expression of the COX-2 enzyme, which is not found in normal tissue but which plays a key part in inflammations and the development of cancer. As regards tumours, it has previously been shown that for unknown reasons COX-2 is induced in tumour cells; a phenomenon often associated with poor prognoses. Further, the knowledge that COX-2 inhibitors reduce the risk of cancer has led to their use in clinical studies for cancer prevention. CMV in turn, greatly and specifically stimulates the synthesis of COX-2 and is thus a possible control signal for tumour growth. COX-2 inhibitors also reduce the production of CMV. The researchers now show in their paper, which is published in the Journal of Clinical Investigation, that tumour growth decreases when CMV is inhibited.

"Our experiments on mice show that tumour growth declines by around 40 per cent when antiviral drugs or COX-2 inhibitors are used separately, and by no less than 72 per cent when used in combination," says Professor Söderberg-Nauclér, adding that this effect is achieved without using chemotherapy.

Since both the drugs used in the study, an NSAID that inhibits CMV replication and inflammation, and the antiviral Valcyte (Valganciclovir) for CMV infection, have relatively good adverse effect profiles, the researchers now see immediate opportunities for studying their impact on different forms of tumour. Antiviral drugs are also selective and largely affect infected cells.

"These are very promising and exciting results," says Professor Söderberg-Nauclér. "The virus infection isn't cured by the treatment, nor is the tumour, but the virus in the tumour decreases, which affects its growth. This therefore presents a new approach to treating tumours and could henceforth be used as a possible complementary therapy."

Publication: Ninib Baryawno, Afsar Rahbar, Nina Wolmer-Solberg, Chato Taher, Jenny Odeberg, Anna Darabi, Zahidul Khan, Baldur Sveinbjörnsson, O-M Fuskevåg, Lova Segerström, Magnus Nordenskjöld, Peter Siesjö, Per Kogner, John Inge Jo

<http://medicalxpress.com/news/2011-09-asians-alcoholism-benefit.html>

Asians fighting alcoholism may benefit from new study

New UCLA psychology research indicates that Asians who are struggling with alcoholism may benefit especially from naltrexone, one of three medications approved by the U.S. Food and Drug Administration for the treatment of alcoholism.

Medical Xpress - Recent research has found that a gene variant may predict naltrexone treatment success for alcoholism. About 50 percent of patients of Asian descent have a particular mutation that makes them likely to benefit from naltrexone, compared with about 20 percent of Caucasians and less than 5 percent of African Americans, said lead study author Lara Ray, an assistant professor of psychology and director of the UCLA Addictions Laboratory. The findings are currently available online (<http://1.usa.gov/ojdjPJ>) in the journal Neuropsychopharmacology and will be published in an upcoming print edition of the journal.

The mutation in question is in the OPRM1 gene, which codes for the mu opioid receptors in the brain. People with "AG" or "GG" variants of OPRM1 have better clinical alcohol-treatment outcomes with naltrexone than those with the "AA" variant, Ray said, adding that approximately half of Asians have at least one copy of the "G" nucleotide at the particular location.

Ray's laboratory conducted a study that tested the effect of naltrexone versus a placebo in heavy drinkers of Asian descent. In the study, 35 participants received alcohol in the laboratory through an infusion of ethanol that was the equivalent of two to three standard alcoholic drinks. They completed two alcohol sessions, one after taking naltrexone and one after taking a sugar pill.

"Our results revealed that naltrexone reduced the positive feelings of alcohol intoxication among individuals with the 'AG' or 'GG' genotypes but not among those with the 'AA' genotype," said Ray, who is also a faculty member with the UCLA Brain Research Institute and the department of psychiatry and biobehavioral sciences at the Semel Institute for Neuroscience and Human Behavior at UCLA.

"Specifically, 'AG'/'GG' participants reported more sedative and unpleasant feelings of intoxication on naltrexone versus the placebo," she said. "In addition, they reported less craving for alcohol on naltrexone versus the placebo. These results were confirmed even after controlling for genes responsible for the metabolism of alcohol and an 'alcohol flushing response' often reported by individuals of Asian descent."

People vary widely in how they respond to medications, and this is true of medications for alcoholism, Ray said. Naltrexone can reduce the stimulating feelings of alcohol; patients on naltrexone often report that their alcohol 'high' is not as pleasant, which helps them reduce their drinking, she said.

"In short, these efforts are a good example of personalized medicine, which seeks to improve clinical care by identifying who is more likely to benefit from a medication based on their genetic make up," Ray said.

Co-authors of the study are Spencer Bujarski, a UCLA graduate student in clinical psychology; Pauline Chin, a former UCLA researcher in Ray's laboratory; and Karen Miotto, a clinical professor in department of psychiatry and biobehavioral sciences at UCLA's Semel Institute and director of alcoholism and addiction medicine service at the David Geffen School of Medicine at UCLA. Provided by University of California Los Angeles

<http://news.discovery.com/space/mars-life-trench-clay-110927.html>

Martian Life's Last Stand in the Trenches?

If there was life on Mars, scientists may have found one of its final resting spots.

By Irene Klotz | Tue Sep 27, 2011 09:58 AM ET

Scientists have found water-bearing deposits on Mars that are out of step with what was happening elsewhere on the planet, raising the prospect that the sites could have hosted Martian life's last stand. The deposits are a type of clay called smectites, which contain a blend of silica with aluminum, iron or magnesium. They form in the presence of water.

The deposits were found in an unlikely locale - roughly 30 feet up from the ground inside two troughs in Noctis Labyrinthus ("the labyrinth of the night"), a maze-like system of deep valleys located near the western end of the massive Valles Marineris canyon that cuts across the face of Mars.



Exposed layers are seen in the Martian trench system, Noctis Labyrinthus, which may contain water-bearing deposits of clay minerals and could have once hosted life. NASA/JPL-Caltech

Other smectites have been found on Mars, but only in areas with rock dating back to an older period in the planet's history, known as the Noachian age, which spans from about 3.6 billion to 4.5 billion years ago. The planet's climate is then believed to have shifted, leading to a new geologic epoch marked by minerals that formed under more acidic conditions.

"So far, we've found these kinds of clays in the very oldest terrain," lead research Catherine Weitz, with the Planetary Science Institute, told Discovery News. "In our study, we see these same kind of smectites, but they formed in these depressions, these troughs, that are probably much younger."

The Noctis Labyrinthus smectites are believed to have formed around 2 to 3 billion years ago, possibly providing a haven for life when the rest of the planet dried out.

"It was a surprise to see such young clays that must have formed in a persistent water under neutral conditions," Weitz said. "If there's life on Mars, if it had persisted, this would be a nice place for it, because it does indicate that there was water in this location on the surface at that relatively young age."

Chemical analysis collected from probes orbiting Mars shows the troughs in Noctis Labyrinthus filled with minerals in reverse order to what was happening across the planet globally.

"The hard part is how do you get water up that high and how do you get it at that time," planetary geologist Matt Golombek, told Discovery News.

Clays, in general, are ideal for preserving organics, if any exist, because the material can seal things off from water that comes later. "Clay-rich materials are extremely good at preserving evidence for life," said Golombek. "That's part of what makes going to them such a compelling story."

Scientists are about to get their first close-up studies of Martian clays. The long-lived rover Opportunity recently arrived at the rim of a 14-mile wide crater called Endeavour that contains hydrated clays.

And the Cadillac of rovers is not far behind. NASA's Mars Science Laboratory, nicknamed Curiosity, is to be due to launch Nov. 25 to explore the clay-rich deposits in Gale Crater.

The Noctis Labyrinthus deposits are off-limits to rovers -- the terrain is too high and too steep to be accessible -- but scientists are hopeful the studies in Endurance and Gale craters will fill in missing pieces of the Mars story. Weitz's research appears in this week's *Geology*.

http://www.eurekalert.org/pub_releases/2011-09/mgh-spn092211.php

Saw palmetto no better than placebo in relieving prostate symptoms, even at high doses
Long-term administration of the dietary supplement saw palmetto, even at three times the usual dose, did not reduce symptoms of prostate enlargement significantly better than placebo in a large group of middle-aged men.

The study from researchers at 14 institutions across the U.S. and Canada appears in the September 28 *Journal of the American Medical Association* and extends the results of several other double-blinded, placebo controlled trials.

"Saw palmetto extracts are commonly used by men with bothersome lower urinary tract symptoms, but our results indicate that the particular extract we tested was no better than a placebo at relieving those symptoms," says Michael Barry, MD, of the Massachusetts General Hospital Department of Medicine, lead author of the *JAMA* report. "It is possible that other formulations could be helpful, but a number of recent studies with negative results suggest it may be difficult to find a saw palmetto extract that is better than placebo."

Benign prostatic hyperplasia (BPH), commonly referred to as an enlarged prostate, affects around half of men at age 50 and three-quarters by age 80. The condition can be mild, but for many men symptoms such as frequent urination – including the need to visit the bathroom several times at night – difficulty urinating, and weak or intermittent urinary flow interfere with their quality of life. Several conventional medications are available to treat BPH, but their side effects can be unpleasant.

Saw palmetto extract is a common alternative treatment for BPH. Some early studies indicated that saw palmetto could reduce symptoms of BPH, but recent, more rigorous trials had less promising results. The largest previous trial, enrolling 225 men over 50, found that a standard dose of 160 mg twice a day for one year was no better than placebo at relieving symptoms. The current study was designed to see whether longer treatment with higher doses would give better results.

Conducted at 11 North American hospitals, the current trial enrolled men over 45 with moderate symptoms of BPH. Participants took daily doses of identical gelcaps that contained either saw palmetto extract or a placebo. The dosage was doubled 28 weeks into the study and then tripled at 48 weeks. Those receiving saw palmetto started at a standard daily dose of 320 mg., increased to 640 mg. and ended at 960 mg. Of the more than 300 participants who completed the study, all reached the triple dose with no significant side effects. At the end of the 72-week study period, participants receiving saw palmetto showed less improvement in a standard index of BPH symptoms than did those taking the placebo.

"The conventional medications we prescribe for BPH can have unpleasant side effects, and participants taking even the highest doses of saw palmetto had no serious adverse effects," Barry says. "So while I would tell a patient interested in trying saw palmetto that I wouldn't object, I'd make sure he understood that, on average, it doesn't seem to work any better than a placebo." Barry is a clinical professor of Medicine at Harvard Medical School

Support for the study – which was conducted by the Complementary and Alternative Medicine for Urologic Symptoms Study Group – included grants from the National Institutes of Health, including the National Center for Complementary and Alternative Medicine, and the Office of Dietary Supplements.

Alzheimer's protein kills nerve cells in nose

Animal study may suggest way to rescue cells from disease

Washington, DC — A protein linked to Alzheimer's disease kills nerve cells that detect odors, according to an animal study in the September 28 issue of *The Journal of Neuroscience*. The findings shed light on why people with Alzheimer's disease often lose their sense of smell early on in the course of the disease.

"Deficits in odor detection and discrimination are among the earliest symptoms of Alzheimer's disease, suggesting that the sense of smell can potentially serve as a 'canary in the coal mine' for early diagnosis of the disease," said Leonardo Belluscio, PhD, of the National Institute of Neurological Disorders and Stroke, who led the study. "The changes taking place in the olfactory system as a result of Alzheimer's disease may be similar to those in other regions of the brain but appear more rapidly" he added.

Researchers once thought that protein plaques commonly seen in the brains of people with Alzheimer's disease were responsible for killing off nerve cells, causing disruptions in memory — a hallmark of the disease. The plaques are primarily derived from a protein called amyloid precursor protein (APP). The new study suggests that APP alone — in the absence of the plaques — may be to blame for the death of nerve cells.

In the new study, Belluscio and his colleagues genetically manipulated mice to produce high levels of a mutated version of human APP in olfactory nerve cells. The mutated form of the protein is seen in some people with early-onset Alzheimer's disease, a rare form that runs in families and strikes before age 65.

The researchers found that mice making mutant APP had four times as much olfactory nerve cell death by three weeks of age compared with normal mice. Although the cells that produced mutant APP died, the neighboring cells — that did not have mutant APP — survived. The cell death also occurred in the absence of amyloid plaques. Together, this showed that the cell death was initiated from within the cells making the mutant APP, not from plaques outside the cells. When the researchers blocked the olfactory nerve cells from producing high levels of the mutant precursor protein, more cells lived.

"Reducing APP production suppressed the widespread loss of nerve cells, suggesting that such disease-related death of nerve cells could potentially be stopped," Belluscio said.

"Together, these results support the hypothesis that amyloid proteins are involved in the degeneration of the brain that occurs with Alzheimer's disease," said Donald Wilson, PhD, of New York University School of Medicine and the Nathan Kline Institute for Psychiatric Research, an olfactory system expert who was unaffiliated with the study. "Further, they provide an exciting opportunity to explore how to prevent or reverse the events that lead to cell death and, ultimately, dementia."

The research was supported by the National Institute of Neurological Disorders and Stroke.

http://www.eurekalert.org/pub_releases/2011-09/uoaf-woo092611.php

Window of opportunity to treat some stroke patients may be longer than originally suspected

Literature review demonstrates some stroke patients could benefit from treatment outside the typical 3 hour window

Stroke victims may have a longer window of opportunity to receive treatment to save their brain cells, demonstrates a literature review published by University of Alberta medical researchers in *Lancet Neurology*.

The review, which was published online last week, was written by Ashfaq Shuaib and his colleagues. Shuaib, the senior author, is a researcher in the Division of Neurology with the Faculty of Medicine & Dentistry at the University of Alberta. He is also a practising neurologist and a stroke specialist.

Literature reviews, which bring together large amounts of information from numerous studies, is one form of clinical research often referred to as health-outcomes research. This kind of "translational" work is valuable, since it synthesizes knowledge that lab researchers know and analyzes it for practising physicians so they can provide better patient care. The Faculty of Medicine & Dentistry has special expertise in conducting sophisticated health-outcomes research – taking knowledge "from bench to bedside."

Shuaib reviewed stroke studies that examined the use of imaging to measure blood flow in the brain after a stroke. The literature was written from 1980 to July 2011. His review notes that using advanced neuroimaging, such as multi-dimensional brain CT scans and MRIs, can provide physicians important information about blood flow in the brain following a stroke. This information could enable doctors to provide better treatment to prevent brain cells from dying, through the use of techniques to increase blood flow in the brain.

The review noted that the presence of good "collateral" blood flow in the brain can "sustain brain tissue for hours" after major arteries to the brain have been affected by a stroke, and this flow could potentially offset injury to the brain. Enhancing or maintaining strong blood flow is a potential therapeutic treatment for stroke; it is currently under investigation in several stroke centres around the world, he says.

Shuaib's review notes that stroke is the second most common cause of death, with the majority of the 16 million cases happening in developed nations. A lack of blood flow is the primary cause of a stroke. It is typically triggered by a blockage in a brain artery due to arteries thinning from a build-up of plaque, or by a mass from the heart or neck vessels restricting blood flow to the brain.

Normal blood flow in the brain is between 50-60 ml/100g/minute. If someone suffers a stroke and blood flow levels in the brain fall below 10 ml/100g/minute, brain cells die within minutes of the stroke. However, if blood flow in the brain is between 10-20ml/100g/minute, "the neurons cease function but remain structurally intact and are potentially revivable if normal blood flow is restored," Shuaib says in the review.

He further adds that brain cell death after a stroke may not be complete for hours or even days after a stroke, meaning that the window to treat some stroke patients is longer than three hours – the standard timeframe that has been referenced in medicine since the 1990s. Shuaib says cell death can be complete within as little as an hour in some people following a stroke, while other patients have viable brain tissue and cells for days or indefinitely after a stroke. And with current imaging technology, physicians can determine whether brain cells are dead or have simply ceased functioning post-stroke.

"What we're recommending is, don't look at the window of time only, look at the important tissue window which may be quite prolonged in many patients," says Shuaib. "Don't just say, 'oh this person had a stroke 4.5 hours ago, end of story.' This person may have very good tissue you could treat."

<http://news.discovery.com/animals/prehistoric-beetles-colors-110927.html>

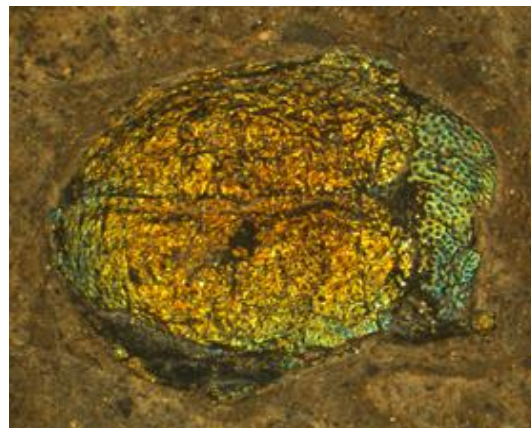
Prehistoric Beetles Sported Hotrod Colors

Many beetle fossils have color, but they are a far cry from the flashy shades these insects once wore.

By Jennifer Viegas | Tue Sep 27, 2011 07:00 PM ET

Fossils tend to offer a black and white view of the past, but new research on prehistoric beetles brings the insects' flashy metallic colors back to vivid life. The findings, published in the journal *Proceedings of the Royal Society B*, add to the growing body of evidence that non-avian dinosaurs, Dino Era birds, prehistoric fish, early insects, and more were literally very colorful creatures.

The colors within fossils may not always be visible to the naked eye. Researchers, however, are now able to reveal the long-lost hues by studying the structural and chemical bases of the individual's original color. Many beetle fossils do exhibit colors, but they are a far cry from the hotrod shades these insects once sported.



The original color of this 47-million-year-old beetle was reconstructed using microscopic details preserved in the cuticle. Maria McNamara

"Our results show that the colors of the fossil beetles we studied changed during the fossilization process," lead author Maria McNamara told Discovery News.

"In particular, the colors have been shifted towards the red end of the spectrum -- not completely, but enough to make, for example, a formerly blue beetle more green, and a formerly yellow beetle more orange," added McNamara, a postdoctoral research fellow in the Department of Geology and Geophysics at Yale University.

She and her colleagues made the determination after studying fossil beetle specimens dating from 15 to 47 million years ago. The beetles once lived in what are now Idaho (U.S.), Germany, and other locations.

The beetles' flashy yellow, green, blue, red, and other metallic car-like hues were due to structural color, meaning color that results from interference of light. The ocean is blue, for example, because water absorbs colors in the red part of the light spectrum, leaving behind blue.

The fossil beetles achieved their light manipulation, not with water, but with "very fine layers, millionths of a meter, in the outermost levels of the beetle cuticle," McNamara explained. Such color depends on two variables: the structure itself and the refractive index of the beetle's cuticle, meaning how much light is bent, or slowed, as it passes through a material.

Extremely high magnification of the beetle remains showed that the structure of the beetles' cuticles did not change during fossilization, so the color changes were instead due to changes in the cuticles' refractive index.

"These findings will allow the former presence, and original hue, of metallic structural colors to be identified in diverse fossil insects, thus providing critical evidence of the evolution of structural color in this group," the researchers concluded.

Gengo Tanaka, a researcher at Japan's Gunma Museum of Natural History, has also studied color in fossilized beetles and believes that McNamara and her team "broke a milestone in paleontology" given the future possibility of recreating past structural colors in now-extinct species.

Andrew Parker, a research leader at both Oxford University's Green Templeton College and The Natural History Museum, London, is another leading expert on color in the prehistoric world.

"I am very keen to see studies that add details of color and vision to the geological time scale" Parker told Discovery News. "This informs us that the myriad interactions involving color that we see today -- the arms race between predators and prey, and the signaling to a potential mate within conspecifics -- extend back through time." The big question, though, is how far back can this scenario extend. In other words, when did the world become such a colorful place?

"The answer is to the origin of eyes in a fast moving predator that can have a major influence on the dynamics of an entire ecosystem" Parker answered. "That appears to be about 520 million years ago, with the new visually-guided predator probably triggering the Cambrian explosion."

He added, "After that, other innovations would have impacted the visual arms race, such as the evolution of flight in both predators and prey, so it is important to fill in as many gaps in the timeline of color and vision as possible. At this stage, we have mainly gaps!"

http://www.eurekalert.org/pub_releases/2011-09/nu-wtb092611.php

Who's the best leader: the saint or the scrooge?

New study explains why nice people are overlooked as strong leaders

Generosity is typically regarded as a virtue. But among leaders, it can be seen as a sign of weakness, according to a new study. The research finds that generosity - in the sense of contributing to the public good - influences a person's status on two critical dimensions: prestige and dominance. "People with high prestige are often regarded as saints, possessing a self-sacrificial quality and strong moral standards," said Robert Livingston, assistant professor of management and organizations at the Kellogg School of Management at Northwestern University. "However, while these individuals are willing to give their resources to the group, they are not perceived as tough leaders."

The researchers define dominance as an imposed "alpha status," whereas prestige is freely-conferred admiration from others. Al Capone, for example, can be viewed as a high-dominance individual, whereas Mother Theresa exudes high prestige.

The study argues that people with high prestige are perceived as desirable leaders in noncompetitive contexts, but that they are viewed as submissive in comparison to individuals who strive to maximize their personal gains. In times of competition, individuals who are less altruistic are seen as dominant and more appealing as leaders.

"Our findings show that people want respectable and admired group members to lead them at times of peace, but when 'the going gets tough,' they want a dominant, power-seeking individual to lead the group," said Nir Halevy, lead author and acting assistant professor of organizational behavior at the Stanford Graduate School of Business. Livingston and Halevy co-authored the research with Taya Cohen of Carnegie Mellon University's Tepper School of Business and Kellogg PhD student Eileen Chou.

Their study highlights the need to distinguish between different types of status in groups as well as how intergroup conflict shapes followers' leadership preferences. "There are numerous academic findings on status, but we sought to investigate the antecedents and consequences of two distinct forms of status, depending on the context," said Livingston.

To test their theory, the researchers conducted three experiments where participants were given the option to keep an initial endowment (10 game chips worth a total of \$20) for themselves or contribute it to a group pool. Contributions either benefitted the contributor's fellow group members, or simultaneously benefitted the contributor's group members and harmed the members of another group.

The first two experiments found that selfishness and displays of 'out-group hate' - which unnecessarily deprived the members of another group - boosted reflected dominance but decreased respect and admiration from others. In contrast, displays of in-group love ± generously sharing resources with fellow group members — increased respect and admiration but decreased dominance.

The third experiment found that "universalism" - that is, sharing one's resources with both in-group members and outsiders - had the most dire net outcomes on a person's status. The researchers found that universal generosity decreased perceptions of both prestige and dominance compared those who shared resources only with members of their group.

In short, being generous can boost one's prestige, if one is selectively generous to one's own group; this increases respect and admiration from others. However, being selfish or belligerent (unnecessarily harming

members of another group) decreases respect and admiration from others but it increases perceptions of one's dominance.

The intriguing consequence is that dominant individuals were more likely than prestigious individuals to be elected as a representative for the group in a mock competition with another group. Thus, being too nice can have negative consequences for leadership. "Being too generous often comes at a personal cost to one's position of strength or power," Livingston explained. "This research begins to explore when 'nice guys' finish first and when they finish last, depending on the group context," Halevy said. "'Nice guys' don't make it to the top when their group needs a dominant leader to lead them at a time of conflict."

The study "Status Conferral in Intergroup Social Dilemmas: Behavioral Antecedents and Consequences of Prestige and Dominance" will appear in a forthcoming issue of the Journal of Personality and Social Psychology.

http://www.eurekalert.org/pub_releases/2011-09/ccsd-msh092711.php

MVA-B Spanish HIV vaccine shows 90 percent immune response in humans **Phase I clinical trials reveal MVA-B preventive vaccine's immune efficiency against Human immunodeficiency virus (HIV)**

Phase I clinical trials developed by Spanish Superior Scientific Research Council (CSIC) together with Gregorio Marañón Hospital in Madrid and Clínic Hospital in Barcelona, reveal MVA-B preventive vaccine's immune efficiency against Human immunodeficiency virus (HIV). 90% of the volunteers who went through the tests developed an immunological response against the virus and 85% have kept this response for at least one year. Safety and efficiency of this treatment have been described in articles for Vaccine and Journal of Virology science magazines.

The success of this vaccine, CSIC's patent, is based on the capability of human's immune system to learn how to react over time against virus particles and infected cells. "MVA-B vaccine has proven to be as powerful as any other vaccine currently being studied, or even more", says Mariano Esteban, head researcher from CSIC's National Biotech Centre.

In 2008, MVA-B already showed very high efficiency in mice as well as macaque monkeys against Simian's immunodeficiency virus (SIV). Due to its high immunological response in humans, Phase I clinic trials will be conducted with HIV infected volunteers, to test its efficiency as a therapeutic vaccine.

Weapon's origins

Back in 1999, Esteban's research team began to work in the development and preclinical studies of MVA-B, which name comes from its composition, based in Modified Ankara Vaccinia virus. MVA-B is an attenuated virus, which has already been used in the past to eradicate smallpox, and also as a model in the research of many other vaccines. The "B" stands for the HIV subtype it is meant to work against, the most common in Europe.

Development of MVA-B is based in the insertion of four HIV genes (Gag, Pol, Nef & Env) in Vaccinia's genetic sequence. A healthy immunity system is able to react against MVA. On the other hand, the inserted HIV genes in its DNA are not able to self-replicate, which guarantees the safety of the clinical trial.

30 healthy volunteers participated in this clinical trial. 24 of them were treated with MVA-B, while the other 6 were treated with a placebo, following a double-blind testing method. 3 doses of the vaccine were given via intramuscular route in weeks 0, 4 and 16. The effects were studied in peripheral blood until the trial ended on week 48.

Combat battalion

Inoculating the vaccine in a healthy volunteer is intended to train its immune system to detect and learn how to combat those virus components. According to Esteban "it is like showing a picture of the HIV so that it is able to recognise it if it sees it again in the future".

Lymphocytes T and B are the main cells in this experiment, the soldiers in charge of detecting the foreign substances in the body and sending the right coordinates to destroy them. "Our body is full of lymphocytes, each of them programmed to fight against a different pathogen" says Esteban. For that reason "Training is needed when it involves a pathogen, like the HIV one, which cannot be naturally defeated".

Lymphocytes B are responsible for the humoral immune response, producing antibodies which attack the HIV particles before they penetrate and infect the cell, anchoring themselves to the external structure and blocking it. 48th week blood tests reveal 72,7% of the treated volunteers hold specific antibodies against HIV.

On the other side, lymphocytes T control cell's immune response, in charge of detecting and destroying HIV infected cells. In order to verify their defence response to the vaccine, production of interferon gamma immunity protein was measured. Tests performed on the 48th week, 32 weeks after the last inoculation of the vaccine, show the production of lymphocytes T CD4+ and CD8+ of the vaccinated group is 38,5% and 69,2%, respectively, while it stays at 0% in the control group.

Action in several fronts

Besides interferon gamma, other immune proteins (cytokines and chemokines) are produced by the body when the presence of a pathogen is detected. Each of these proteins tends to attack a different enemy front. When T lymphocytes' defence action is able to generate several of these proteins it is called a polyfunctional action. CSIC's researcher adds "The importance of polyfunctionality has to do with the capability of pathogens to develop resistance to the immune systems attacks. The higher the polyfunctionality, the lower the resistance".

The defence spectrum of T lymphocytes in vaccinated subjects was measured based on the production of 3 other immunitary proteins. Tests indicate the vaccine generates up to 15 types of lymphocyte T CD4+ and CD8+ populations. 25% of CD4+ type and 45% of CD8+ type are able to produce two or more different proteins, proving their polyfunctionality.

War veterans

For a vaccine to become really effective, besides its immune system's defence capability, generating a long lasting response against future attacks is the key. For this purpose, the body needs to be able to keep a basic level of memory T lymphocytes. These lymphocytes, generated after a first pathogen attack, are veteran soldiers, which can circulate the body for years, prepared to respond to a new enemy's incursion.

48th week blood tests ran on vaccinated subjects show over 50% of CD4+ and CD8+ lymphocytes were memory T lymphocytes in the 85% of the patients who kept an immune response at this point of the trials.

In Esteban's opinión "MVA-B immune profile meets, initially, the requirements for a promising HIV vaccine". MVA-B is not capable of removing the virus from the body as once a cell is infected, virus' genetic data is integrated and replicated with the cell. However, the immune response induced by the vaccine could keep the virus under control, "if the virus enters the body and tries to develop in a cell, the immune system is ready to inactivate the virus and destroy the infected cell".

According to CSIC's researcher: "If this genetic cocktail passes Phase II and Phase III future clinic trials, and makes it into production, in the future HIV could be compared to herpes virus nowadays". Virus would not cause a disease anymore and would become a minor chronic infection, which would only show its effects in a low defence scenario, with a much lower contagious profile.

<http://medicalxpress.com/news/2011-09-rebranding-quality-life-longer.html>

Rebranding exercise: 'Quality of life' a better motivator than 'Live longer'

A new University of Michigan study finds that the most convincing exercise message emphasizes immediate benefits that enhance daily quality of life.

Medical Xpress - Health care, business and public health have presumed that promoting health and longevity benefits from exercise will motivate people to exercise. The new findings, however, indicate that these individuals exercised less than those who aimed to enhance the quality of their daily lives.

"The study showed that what an individual espouses as important does not necessarily translate into behavior," said Michelle Segar, research investigator for the U-M Institute for Research on Women and Gender. "While people say they value health and healthy aging, those distant benefits don't make exercise compelling enough to fit into their busy lives." These findings challenge the current convention of promoting exercise for better health, longevity, or as medicine. "Promoting exercise for health is logical, but people's daily decisions are more often connected to emotion than logic," Segar said. "A more effective 'hook' is to rebrand exercise to emphasize the immediate benefits that enrich daily living, such as stress reduction and increased vitality."

Individuals may also appreciate the subsequent benefits that make exercise more personally meaningful, such as being a patient parent, enjoying life, being creative and having focus at work, she says.

"By shifting our model from medicine to marketing, we can improve how we 'sell' exercise to the public by using principles like branding," Segar said. For example, messages about immediate rewards from exercise that make life more enjoyable, such as "move more, get energy," may better motivate busy individuals than promotions focused on achieving distant and abstract benefits, such as "move more, get healthy."

Segar studied responses from 226 women between the ages of 40 to 60 who worked full time. They completed three surveys during a one-year period. Respondents were asked about their exercise goals and participation, how much they valued their goals, body mass index (BMI) and social support. This study supports other research showing that the reasons why individuals initiate exercise influence their motivation and behavioral sustainability.

Segar recommends four steps to rebrand exercise and to improve engagement and participation:

- Assess the specific exercise benefits your organization has been promoting.
- Evaluate the effectiveness of these motives to engage and motivate ongoing participation.
- Ask your target population what values and experiences they most care about achieving in their daily life that exercise benefits would impact, such as reduced stress and improved mood.

- Develop new messaging that addresses these valued end points.

Caroline Richardson, an associate professor of family medicine at U-M and research scientist at the VA Ann Arbor Healthcare System, and Jacquelynne Eccles, a professor of psychology and education, co-authored the study.

More information: The findings appear in the latest issue of The International Journal of Behavioral Nutrition and Physical Activity. Provided by University of Michigan

http://www.eurekalert.org/pub_releases/2011-09/jhmi-pcc092811.php

Popular colorectal cancer drug may cause permanent nerve damage ***Nerve degeneration detected with skin biopsies***

Oxaliplatin, a platinum-based anticancer drug that's made enormous headway in recent years against colorectal cancer, appears to cause nerve damage that may be permanent and worsens even months after treatment ends. The chemotherapy side effect, described by Johns Hopkins researchers in the September issue of *Neurology*, was discovered in what is believed to be the first effort to track oxaliplatin-based nerve damage through relatively cheap and easy punch skin biopsies.

The Johns Hopkins investigators emphasize that the drug therapy clearly improves length of survival in advanced cancer by months to years, and that the goal of their new study is to find ways of preventing or slowing the damage through nerve-protective therapies identified through simple skin testing.

Many patients who take oxaliplatin report bothersome neurological side effects, including pain in the hands and feet and a numbness or tingling in the throat that affects swallowing, according to study leader Michael Polydefkis, M.D., M.H.S., associate professor of neurology at the Johns Hopkins University School of Medicine and director of the EMG Laboratory and Cutaneous Nerve Laboratory at Johns Hopkins Bayview Medical Center. Though these symptoms develop over time in the majority of patients, some report neuropathies as early as when the drug is first infused.

To get a better sense of how oxaliplatin affects nerve cells, Polydefkis and his colleagues recruited eight cancer patients about to begin oxaliplatin treatment at The Johns Hopkins Hospital. All had been diagnosed with advanced colon cancer. Before their first oxaliplatin infusion, each patient underwent a comprehensive neurological examination, including nerve conduction testing, a clinical exam to look for signs of nerve damage, and a punch biopsy that removed tiny (3-mm diameter) portions of skin near their knees and ankles. Once oxaliplatin treatment began, consisting of infusions over two days once every two weeks for 12 cycles, the researchers performed the same tests after 30, 90 and 180 days. Another 180 days after they finished with treatment, the patients received one final exam.

Test results showed that each of the patients' nerve function and neuropathy symptoms worsened over time and that results from the punch skin biopsies neatly mirrored the side effect arc. Using a microscope, the researchers saw that nerve cells' long extensions, called axons, degenerated over the course of oxaliplatin therapy. This progression persisted after treatment stopped. Even 180 days after their last doses, seven out of the eight patients' axons continued to wither.

"This drug has rapidly become the standard of care for people with advanced colon cancer, but we really knew little about how oxaliplatin affects nerves over time," he says. "With people living longer lives on oxaliplatin, it's important to know more about these neurological side effects so patients and their physicians can make educated choices on how this drug is used, and perhaps suggest ways to limit the damage."

The new study strongly suggests that punch skin biopsies could be an easy and inexpensive way to follow nerve cell degeneration, a crucial prerequisite for testing the effectiveness of drugs currently in development to trace, prevent or slow nerve damage. "Skin biopsies can be done pretty easily, uniformly and cheaply anywhere, including hospitals, doctors' offices and clinics, and those places can have the tissue sent to Hopkins for analysis," Polydefkis says. "High-quality neurological testing isn't nearly as easy or economical to do, so it's possible that the biopsies could play a pivotal role in bringing neuroprotective drugs to fruition."

Other Johns Hopkins researchers who participated in this study include Ahmet Z. Burakgazi, M.D., Wells Messersmith, M.D., Dhananjay Vaidya, M.D., Ph.D., Peter Hauer, B.S., and Ahmet Hoke, M.D., Ph.D.

http://www.eurekalert.org/pub_releases/2011-09/acs-fdo092811.php

First detection of pregnancy protein in older people destined for Alzheimer's disease ***In an advance toward a much-needed early diagnostic test for Alzheimer's disease (AD), scientists have discovered that older women destined to develop AD have high blood levels of a protein linked to pregnancy years before showing symptoms.***

Theo Luiders and colleagues explain that more than 26 million people worldwide already have AD, and the numbers are rising with the graying of the population. Doctors can prescribe any of several drugs to slow the disease's advance. But it is important to start treatment as early as possible. Unfortunately, however, no test

exists to diagnose patients before obvious memory loss and other symptoms appear. Luider's team decided to look for proteins in the blood that might be used in such a test. Their report appears in ACS' Journal of Proteome Research.

They looked for those proteins in blood samples of 86 people aged 60-90 who participated in a larger study of aged-related brain changes conducted in The Netherlands. Surprisingly, Luider's group found that significant elevations in pregnancy zone protein (PZP) occurred in women an average of 4 years before diagnosis of AD. Scientists long have known that PZP levels rise during pregnancy, but this was the first link with AD. Luider further discovered the apparent source of the PZP in the brain of these women, who were not pregnant: PZP was being produced in senile plaques, degenerated areas of the brain associated with AD.

http://www.sciencenews.org/view/generic/id/334755/title/B12_shortage_linked_to_cognitive_problems

B12 shortage linked to cognitive problems

Studies in elderly show that even 'normal' levels of vitamin may not be enough

By Janet Raloff

Not getting enough vitamin B12 may take a serious toll on the brain. Two new studies of the elderly link impairments of memory and reasoning with an indirect measure of vitamin B12 deficiency. Worse, brain scans reveal that those with signs of insufficient B12 are more likely to have shrinkage of brain tissue, vascular damage and patches of dead brain cells than are people with higher levels of the vitamin.

A third, ongoing study is recording neural changes — a slowing in the electrical signals conveying visual information — among people with B12 deficiency.

Conducted in seniors, mostly in their mid-70s to upper 80s (including a large group in Chicago), all three studies observed adverse changes even in people whose B12 levels in blood fall within the ostensibly normal, healthy range. While blood levels of B12 might have been normal, however, two biochemical markers of B12 deficiency often were not: Except in the visual study, brain problems largely correlated with rising blood concentrations of homocysteine and methylmalonic acid, or MMA, which accumulate in blood when cells of the body receive too little B12.

“The message of this Chicago study is watch your B12. It’s important for the brain,” says David Smith of the University of Oxford in England, whose team has begun investigating whether vitamin supplementation can slow cognitive decline in the elderly. The new findings point to the apparent importance of brain changes in the absence of overt disease, says hematologist Ralph Carmel of New York Methodist Hospital, who was not involved in any of the new studies. The new data also argue against the common practice of relying exclusively on blood B12 levels to identify deficiency, he says.

In 2009, scientists at Rush University Medical Center in Chicago reported results from 516 randomly selected seniors showing that cognitive performance declined faster over a six-year period among those with elevated MMA. All had been taking part in an ongoing study of more than 6,100 men and women begun in 1993. One-third of the seniors, who were tested and surveyed about nutrition every three years, fell into this high MMA category, says Rush nutritionist Christine Tangney.

Now, in the September 27 *Neurology*, the same researchers report that high homocysteine values correlated with an accelerated shrinkage of brain tissue. Homocysteine blood levels also were linked to a higher number of what scientists call white matter hyperintensities — abnormal markings in magnetic-resonance imaging scans that are suspected of signaling patches of brain cells that died from blood starvation. High levels of hyperintensities mark people at risk of stroke, dementia and death.

The Rush team did the new work on a random subset of 121 of the original study participants, each about 80 years old, using a more sophisticated battery of 17 separate mental tests. While MMA levels again correlated with lower cognitive test scores, homocysteine levels did not. MMA elevations marked people likely to score substantially worse than other seniors on how quickly they could assimilate information and ideas and on tests of “episodic memory” — a recall of recent events that can be colored by emotions. Two additional biomarkers of B12 deficiency were also linked to poorer episodic memory and with trouble recalling words.

Other researchers have shown how too little B12 might impact the brain at the cellular level. At the Experimental Biology meeting, April 10 in Washington, D.C., Joshua Miller of the UC Davis Medical Center in Sacramento reported data from 97 people linking subtle B12 deficiency with a slowing of certain visual signals to and their interpretation by the brain. Specifically, Miller looked at visual evoked potentials — the transmission of light signals from the eye to the nervous system. Signaling delays likely reflect a deterioration of the myelin sheath that insulates nerve fibers, he says.

Those in the lower half of B12 blood values had slower visual signaling speeds than did participants in the upper range, and the length of delays correlated with how low B12 measurements had been. The signal delay may indicate that tissues aren’t getting enough B12 even when blood levels are in the normal range.

“So we could think of this, perhaps, as a canary in the coal mine,” Miller says.

Miller adds that even though the evoked potentials his team measured in quick, noninvasive tests focused on the eyes, it’s likely that whatever B12 is doing to these neurons occurs elsewhere as well. So, subtle changes in visual evoked potential might identify early neural damage, he says, “and predict if you’re going to descend into dementia.” Identified early enough, there might still be time to intervene with vitamin therapy, he says, and halt further damage.

Previous studies support the idea that B12 shortfalls, even subclinical ones, might damage nerve signaling generally, says Carmel. What’s greatly needed now, he argues, are major B12-supplementation trials to establish whether vitamin therapy can substantially slow the development of dementia. To date, Carmel notes, Smith’s team at Oxford appears to be the only group investigating that.

B-vitamin therapy “stopped memory decline in people who began with high homocysteine levels,” Smith says. “It’s an amazing result — much better than we could have expected.” His group gave B vitamins, including B6, B12 and folic acid, to 133 people over age 70 for two years. All participants had mild cognitive impairment. It’s a well-defined syndrome, Smith notes, and “50 percent of people with it go on to develop dementia within five years.”

The vitamin cocktail was chosen for its established efficacy in lowering homocysteine. Earlier work, Smith explains, “showed elevated homocysteine increases the risk of cognitive impairment, including Alzheimer’s disease and vascular dementia.” In the September 2010 PLoS One, the Oxford group had reported that, compared with seniors getting a placebo pill, the B-vitamin cocktail reduced brain shrinkage.

A new follow-up paper, posted online July 21 in the International Journal of Geriatric Psychiatry, shows “the biggest effect of supplementation was on memory,” Smith says.

But as impressive as the new studies are, Carmel says, niggling questions remain about how B12 deficiency damages the brain — and whether it acts alone or in consort with deficiencies of other vitamins. The body tends to absorb B12 poorly after age 50, and several medicines further diminish the vitamin’s uptake. “So for many people, especially those with high homocysteine,” Smith says, “it seems to make sense to take these vitamins.”

http://www.eurekalert.org/pub_releases/2011-09/jhmi-iod092111.php

Instead of defibrillator's painful jolt, there may be a gentler way to prevent sudden death

Study demonstrates 'proof of principle' in new way to restore normal heart rhythm

Each year in the United States, more than 200,000 people have a cardiac defibrillator implanted in their chest to deliver a high-voltage shock to prevent sudden cardiac death from a life-threatening arrhythmia. While it's a necessary and effective preventive therapy, those who've experienced a defibrillator shock say it's painful, and some studies suggest that the shock can damage heart muscle.

Scientists at Johns Hopkins believe they have found a kinder and gentler way to halt the rapid and potentially fatal irregular heart beat known as ventricular fibrillation. In a study published in the September 28 issue of Science Translational Medicine, they report success using lower amplitude, high-frequency alternating current at 100-200 Hz to stop the arrhythmia in the laboratory. They say this approach also may prove to be less painful for patients because of the lower amplitude and different frequency range than what is used for standard defibrillator shocks.

“We believe we have found a way to stop a life-threatening arrhythmia by applying a high-frequency alternating current for about one-third of a second,” says Ronald Berger, M.D., Ph.D., a cardiac electrophysiologist at the Johns Hopkins Heart and Vascular Institute and a professor of medicine and biomedical engineering at the Johns Hopkins University School of Medicine. “The alternating current puts the disorganized, rapidly moving heart cells in a refractory state, like suspended animation. When we turn off the current, the cells immediately return to a normal state. If further research confirms what we have learned so far, this could be less painful for a patient while achieving the same result,” says Berger, who is the senior author of the study.

Graduate student Seth Weinberg, a co-lead author of the study, says the way heart cells behave during ventricular fibrillation is like having a football stadium full of fans, all of whom are doing “the wave” in an uncoordinated, disorganized fashion. “Applying the alternating current,” he says, “is like freezing all of the fans in a position halfway between sitting and standing. When the current is turned off, the fans sit down in an orderly way, ready to be instructed to do the wave in a coordinated way.”

Berger says he and his colleagues, a team of Johns Hopkins cardiologists and biomedical engineers, have shown a proof of principle and a novel scientific finding: It's the first time heart cells have been put in a suspended state to interrupt ventricular fibrillation.

"The idea to put heart cells in a brief state of suspended animation came from studies showing that alternating current could be used to put nerve cells in a similar state to block the signals that cause pain," says Harikrishna Tandri, M.D., assistant professor of medicine and the other co-lead author of the study.

To ensure that they were correctly assessing the response of the heart cells to the high frequency current, and, at the same time, distinguishing the response from the cells' native electrical activity, the researchers used a technique called optical mapping. Unlike other electrical recording techniques, optical mapping measurements are not affected by applied electrical stimuli, according to co-author Leslie Tung, Ph.D., professor of biomedical engineering, who led the optical mapping aspect of the research.

In order to allow the team to explore the response of individual heart cells to the high-frequency electrical current, co-author Natalia Trayanova, Ph.D., professor of biomedical engineering, produced a multi-scale computational model of the heart.

While more testing is needed in animal models, the researchers are optimistic that their work may lead to a new approach to shock the human heart back to a normal rhythm. "We are ultimately hoping to develop a device that, instead of delivering a painful, high-voltage shock when it detects a life-threatening arrhythmia, applies a more gentle alternating current for the right amount of time to stop the dangerous rhythm. We think that would be a great benefit to the millions of people worldwide who have a defibrillator to prevent sudden death," Berger says.

Ventricular fibrillation is an uncontrolled twitching or quivering of muscle fibers in the lower chambers of the heart. It is the most dangerous type of arrhythmia and is often caused by a heart attack. During ventricular fibrillation, the heart cannot pump blood to the rest of the body, which leads to sudden death unless the person is revived through CPR or a shock from an external defibrillator. People who are fortunate to have survived ventricular fibrillation and those who have other risk factors, are advised to have an implanted defibrillator to detect ventricular fibrillation and shock the heart back to a normal rhythm.

In addition to Berger, Weinberg, Tandri, Trayanova and Tung, other authors of the study were Kelly Chang and Renjun Zhu. http://www.hopkinsmedicine.org/heart_vascular_institute/experts/physician_profile/ADB0581903306E89F7082BAF7901CFA3/Ronald_Berger,%20MD

http://www.eurekalert.org/pub_releases/2011-09/uoc--btk092811.php

Big Tobacco knew radioactive particles in cigarettes posed cancer risk but kept quiet
Tobacco companies knew that cigarette smoke contained radioactive alpha particles for more than four decades and developed "deep and intimate" knowledge of these particles' cancer-causing potential, but they deliberately kept their findings from the public, according to a new study by UCLA researchers.

The analysis of dozens of previously unexamined internal tobacco industry documents, made available in 1998 as the result of a legal settlement, reveals that the industry was aware of cigarette radioactivity some five years earlier than previously thought and that tobacco companies, concerned about the potential lung cancer risk, began in-depth investigations into the possible effects of radioactivity on smokers as early as the 1960s.

"The documents show that the industry was well aware of the presence of a radioactive substance in tobacco as early as 1959," the authors write. "Furthermore, the industry was not only cognizant of the potential 'cancerous growth' in the lungs of regular smokers, but also did quantitative radiobiological calculations to estimate the long-term lung radiation absorption dose of ionizing alpha particles emitted from cigarette smoke." The study, published online Sept. 27 in *Nicotine & Tobacco Research*, the peer-reviewed journal of the Society for Research on Nicotine and Tobacco, adds to a growing body of research detailing the industry's knowledge of cigarette smoke radioactivity and its efforts to suppress that information.

"They knew that the cigarette smoke was radioactive way back then and that it could potentially result in cancer, and they deliberately kept that information under wraps," said the study's first author, Hrayr S. Karagueuzian, a professor of cardiology who conducts research at UCLA's Cardiovascular Research Laboratory, part of the David Geffen School of Medicine at UCLA. "Specifically, we show here that the industry used misleading statements to obfuscate the hazard of ionizing alpha particles to the lungs of smokers and, more importantly, banned any and all publication on tobacco smoke radioactivity."

The radioactive substance - which the UCLA study shows was first brought to the attention of the tobacco industry in 1959 - was identified in 1964 as the isotope polonium-210, which emits carcinogenic alpha radiation. Polonium-210 can be found in all commercially available domestic and foreign cigarette brands, Karagueuzian said, and is absorbed by tobacco leaves through naturally occurring radon gas in the atmosphere and through high-phosphate chemical fertilizers used by tobacco growers. The substance is eventually inhaled by smokers into the lungs.

The study outlines the industry's growing concerns about the cancer risk posed by polonium-210 inhalation and the research that industry scientists conducted over the decades to assess the radioactive isotope's potential effect on smokers - including one study that quantitatively measured the potential lung burden from radiation exposure in a two-pack-a-day smoker over a two-decade period.

Karagueuzian and his colleagues made independent calculations using industry and academic data and arrived at results that very closely mirrored those of that industry study, which was conducted nearly a quarter-century ago. They then compared those results to rates used by the Environmental Protection Agency to estimate lung cancer risk among individuals exposed to similar amounts of alpha particle-emitting radon gas in their homes.

"The gathered data from the documents on the relevant radiobiological parameters of the alpha particles - such as dose, distribution and retention time - permitted us to duplicate the industry's secretly estimated radiation absorbed dose by regular smokers over a 20- or 25-year period, which equaled 40 to 50 rads," he said. "These levels of rads, according to the EPA's estimate of lung cancer risk in residents exposed to radon gas, equal 120 to 138 deaths per 1,000 regular smokers over a 25-year period."

Despite the potential risk of lung cancer, tobacco companies declined to adopt a technique discovered in 1959 and then another developed in 1980 that could have helped eliminate polonium-210 from tobacco, the researchers said. The 1980 technique, known as an acid-wash, was found to be highly effective in removing the radioisotope from tobacco plants, where it forms a water-insoluble complex with the sticky, hair-like structures called trichomes that cover the leaves. And while the industry frequently cited concerns over the cost and the possible environmental impact as rationales for not using the acid wash, UCLA researchers uncovered documents that they say indicate the real reason may have been far different.

"The industry was concerned that the acid media would ionize the nicotine, making it more difficult to be absorbed into the brains of smokers and depriving them of that instant nicotine rush that fuels their addiction," Karagueuzian said. "The industry also were well aware that the curing of the tobacco leaves for more than a one-year period also would not eliminate the polonium-210, which has a half-life of 135 days, from the tobacco leaves because it was derived from its parent, lead-210, which has a half-life of 22 years."

Karagueuzian said the insoluble alpha particles bind with resins in the cigarette smoke and get stuck and accumulate at the bronchial bifurcations of the lungs, forming "hot spots," instead of dispersing throughout the lungs. In fact, previous research on lung autopsies in smokers who died of lung cancer showed that malignant growths were primarily located at the same bronchial bifurcations where these hot spots reside.

"We used to think that only the chemicals in the cigarettes were causing lung cancer," Karagueuzian said. "But the case of the these hot spots, acknowledged by the industry and academia alike, makes a strong case for an increased probability of long-term development of malignancies caused by the alpha particles. If we're lucky, the alpha particle-irradiated cell dies. If it doesn't, it could mutate and become cancerous."

Karagueuzian said the findings are very timely in light of the June 2009 passage of the Family Smoking Prevention and Tobacco Control Act, which grants the U.S. Food and Drug Administration broad authority to regulate and remove harmful substances - with the exception of nicotine - from tobacco products. The UCLA research, he said, makes a strong case that the FDA ought to consider making the removal of alpha particles from tobacco products a top priority. "Such a move could have a considerable public health impact, due to the public's graphic perception of radiation hazards," he said.

To uncover the information, Karagueuzian and his team combed through the internal tobacco industry documents made available online as part of the landmark 1998 Tobacco Master Settlement Agreement. Documents from Philip Morris, R.J. Reynolds, Lorillard, Brown I Williamson, the American Tobacco Company, the Tobacco Institutes and the Council for Tobacco Research, as well as the Bliley documents, were examined, Karagueuzian said. The team searched for key terms such as "polonium-210," "atmospheric fallout," "bronchial epithelium," "hot particle" and "lung cancer," among others.

Karagueuzian said the earliest causal link between alpha particles and cancer was made in around 1920, when alpha particle-emitting radium paint was used to paint luminescent numbers on watch dials. The painting was done by hand, and the workers commonly used their lips to produce a point on the tip of the paint brush. Many workers accumulated significant burdens of alpha particles through ingestion and absorption of radium-226 into the bones and subsequently developed jaw and mouth cancers. The practice was eventually discontinued.

Another example involves liver cancer in patients exposed to chronic low-dose internal alpha particles emitted from the poorly soluble deposits of thorium dioxide after receiving the contrast agent Thorotrast. It has been suggested that the liver cancers resulted from point mutations of the tumor suppressor gene p53 by the

accumulated alpha particles present in the contrast media. The use of Thorotrast as contrast agent was stopped in the 1950s.

In addition to Karagueuzian, authors of the study include the late Amos Norman, professor emeritus in the departments of radiation oncology and radiological sciences at UCLA; James Sayre, of the departments of biostatistics and radiological sciences at UCLA; and Celia White, who served from 1999 to 2002 as director of content and services at the Legacy Tobacco Documents Library, which contains more than 13 million documents created by major tobacco companies related to their advertising, manufacturing, marketing, sales and scientific research activities.

The study was funded by the University of California Tobacco-Related Disease Research Program, established by the passage of California's SB1613 in 1989 to fund a comprehensive University of California grant program to support research into the prevention, causes and treatment of tobacco-related diseases.

The authors report no conflict of interest.

http://www.eurekalert.org/pub_releases/2011-09/uoc--ees092811.php

Easily embarrassed? Study finds people will trust you more

Findings suggest that embarrassment is the social glue that fosters cooperation

If tripping in public or mistaking an overweight woman for a mother-to-be leaves you red-faced, don't feel bad. A new study from the University of California, Berkeley, suggests that people who are easily embarrassed are also more trustworthy, and more generous.

In short, embarrassment can be a good thing.

"Embarrassment is one emotional signature of a person to whom you can entrust valuable resources. It's part of the social glue that fosters trust and cooperation in everyday life," said UC Berkeley social psychologist Robb Willer, a coauthor of the study published in this month's online issue of the *Journal of Personality and Social Psychology*.

Not only are the UC Berkeley findings useful for people seeking cooperative and reliable team members and business partners, but they also make for helpful dating advice. Subjects who were more easily embarrassed reported higher levels of monogamy, according to the study.

"Moderate levels of embarrassment are signs of virtue," said Matthew Feinberg, a doctoral student in psychology at UC Berkeley and lead author of the paper. "Our data suggests embarrassment is a good thing, not something you should fight." The paper's third author is UC Berkeley psychologist Dacher Keltner, an expert on pro-social emotions.

Researchers point out that the moderate type of embarrassment they examined should not be confused with debilitating social anxiety or with "shame," which is associated in the psychology literature with such moral transgressions as being caught cheating.

While the most typical gesture of embarrassment is a downward gaze to one side while partially covering the face and either smirking or grimacing, a person who feels shame, as distinguished from embarrassment, will typically cover the whole face, Feinberg said.

The results were gleaned from a series of experiments that used video testimonials, economic trust games and surveys to gauge the relationship between embarrassment and pro-sociality.

In the first experiment, 60 college students were videotaped recounting embarrassing moments such as public flatulence or making incorrect assumptions based on appearances. Typical sources of embarrassment included mistaking an overweight woman for being pregnant or a disheveled person for being a panhandler. Research assistants coded each video testimonial based on the level of embarrassment the subjects showed.

The college students also participated in the "Dictator Game," which is used in economics research to measure altruism. For example, each was given 10 raffle tickets and asked to keep a share of the tickets and give the remainder to a partner. Results showed that those who showed greater levels of embarrassment tended to give away more of their raffle tickets, indicating greater generosity.

Researchers also surveyed 38 Americans whom they recruited through Craigslist. Survey participants were asked how often they feel embarrassed. They were also gauged for their general cooperativeness and generosity through such exercises as the aforementioned dictator game.

In another experiment, participants watched a trained actor being told he received a perfect score on a test. The actor responded with either embarrassment or pride. They then played games with the actor that measured their trust in him based on whether he had shown pride or embarrassment.

Time and again, the results showed that embarrassment signals people's tendency to be pro-social, Feinberg said. "You want to affiliate with them more," he said, "you feel comfortable trusting them."

So, can one infer from the results that overly confident people aren't trustworthy? While the study didn't delve into that question, researchers say they may look into that in the future.

Soviet-era pill from Bulgaria helps smokers quit

A pill developed in Bulgaria during the Soviet era shows promise for helping millions of smokers cheaply and safely kick the habit, the first big study of it shows.

AP - It could become a new weapon to combat smoking in poor countries, but it is unclear whether it will ever reach the market in the U.S. or Western Europe.

The drug, cytisine, is now used just in Eastern Europe, where smokers usually take the pill for three or four weeks. Generic versions cost as little as \$5 to \$17 a month, compared with about \$100 for an eight-week supply of nicotine patches or about \$300 for a 12-week supply of Pfizer Inc.'s Chantix pill - common treatments in rich countries to help smokers quit.

Cytisine "is so cheap that even in developing countries, if you can afford to smoke, you can afford to stop," said Dr. Robert West of University College London. He led the study, published in Thursday's New England Journal of Medicine.

Cytisine, sold as Tabex by Sopharma AD, a Bulgaria-based company, is derived from laburnum seeds, which contain a natural nicotine substitute. West said it was discovered when much of the Soviet Union's drug research was farmed out to Bulgaria. Russian soldiers referred to it as "fake tobacco," West said.

New research suggests the drug can triple smokers' chances of being off cigarettes after one year compared with those taking a dummy pill.

It has been sold in Eastern Europe for about 40 years but has not been approved in Western Europe or the United States. Extab, a Sopharma subsidiary, has bought worldwide rights to sell it and plans to market it cheaply in developing countries like China and India.

Some experts are unsure it will ever make it to Western markets without larger trials - and without a big pharmaceutical stepping in to pay for them.

"It is possible that extensive bureaucracy and overcautious regulations will prevent its use in the U.S. and Europe," said Peter Hajek, director of the Tobacco Dependence Research Unit at Queen Mary University Hospital in London. Hajek said if a big drugmaker got involved, the price would probably jump.

About 95 percent of smokers who try to quit without help fail within six months, and more than two-thirds of the world's 1 billion smokers live in developing countries. Smoking is the world's leading cause of preventable death.

The new study was the first major test of cytisine's safety and effectiveness. It involved 740 smokers in Poland. For 25 days, half were given cytisine and half received dummy pills. Neither they nor their doctors knew which treatment they were getting. After one year, 2.4 percent of those on dummy pills had stopped smoking versus 8.4 percent of the people on cytisine (often pronounced like "citizen").

The study did not compare cytisine to other smoking-cessation treatments, but experts said the results were on par with those of many alternatives. It had a lower success rate than the 15 to 30 percent seen in studies with Chantix, but that drug carries warnings about possible psychiatric risks.

Nearly 14 percent of people taking cytisine reported stomach problems such as nausea, versus 8 percent of the people on dummy pills. There were two deaths in the group taking cytisine, from lung cancer and cardiac arrest, and three deaths in the placebo group, from lung cancer, stroke and respiratory problems. Dizziness and sleep problems were a little more common among cytisine users.

There have been no signs of any serious side effects in the more than 7 million people who have taken cytisine in the past 40 years, according to records from regulatory agencies in countries where the drug is licensed.

Patients are given the pills to satisfy their nicotine cravings, then are slowly weaned off the drug. They start with six pills a day, cutting down to just two by the end of the treatment.

The study was paid for by Britain's Medical Research Council, while the cytisine and the placebo pills were provided by Sopharma AD. West and one other study author reported having consulted for drugmakers, including several that make kick-the-habit products. West also has a patent pending on a nicotine delivery device.

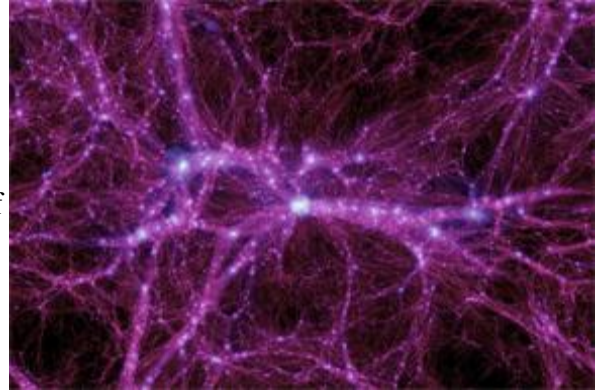
Cytisine "looks promising, but the jury is still out," said Dr. Michael Fiore, director of the Center for Tobacco Research and Interventions at the University of Wisconsin, Madison, who had no role in the study. Fiore said that more studies are needed to confirm the findings, but that an inexpensive anti-smoking drug would be useful anywhere.

Cosmic thread that binds us revealed

Astronomers at The Australian National University have found evidence for the textile that forms the fabric of the Universe.

PhysOrg.com - In findings published in the October Astrophysical Journal, the researchers discovered proof of a vast filament of material that connects our Milky Way galaxy to nearby clusters of galaxies, which are similarly interconnected to the rest of the Universe. The team included Dr. Stefan Keller, Dr. Dougal Mackey and Professor Gary Da Costa from the Research School of Astronomy and Astrophysics at ANU.

“By examining the positions of ancient groupings of stars, called globular clusters, we found that the clusters form a narrow plane around the Milky Way rather than being scattered across the sky,” Dr. Keller said.



Simulated view of the interconnecting filaments between galaxies. Michael Boylan-Kolchin, University of California Irvine

“Furthermore, the Milky Way’s entourage of small satellites are seen to inhabit the same plane. “What we have discovered is evidence for the cosmic thread that connects us to the vast expanse of the Universe. “The filament of star clusters and small galaxies around the Milky Way is like the umbilical cord that fed our Galaxy during its youth.”

Dr. Keller said there were two types of matter that made up the Universe – the dominant, enigmatic dark matter and ordinary matter in the form of galaxies, stars and planets.

“A consequence of the Big Bang and the dominance of dark matter is that ordinary matter is driven, like foam on the crest of a wave, into vast interconnected sheets and filaments stretched over enormous cosmic voids – much like the structure of a kitchen sponge,” he said. “Unlike a sponge, however, gravity draws the material over these interconnecting filaments towards the largest lumps of matter, and our findings show that the globular clusters and satellite galaxies of the Milky Way trace this cosmic filament.

“Globular clusters are systems of hundreds of thousands of ancient stars tightly packed in a ball. In our picture, most of these star clusters are the central cores of small galaxies that have been drawn along the filament by gravity. “Once these small galaxies got too close the Milky Way the majority of stars were stripped away and added to our galaxy, leaving only their cores. “It is thought that the Milky Way has grown to its current size by the consumption of hundreds of such smaller galaxies over cosmic time.”

Provided by Australian National University

http://www.eurekalert.org/pub_releases/2011-09/uoh-wav092711.php

Weeds are vital to the existence of farmland species, study finds

Weeds, which are widely deemed as a nuisance plant, are vital to the existence of many farmland species according to a new University of Hull study published in the journal Biological Conservation

Weeds, which are widely deemed as a nuisance plant, are vital to the existence of many farmland species according to a new University of Hull study published in the journal Biological Conservation today.

Since many weeds produce flowers and seed, they are an integral part of our ecosystem and together with other crop and non-crop seeds found on farms, they provide food for over 330 species of insects, birds and animals.

Scientists at the Universities of Hull and Bristol examined the distribution of berries and soil-surface seeds collected over an entire year. They built up the first picture of its kind showing which farmland habitats are the most important seed producers and how the seed resources change in different seasons.

Whilst considerable research has linked agricultural intensification with dramatic declines of seed-feeding birds, surprisingly little is known about the wider importance of seeds for other farmland animals, especially insects. Moreover, understanding the dynamics of farmland seed food resources for species of conservation concern is of considerable research interest.

The team of researchers created complex 'food-webs' which linked all farmland insects, birds and mammals which are known to feed on the seeds recorded on a typical organic farm. They used the food-web to identify the key seed-producing plants favoured by most animals. This enabled them to model the impacts of increasing farm management on seed resources and food-web interactions.

Dr Darren Evans, a lecturer in Conservation Biology at the University of Hull and who led the research said: "We understand a lot about farmland birds and mammals, but little about the plants and insects that underpin them. In this study, we discovered not only the importance of weed and non-crop species for many farmland animals but that the vast majority of seed-feeding animals on farms are insects, which are often overlooked by conservationists."

The team of researchers converted seed counts into mass and energy estimates; they found that shed seeds and berries available on a single organic farm have can produce a staggering 560 gigajoules of energy.

Dr Evans added: "We show that an increase in farm management intensity can lead to a decline of up to 19% in overall seed biomass and energy, which is presumably why agricultural intensification causes many farmland birds to suffer a 'hunger-gap' in mid-winter. Non-farmed habitats such as woodlands and hedgerows are important for seed resources, but we also show that some farmed areas are too".

The team predicted that increased farming intensity can have large cascading effects throughout an entire ecosystem, which can indirectly affect animals associated with the seeds.

The scientists conclude that farmers can maintain or enhance biodiversity by appropriately managing uncultivated, semi-natural habitats such as hedgerows and woodlands but that even small changes to cropped areas, such as allowing some weed species to grow, could have a huge impact on the quantity and variety of seeds available on the farm and the animals that feed on them. They suggest that rather than focussing limited conservation resources on a small number of charismatic species such as birds, an alternative approach is to understand and manage the complex network of species interactions on farms and to explore ways of incorporating this into policy.

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A copy of the paper entitled 'Seeds in farmland food-webs: Resource importance, distribution and the impacts of farmland management' is available on request.

http://www.eurekalert.org/pub_releases/2011-09/ci-mnl092911.php

Mercury not like other planets MESSENGER finds

Only six months into its Mercury orbit, the tiny MESSENGER spacecraft has shown scientists that Mercury doesn't conform to theory.

Washington, D.C.- Its surface material composition differs in important ways from both those of the other terrestrial planets and expectations prior to the MESSENGER mission, calling into question current theories for Mercury's formation. Its magnetic field is unlike any other in the Solar System, and there are huge expanses of volcanic plains surrounding the north polar region of the planet and cover more than 6% of Mercury's surface. These findings and other surprises are revealed in seven papers in a special section of the September 30, 2011, issue of Science.

Surface Surprises

Two of the seven papers indicate that the surface material is more like that expected if Mercury formed from similar, but less oxidized, building blocks than those that formed its terrestrial cousins, perhaps reflecting a variable proportion of ice in the initial accretionary stages of the planets. Measurements of Mercury's surface by MESSENGER's X-Ray and Gamma-Ray Spectrometers also reveal substantially higher abundances of sulfur and potassium than previously predicted. Both elements vaporize at relatively low temperatures, and their abundances thus rule out several popular scenarios in which Mercury experienced extreme high-temperature events early in its history.

"Theorists need to go back to the drawing board on Mercury's formation," remarked the lead author of one of the papers, Carnegie's Larry Nittler. "Most previous ideas about Mercury's chemistry are inconsistent with what we have actually measured on the planet's surface."

Volcanism

For decades scientists had puzzled over whether Mercury had volcanic deposits on its surface. MESSENGER's three flybys answered that question in the affirmative, but the global distribution of volcanic materials was not well constrained. New data from orbit show a huge expanse of volcanic plains surrounding the north polar region of Mercury. These continuous smooth plains cover more than 6% of the total surface of Mercury.

Another lead author, James Head of Brown University, said that the deposits appear typical of flood lavas, like those found in the few-million-year-old Columbia River Basalt Group on Earth. "Those on Mercury appear to have poured out from long, linear vents and covered the surrounding areas, flooding them to great depths and burying their source vents,"

Scientists have also discovered vents, measuring up to 25 kilometers (km) (15.5 miles) in length, that appear to be the source of some of the tremendous volumes of very hot lava that have rushed out over the surface of Mercury and eroded the substrate, carving valleys and creating teardrop-shaped ridges in the underlying terrain.

New landforms

MESSENGER revealed an unexpected class of landform on Mercury and suggest that a previously unrecognized geological process is responsible for its formation. Images collected during the Mariner 10 and MESSENGER flybys of Mercury showed that the floors and central mountain peaks of some impact craters are very bright and have a blue color relative to other areas of Mercury. These deposits were considered to be unusual because no craters with similar characteristics are found on the Moon. But without higher-resolution images, the bright crater deposits remained a curiosity.

Now MESSENGER's orbital mission has provided close-up, targeted views of many of these craters. The bright areas are composed of small, shallow, irregularly shaped depressions that are often found in clusters said David T. Blewett, a planetary scientist at the Johns Hopkins University Applied Physics Laboratory (APL) and lead author of one of the Science reports. "The science team adopted the term 'hollows' for these features to distinguish them from other types of pits that are found on Mercury."

Hollows have been found over a wide range of latitudes and longitudes, suggesting that they are fairly common across Mercury. Many of the depressions have bright interiors and halos, and Blewett says the ones detected so far have a fresh appearance and have not accumulated small impact craters, indicating that they are relatively young.

"Analysis of the images and estimates of the rate at which the hollows may be growing lead to the conclusion that they are actively forming today," Blewett says. "The old conventional wisdom was that 'Mercury is just like the Moon.' But from its vantage point in orbit, MESSENGER is showing us that Mercury is radically different from the Moon in just about every way we can measure."

Magnetic Field

Earth, Mercury, Jupiter, Saturn, Uranus, and Neptune all have intrinsic magnetic fields, but MESSENGER found that Mercury's weak field is different. So too are particle acceleration processes in Mercury's magnetosphere, as described in a paper by lead author George Ho of APL. MESSENGER's observations of energetic electrons indicated that their distribution is not consistent with what are known as Van Allen radiation belts. These belts are bands of charged particles that interact with the magnetic field and surround the planets.

Mercury's magnetic equator is also well to the north of the planet's geographic equator. The best-fitting internal dipole magnetic field is located about 480 km (298 miles), northward of the planet's center.

The team found that sodium is the most important plasma ion contributed by the planet to the magnetosphere. "We had previously observed neutral sodium from ground observations, but up close we've discovered that charged sodium particles are concentrated near Mercury's polar regions where they are likely liberated by solar wind ion sputtering, effectively knocking sodium atoms off Mercury's surface" notes the University of Michigan's Thomas Zurbuchen, author of one of the Science reports. "We were able to observe the formation process of these ions, one that is comparable to the manner by which auroras are generated in the Earth atmosphere near polar regions."

MESSENGER's Fast Imaging Plasma Spectrometer detected helium ions throughout the entire volume of Mercury's magnetosphere. "Helium must be generated through surface interactions with the solar wind," says Zurbuchen. "We surmise that the helium was delivered from the Sun by the solar wind, implanted on the surface of Mercury, and then fanned out in all directions." "Our results tell us is that Mercury's weak magnetosphere provides very little protection of the planet from the solar wind," he continued. "Extreme space weather must be a continuing activity at the surface of the planet closest to the Sun."

"In the history of exploration of our planetary system, the first spacecraft to orbit a planet has always yielded stunning surprises, and MESSENGER has been true to that pattern," notes Carnegie's Sean Solomon, MESSENGER Principal Investigator. "Our first good views of the polar regions, our first high-resolution images, our first continuous observations of the exosphere and magnetosphere, and our first opportunity to collect time-consuming measurements of surface composition have all returned unexpected results. Mercury is not the planet described in the textbooks. Although a true sibling of Venus, Mars, and Earth, the innermost planet has had a much more exciting life than anyone predicted."

MESSENGER (MErcury Surface, Space ENvironment, GEochemistry, and Ranging) is a NASA-sponsored scientific investigation of the planet Mercury and the first space mission designed to orbit the planet closest to the Sun. The MESSENGER spacecraft launched on August 3, 2004, and entered orbit about Mercury on March 18, 2011, to begin a one-year study of its target planet. Dr. Sean C. Solomon, of the Carnegie Institution of Washington, leads the mission as Principal Investigator. The Johns Hopkins University Applied Physics Laboratory built and operates the MESSENGER spacecraft and manages this Discovery-class mission for NASA.

Study finds promising drug treatment for improving language, social function in people with autism

University of Missouri researchers are examining the use of propranolol to improve the primary traits associated with autism

COLUMBIA, Mo. – Most drug therapy interventions for people with autism have targeted psychiatric problems, including aggression, anxiety and obsessive behavior. Now, University of Missouri researchers are examining the use of propranolol (a drug used to treat high blood pressure and control heart rate as well as to reduce test anxiety) to improve the primary traits associated with autism – difficulty with normal social skills, language and repetitive behaviors. MU researchers say the drug is a promising new avenue for improving language and social function.

"We can clearly say that propranolol has the potential to benefit language and may help people with autism function appropriately in social situations, including making eye contact with others," said David Beversdorf, associate professor and Thompson Endowed Chair at the MU Thompson Center for Autism and Neurodevelopmental Disorders. "Enhancing both language and social function is significant because those are two of the three main features of autism. Clinical trials will assess the drug's effect on all three features, including repetitive behaviors."

Propranolol has been used for decades with minimal side effects reported in healthy individuals. The MU researchers are the first to study the benefits of the drug in autism in a controlled manner. The next step is to conduct clinical trials to determine if the benefits are sustained over time and if the benefits outweigh other effects.

Propranolol acts by reducing the effect of norepinephrine brought on by stress in order to allow the brain to function as if there is no stress. This is beneficial for persons who have trouble with test taking. In people with autism, the brain is hardwired in a different way, making processing more rigid in terms of social function and language. The researchers think that the drug acts on these hardwired processes and therefore, improves tasks and functioning in these areas.

"When healthy persons are under stress their neurons fire in an expedited manner, to respond quickly to the stressor, that does not allow input from remote sources," Beversdorf said. "Unfortunately when trying to solve difficult problems, we need information from remote sources. For example, if we come in contact with a tiger, we are programmed to respond quickly and run away. However, this fight or flight response isn't as helpful in today's society because instead of facing a tiger, we are taking an exam or giving a speech. Evidence suggests that individuals with autism have a similar difficulty accessing input from remote sources regardless of the presence of stress when using language and communicating."

In previous studies, the researchers found that propranolol helped people with autism solve simple anagrams, word unscrambling tasks. It also increased semantic word fluency, which requires understanding the definition of words and connectivity among different brain regions. It did not help with letter fluency, which involves identifying words that start with specific letters and requires less distributed connectivity among brain regions.

"We are interested to see if we can predict who will or will not respond to this drug among those with autism," Beversdorf said. "In the follow-up study, we're looking at markers of increased stress reactivity. If we find that those with higher stress reactivity are more sensitive to the effects of propranolol, it might help to identify who will benefit most from the drug."

Beversdorf is a physician and faculty member at MU in the departments of Radiology, Neurology and Psychological Sciences. The study, "Effect of Propranolol on Word Fluency in Autism," was published in Cognitive and Behavior Neurology.

<http://www.newscientist.com/article/dn20982-brain-tweak-turns-wimpy-mice-into-dominant-leaders.html>

Brain tweak turns wimpy mice into dominant leaders

19:00 29 September 2011 by Andy Coghlan

Dominant mice can be humbled and wimps made mighty by altering the strength of electrical connections in their brain.

The crucial connections dictating a mouse's place in the social hierarchy appear to sit in the part of the brain called the medial prefrontal cortex (mPFC), responsible for emotion and decision-making.

To investigate the impact of the mPFC on social ranking, Hailan Hu of the Chinese Institute of Neuroscience in Shanghai and her colleagues first worked out the social hierarchy of mice through challenges between pairs of the animals in transparent tubes. When the mice came face to face, the subordinate animal would retreat and back out of the tube.

The team then injected a virus into some of the mice that inserts a gene called GluR4 into mPFC neurons. GluR4 amplifies transmission of electrical signals – a key step in strengthening connections.

Up the ladder

When the dominance tests were repeated, previously subordinate mice that had received the virus were propelled to the top of the social ladder. "These mice also tended to gain more food in competition with their cage-mates, mark more territories and sing more courtship songs than their subordinate counterparts," says Hu.

Hu's team then took brain slices from the mice in order to measure the electrical currents produced from mPFC neurons. Mice that had received the virus had mPFC connections almost twice as strong as those in control mice.

And back down

Another virus that implanted a gene called R4Ct – that reduces transmission of electrical signals – into the mPFC reduced connections between neurons to 71 per cent of their strength in control mice. Previously dominant mice who received this treatment became subordinate.

Hu says that the strengthened connections probably enable mice to exert more control over anger, emotion and aggression. The mPFC is the "master region" dictating release of key neurotransmitters that regulate emotion, as well as hormones vital for fine-tuning dominance behaviours, including aggressiveness and responses to stress.

Hu's team have begun experiments to identify circuits triggered by the mPFC. "We want to know how dominance rank is initiated and maintained by different neuronal activities in these circuits," she says.

The work could throw new light on the brain mechanisms that dictate social standing in people and its effects on anxiety, motivation, addiction and relationships, says Hu. But she cautions that social rank in humans is much more complex than in mice. "In mice it's mostly about temperament, whereas in humans it relies on factors such as education, wealth and heritage," she says.

Results from humans show several areas of the prefrontal cortex are strongly involved in dominance and hierarchy, says Andreas Meyer-Lindenberg of the Central Institute of Mental Health in Mannheim, Germany. "So it's good to see an approach to this social phenomenon pointing to shared neural mechanisms between humans and rodents." *Journal reference: Science, DOI: 10.1126/science.1209951*

<http://www.newscientist.com/article/mg21128323.400-epigenetic-clue-to-schizophrenia-and-bipolar-disorder.html>

Epigenetic clue to schizophrenia and bipolar disorder

Updated 11:12 30 September 2011 by Andy Coghlan

TWIN studies have shown that people with schizophrenia and bipolar disorder have changes in gene activity caused by their environment.

The finding provides the strongest evidence yet that such gene changes might cause the conditions.

Jonathan Mill at the Institute of Psychiatry, King's College London, and colleagues scanned the genome of 22 pairs of identical twins - chosen because one twin in each pair was diagnosed with schizophrenia or bipolar disorder. As expected, the twins had identical DNA. However, they showed significant differences in chemical "epigenetic" markings - changes that do not alter the sequence of DNA but leave chemical marks on genes that dictate how active they are. These changes were on genes that have been linked with bipolar disorder and schizophrenia.

Mill's team scanned for differences in the attachment of chemical methyl groups at 27,000 sites in the genome. Methylation normally switches genes off, and de-methylation turns them on.

Regardless of which condition the twin had, the most significant differences, with variations of up to 20 per cent in the amount of methylation, were in the promoter "switch" for a gene called ST6GALNAC1, which has been linked with schizophrenia. Although the function of the gene isn't fully established, it is thought to add sugars to proteins, which could alter the speed or specificity of their usual function.

The findings tallied with another study which involved screening post-mortem brain tissue from people who had had some form of psychosis. The researchers found differences of up to 25 per cent in methylation of the same gene compared with controls.

The twin scans also revealed methylation differences in GPR24, a gene previously linked to bipolar disorder. One gene, called ZNF659, showed over-methylation in people with schizophrenia and under-methylation in those who were bipolar, suggesting that the conditions might result from opposing gene activity (Human Molecular Genetics, DOI: 10.1093/hmg/ddr416).

"We know these disorders are related, and there are clinical features shared by both," says Mill. "But our scan suggests there are some genes that might be overactive in one disease and underactive in the other."

Mill says twins would need to be scanned regularly throughout life to find out whether epigenetic changes precede the onset of the disorders. It might be possible then to link the alterations to environmental changes such as stressful events or diet, which have been shown to cause inheritable epigenetic changes in mice.

"I feel this is the best evidence yet, from human studies, supporting the hypothesis that epigenetic mechanisms may drive psychiatric disorders," says David Sweatt, who studies epigenetics at the University of Alabama and was not involved in the study.

<http://medicalxpress.com/news/2011-09-rare-flu-like-virus.html>

Rare flu-like virus on the rise: US

A rare virus has killed three people and sickened nearly 100 in Japan, the Philippines, the United States and the Netherlands over the past two years, US health authorities said Friday.

The culprit is human enterovirus 68 (HEV68), and its respiratory symptoms can be particularly dangerous to children, the US Centers for Disease Control and Prevention said in its Morbidity and Mortality Weekly Report.

In six separate clusters of the virus that showed up worldwide, patients commonly experienced cough, difficulty breathing and wheezing.

The highest number of cases were found in Japan, where local public health authorities reported more than 120 cases last year. However, the CDC said it could only confirm clinical data for 11 of those patients, all children, one of whom died. The Philippines had 21 cases in late 2008 and early 2009, causing two deaths, the CDC said. Other cases surfaced in the Netherlands and the US states of Georgia, Pennsylvania and Arizona, for 95 total confirmed cases over two years.

The virus was first discovered in four children who were sick with pneumonia in California in 1962, but subsequent incidences have been rare and sporadic, according to the CDC.

"Identification of a large number of patients with HEV68 respiratory disease detected during a single season, such as described in this report, is a recent phenomenon," it added. "Whether this increase in recognized cases is attributable to improved diagnostics or whether the clusters themselves represent an emergence of the pathogen is unknown."

The CDC said its report aimed to highlight HEV68 as "an increasingly recognized cause of respiratory illness" and urged clinicians to report cases of unexplained respiratory illness to public health authorities.

Human enterovirus is closely related to human rhinovirus, which causes the common cold. (c) 2011 AFP

<http://www.bbc.co.uk/news/health-15095623>

Polio outbreak: Where now for global eradication drive?

A massive vaccination campaign is under way in China after an outbreak of polio, more than 10 years after the country was declared polio free. What are the implications for the global effort to eradicate the disease?

By Helen Briggs Health editor, BBC News website

Health officials in China are taking strong measures in their drive to stop an outbreak of polio. Children who have been given the vaccine are marked behind the ears with indelible ink to make sure there is no confusion.

Vaccination is taking place in homes, kindergartens, schools, bus stations and airports, according to the Global Polio Eradication Initiative, which is leading the worldwide effort to wipe out the disease.

Until a few weeks ago, polio was a disease of the past in China, as in most countries around the world. But the discovery of 10 cases of polio in the western province of Xinjiang, and one death, has led to millions of children and young adults being vaccinated.

Genetic studies show the virus came across the border from neighbouring Pakistan. Polio still has a foothold in Pakistan, along with three other countries - India, Afghanistan and Nigeria. There have also been sporadic cases in other formerly polio-free countries - such as parts of western Africa - as the virus is brought in by travellers. "There is an urgent need to eradicate this disease in the remaining endemic areas because it is from there that it will continue to spread," says Oliver Rosenbauer, of the World Health Organization. "The focus has to be on the endemic countries."

The Global Polio Eradication Initiative was launched in 1988, with the aim of ridding the world of polio. It has two main strategies - mass vaccination and careful surveillance for new cases.

Since 1988, the number of cases have fallen by more than 99%. But persistent pockets of polio transmission in northern India, northern Nigeria and on the border between Afghanistan and Pakistan continue to put unvaccinated children everywhere at risk. Since 2000, polio cases have hovered at about 1,000 a year.

India, with its huge population and poor health facilities in some states, presents a major challenge in efforts to wipe out polio. It has reported only a single case this year, but, concerned about the possibility of polio spreading from Pakistan, the government has set up vaccination booths at major border crossings.

Security issues in parts of Afghanistan and Pakistan make vaccination programmes there very difficult; while Nigeria, which has about 30 cases this year, is continuing its efforts to control the virus, after previous setbacks.

A further challenge is funding. The Global Polio Eradication Initiative says the funding gap up to the end of 2012 is \$590m.

"This is really a risk we shouldn't have to be taking at this stage of the game," says Oliver Rosenbauer.

Some observers believe we have reached the last mile in eradicating polio. But Dr Heidi Larson, a vaccine expert at the London School of Hygiene and Tropical Medicine, says it's not clear how long the last mile will take.

"We're very close but we've been close for over a decade now," she says. "We are in the last mile but that last mile can take us six months or it can take six years.

"The most important thing is that we cannot give up, because if we do the cost will be tremendous - at a financial level, at a health impact level and an overall cost of public confidence in some vaccines."

<http://www.nytimes.com/2011/10/01/health/01hip.html? r=1&partner=rss&emc=rss>

Remedy Is Elusive as Metallic Hips Fail at a Fast Rate

Doctors and patients face a growing public health problem as one of the country's biggest medical device failures unfolds

By BARRY MEIER

BOSTON — As surgeons here sliced through tissue surrounding a failed artificial hip in a 53-year-old man, they discovered what looked like a biological dead zone. There were matted strands of tissue stained gray and black; a large strip of muscle near the hip no longer contracted.

Dr. Young-Min Kwon, the lead orthopedic surgeon on the operation, said the damage was more extensive than tests had indicated and might be permanent. "The prognosis is guarded," Dr. Kwon said.

Similar scenes are playing out at hospitals nationwide as a growing number of patients seek to have faulty metal-on-metal artificial hips removed and replaced. More than a decade ago, some researchers had warned that the hips shed tiny pieces of metallic debris that posed potential health threats to patients. But those warnings were not heeded, and now doctors and patients face a growing public health problem as one of the country's biggest medical device failures unfolds.

Some patients with all-metal hips - ones in which the cup and ball of a joint is made of metal — said they had been bounced from doctor to doctor who did not have the knowledge or the tools to properly diagnose the problem. And by the time they reach specialists like Dr. Kwon at Massachusetts General Hospital, potentially lasting damage may have already taken place.

Dr. Kwon's recent patient, Robert Cartier, said he saw seven doctors over the course of a year who told him not to worry or who gave him shots for his pain. Diagnostic tests also did not point to a problem. Only recently have researchers determined that such scans need to be run in a specific way to detect the extent of metal-related damage. "It really didn't get picked up early. I picked it up," Mr. Cartier said, adding that he learned of Dr. Kwon while researching metal hip problems on the Internet. "It is like buyer-beware kind of stuff, you are trusting the doctors."

All orthopedic implants, regardless of their composition, shed debris as they wear. But researchers say they believe that the particles released by some all-metal hips pose a special threat because scavenger cells dispatched by the body to neutralize the debris convert it into biologically active metallic ions. In some patients, a chain reaction begins that can destroy tissue and muscle.

For researchers like Dr. Kwon, the challenge is to identify both those patients most at risk and the best ways to monitor them. So far, only a small fraction of the estimated 500,000 people in this country who received an all-metal hip over the last decade have suffered injuries. But studies suggest that those numbers will grow and that tissue destruction is occurring silently in some patients who have no obvious symptoms like pain.

"What we are seeing is a complex phenomenon," Dr. Kwon said.

A recent study in England found that all-metal hips were failing early at three times the rate of hips made from metal-and-plastic components, which can last 15 years or more. Most people recover well from a device replacement procedure, but specialists like Dr. Kwon are also seeing growing numbers of patients with complications.

Over the last year, his caseload has tripled and other specialized hospitals like Rush University Medical Center in Chicago have also seen cases. In the first six months of this year, the Food and Drug Administration received more than 5,000 reports about problems with the all-metal hips, according to a recent analysis by The New York Times.

In May 2010, Mr. Cartier, an electrical contractor who lives in Manchester, N.H., got an all-metal hip on his right side when he underwent a procedure known as "resurfacing," an alternative to traditional hip replacement intended to provide more mobility. A similar procedure performed in 2009 on his left hip appeared to have gone well, but the more recent operation left him in pain.

Frustrated with advice from doctors, he took the trip to Boston to see Dr. Kwon. In 2007, the surgeon had arrived as a fellow at Oxford University in England just as problems with all-metal hips were emerging in

England and Australia, two countries where the implants were used earlier than the United States. Since then, he has become a co-author of several studies linking metallic debris and aberrant tissue growth.

For Dr. Kwon, Mr. Cartier's predicament posed a puzzle because he lacked some obvious signs of trouble; his implant, which was made by Stryker, had not been recalled, and the device had been implanted properly. But when the specialist ran his own diagnostic tests, there was evident tissue damage.

"He was the trouble guy," Mr. Cartier said. "He deals with the cases that other people couldn't figure out."

Other patients have encountered frustrations. For example, Cyndi Lafuente, a senior adviser at the Internal Revenue Service, learned last year that the model of artificial hip she got in 2007 was being recalled by its manufacturer, the DePuy division of Johnson & Johnson, because of its high early failure rate. Ms. Lafuente said she contacted her surgeon, who ordered a blood test and diagnostic scans, which came back with normal results. Still concerned, she contacted a British researcher, Dr. David Langton, who had helped sound the alarm about the recalled model.

In January, she met again with her orthopedist, armed with information from that talk and other research. The physician suggested that they run an added test. It showed very high metal levels, she said. Now, four months after replacement surgery, her recovery has been slow and her leg is still weak, said Ms. Lafuente, who has sued DePuy. "If I had not played an aggressive role, I think I would have had permanent damage" to muscle or bone, she said.

In May, the Food and Drug Administration ordered makers of all-metal hips to develop studies to determine how frequently the devices were failing and the implications for patients. But those studies are not likely to be completed for years, leaving specialists like Dr. Kwon to face a medical problem playing out in baffling ways.

For example, while some patients like Mr. Cartier with high blood levels of metallic debris show evidence of tissue damage, other patients with high levels appear fine. Tissue damage is also occurring in some patients with low or normal metal blood levels and in some patients who are free of symptoms.

As for Mr. Cartier, Dr. Kwon is not done with him. Even before the recent operation to replace his right hip, the surgeon told him the metal hip joint on his left side would also have to be replaced. "He told me, 'I can't guarantee that you are going to be one of those guys who come out as well as you went in,' " he said.

<http://www.physorg.com/news/2011-10-square-small-businesses-edge.html>

'Square' gives small US businesses an edge

Word is spreading quickly among small American businesses hustling to thrive in tough economic times -- hip young Internet payment service Square will give them an edge.

Word is spreading quickly among small American businesses hustling to thrive in tough economic times -- hip young Internet payment service Square will give them an edge. The brain child of Twitter co-founder Jack Dorsey, Square lets anyone take credit card payments using smartphones or iPad tablet computers. Barely one year old, it is used by 750,000 merchants and handles \$2 billion in transactions annually, chief operating officer Keith Rabois told AFP. The San Francisco-based startup is aiming to snag the 26 million American businesses that do not accept credit cards and is planning to expand outside the United States next year.

Square charges a 2.75 percent fee, on par or lower than merchants would be charged per transaction if they went directly through credit card companies, but has the advantage of no set up costs. "Square increases the prospect of closing a sale," Rabois said. "In a tough financial time, we make it easier. We remove a lot of the pain from starting a business and growing a business." Rabois believes Square can eliminate the need for cash registers, eventually letting people run small businesses almost entirely from iPads using inventory, billing and other features in software.

The company was named after the small, square magnetic-strip readers plugged into smartphones or iPads to allow people to swipe credit cards. It feeds credit card information to free Square software and avoids the need to rent or buy credit card processing equipment. A Square Card Case application at the iTunes store even lets people run tabs at businesses and pay using just their names. "You can get a massage, bicycle to the farmers market and never have to pull out the credit card," Rabois said.

Making it easy to begin taking credit card payments has been a boon for small businesses from sole operators based at homes to brick-and-mortar shops. Massage therapist Joey Garcia credited Square with being the reason that his client list is double that of a classmate even though both set up businesses around 18 months ago. "Since I'm a private practitioner most people think I'm only cash and check," said Garcia, the sole employee of Urban Therapy. "When I tell people I take credit cards also, that changes the whole conversation." The 37-year-old Apple gadget fanatic uses an iPad to take payments as well as track business finances with Square software.

"When I go to houses, take out my iPad and swipe a card they think it's the neatest thing," Garcia said of the reaction he gets to Square. "I've turned on other small businesses to it," he added.

Customers who pay using Square get digital receipts sent to them by email or text messages.

Miki Nishihata began using Square in his Hello Bicycle shop in the city of Seattle after it was recommended to him by a hair stylist. Before that, he opted not to take credit cards because of the expense and hassles such as signing contracts and needing a telephone line. "Square is very new or small business friendly," said Nishihata, who opened his shop three years ago. "The learning curve is nothing; anyone can do it that has a smartphone."

He did not contain his dislike for traditional commercial payment services and "primitive" technology such as receipt printers and desktop credit card machines. Nishihata has gone from dealing completely in cash to 90 percent of his sales being paid by credit cards. "We've sold dozens of bikes that are \$600 and people don't usually carry that much money," he said. "When people have plastic, people will buy basically anything."

Luis Morales of Humble House Foods in the Texas city of San Antonio started a Square trend at traditionally cash-based farmers markets. "I was the first to take credit cards and everyone else caught on," Morales said. "Now it is the norm."

Since starting to use Square late last year he has seen holiday season sales jump as being short on pocket money no longer stopped people from buying Humble House pesto, tapenades, hummus and other spreads.

Morales and his wife plan to redesign their Humble Foods farmers market booth in the weeks ahead with influences from Square and consumer electronics giant Apple. Tables and tent walls will be removed and all sales conducted using Square on iPads, Morales said. (c) 2011 AFP

<http://www.physorg.com/news/2011-10-pee-power-urine-loving-bug-churns.html>

Pee power: Urine-loving bug churns out space fuel

Scientists on Sunday said they had gained insights into a remarkable bacterium that lives without oxygen and transforms ammonium, the ingredient of urine, into hydrazine, a rocket fuel.

So-called anammox -- for anaerobic ammonium oxidation -- germs caused a sensation when they were first identified in the 1990s, but uncovering their secrets is taking time.

In a letter published by the British science journal Nature, researchers at Radboud University Nijmegen in the Netherlands reported they had identified the molecular mechanism by which the bugs do their fuel-trick.

"Proving this was quite a feat," said Mike Jetten, professor of microbiology at the university's Institute for Water and Wetland Research. "We had to deploy a range of new experimental methods. In the end, we managed to isolate the protein complex responsible for hydrazine production, a beautifully red mixture."

The team's work initially piqued NASA's interest, but this faded when the US space agency learned that only small quantities of precious hydrazine are produced, "nothing like enough to get a rocket to Mars," said Jetten.

"Now we are accurately determining the crystal structure of the protein complex. Perhaps we can improve the production process if we have a better understanding of how the protein complex fits together."

Anammox is now used commercially in water purification because it is so energy-efficient in breaking down ammonia. It also has potential applications as a biofuel, cleaning up sewerage sludge without the need for pumps to provide air, and providing methane in return. (c) 2011 AFP

<http://medicalxpress.com/news/2011-10-mayo-clinic-multiple-surgeries-anesthesia.html>

Mayo Clinic study: multiple surgeries and anesthesia exposure

Children exposed more than once to anesthesia and surgery prior to age 2 were approximately three times as likely to develop learning disabilities

Every year millions of babies and toddlers receive general anesthesia for procedures ranging from hernia repair to ear surgery. Now, researchers at Mayo Clinic in Rochester have found a link among children undergoing multiple surgeries requiring general anesthesia before age 2 and learning disabilities later in childhood.

The study, which will be published in the November 2011 issue of Pediatrics (published online Oct. 3), was conducted with existing data of 5,357 children from the Rochester Epidemiology Project and examined the medical and educational records of 1,050 children born between 1976 and 1982 in a single school district in Rochester.

"After removing factors related to existing health issues, we found that children exposed more than once to anesthesia and surgery prior to age 2 were approximately three times as likely to develop problems related to speech and language when compared to children who never underwent surgeries at that young age," says David Warner, M.D., Mayo Clinic anesthesiologist and co-author of the study.

Among the 5,357 children in the cohort, 350 underwent surgeries with general anesthesia before their second birthday and were matched with 700 children who did not undergo a procedure with anesthesia. Of those exposed to anesthesia, 286 experienced only one surgery and 64 had more than one. Among those children who had multiple surgeries before age 2, 36.6 percent developed a learning disability later in life. Of those with just one surgery, 23.6 percent developed a learning disability, which compares to 21.2 percent of the children who

developed learning disabilities but never had surgery or anesthesia before age 2. However, researchers saw no increase in behavior disorders among children with multiple surgeries.

"Our advice to parents considering surgery for a child under age 2 is to speak with your child's physician," says Randall Flick, M.D., Mayo Clinic pediatric anesthesiologist and lead author of the study. "In general, this study should not alter decision-making related to surgery in young children. We do not yet have sufficient information to prompt a change in practice and want to avoid problems that may occur as a result of delaying needed procedures. For example, delaying ear surgery for children with repeated ear infections might cause hearing problems that could create learning difficulties later in school."

This study, funded by the U.S. Food and Drug Administration, examines the same population data used in a 2009 study by Mayo Clinic researchers, which reviewed records for children under age 4 and was published in the medical journal *Anesthesiology*.

The 2009 Mayo Clinic study was the first complete study in humans to suggest that exposure of children to anesthesia might affect development of the brain. Several previous studies suggested that anesthetic drugs might cause abnormalities in the brains of young animals. The study released today is significant because it examines children experiencing anesthesia and surgeries under age 2 and removes factors associated with existing health issues. *Provided by Mayo Clinic*

http://www.eurekalert.org/pub_releases/2011-10/nrao-fif093011.php

First images from ALMA

The National Radio Astronomy Observatory (NRAO) has released an image of a merging pair of galaxies as seen by the growing ALMA telescope

In celebration of the start of the Atacama Large Millimeter/submillimeter Array's (ALMA) Early Science observations, the National Radio Astronomy Observatory (NRAO) has released an image of a merging pair of galaxies as seen by the growing ALMA telescope. The detailed views of star-formation in the Antennae Galaxies confirm that this new telescope, while far from completed, and with only a fraction of its ultimate imaging capability, will surpass all others of its kind.

The image gives but a hint of ALMA's promise to make unprecedented contributions to understanding the on

The Observations

"We chose the impressive interacting system called the Antennae galaxies as a test subject," said Dr. Alison Peck, an astronomer from the NRAO who is serving in Chile as ALMA Deputy Project Scientist during its years of careful construction and rigorous testing, "because it is in the process of undergoing the type of spectacular, violent merger that many galaxies may have undergone since their formation, but that we can rarely catch in action."

This image is a composite of views of the Antennae taken with several different types of telescopes, including test data from ALMA (orange and yellow, and shown alone in the inset). Like the view from an ultrasound of an expectant mother's womb, ALMA reveals hidden starbirth nestled inside otherwise obscuring dust clouds.



Multiwavelength composite of interacting galaxies NGC 4038/4039, the Antennae, showing VLA radio (blues), past and recent starbirths in HST and CTIO optical (whites and pinks), and a selection of current star-forming regions in ALMA's mm/submm (orange and yellows) showing detail surpassing all other views in these wavelengths. B. Saxton, (NRAO/AUI/NSF); ALMA (ESO/NAOJ/NRAO); HST (NASA, ESA, and B. Whitmore (STScI)); J. Hibbard, (NRAO/AUI/NSF); NOAO/AURA/NSF.

"ALMA's test views of the Antennae show us star-forming regions on a level of detail that no other telescope on Earth or in space has attained. This capability can only get much better as ALMA nears completion," said Dr. Mark McKinnon, North American ALMA Project Manager from the NRAO in Charlottesville, Virginia.

The inset boxes show regions imaged in additional, higher detail. With this weekend's start of ALMA's first official cycle of observing, called Early Science, a team of North American astronomers is poised to make even more detailed observations of the Antennae.

"The collision of these two galaxies has turned them into an impressive star-making factory. With Hubble, we've seen the formation of thousands of massive super star clusters, each with thousands or even millions of young stars in them," said team leader, Dr. Brad Whitmore of the Space Telescope Science Institute. "With

ALMA, we will focus on the heart of the collision, the interaction region where the two galaxies are crashing together. We can then study the formation of the Antennae's most impressive fireworks and look into the cores of the giant molecular clouds where the star clusters are born."

By 2013, ALMA will have more than tripled its current number of telescopes to 66. With the telescopes combined into a single system by one of the world's fastest, special-purpose supercomputers, and aimed at many more objects all across the sky, ALMA will reveal a Universe never before seen.

The Antennae Galaxies

About six hundred million years ago, this peculiar object was two separate, beautiful spiral galaxies passing by each other for the first time. Now, it captivates astronomers as the youngest and nearest colliding galaxy pair ever found.

Spiral galaxies are a spectacular example of gravity's beautiful geometries, stunning structures created when swirling gas and dust are drawn together. In a spiral galaxy's center, a central massive black hole hoards a giant glowing bulge of gas and stars for itself, while out in the spinning disk, rippling compression waves trigger stars to form along its dusty, gas-rich arms. In isolation, a spiral galaxy would make stars like this until its gas was too thinly spread to fuel any new ones.

In contrast, colliding galaxies like the Antennae are an equally spectacular example of gravity's jumbled catastrophes. If two spirals form too near each other, their centers will slowly tug each other closer, and the gas and stars from their outer disks will lag behind, eventually trailing off into tails. As the central denser parts of the galaxies slowly collide over millions of years, their gas and dust clouds often compress together, eventually producing clumps of new stars.

The National Radio Astronomy Observatory is a facility of the National Science Foundation, operated by Associated Universities, Inc.

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership between Europe, Japan and North America in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Southern Observatory (ESO), in Japan by the National Institutes of Natural Sciences (NINS) in cooperation with the Academia Sinica in Taiwan and in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC). ALMA construction and operations are led on behalf of Europe by ESO, on behalf of Japan by the National Astronomical Observatory of Japan (NAOJ) and on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI).