http://www.eurekalert.org/pub_releases/2012-03/acoc-rri032412.php

Rapid rise in blood pressure before midlife may cause irreversible heart damage

Study suggests a new approach for monitoring and treating high blood pressure, especially in younger people

CHICAGO - The current "watch-and-wait" approach to high blood pressure readings in younger people may set patients on a course for irreversible heart damage, according to research presented today at the American College of Cardiology's 61st Annual Scientific Session. The Scientific Session, the premier cardiovascular medical meeting, brings cardiovascular professionals together to further advances in the field.

The study tracked cardiac health indicators over the course of a lifetime to predict future outcomes and found that a sharp rise in blood pressure in midlife, not just crossing a certain threshold, can increase a person's risk of heart disease later in life.

Furthermore, the study showed blood pressure medications do not fully reverse damage to the heart from high blood pressure, even if drugs are successful in returning blood pressure to normal levels. The findings suggest that early detection and treatment of rapidly rising blood pressure in midlife may be required to prevent long-term damage to the heart.

"Just being on blood pressure medication will not completely get your heart back to where it was before you started having high blood pressure," said Arjun K. Ghosh, MBBS, MRCP (U.K.), clinical research fellow at the International Centre for Circulatory Health of Britain's National Heart and Lung Institute, Imperial College London and clinical career development fellow at the U.K. Medical Research Council's Unit for Lifelong Health and Ageing on behalf of the study team.

Based on the study findings, Dr. Ghosh said a borderline or pre-hypertensive blood pressure reading (a systolic pressure of 120 to 139 mm Hg or a diastolic pressure from 80 to 89 mm Hg) – even in your 30s – should warrant more frequent monitoring so doctors can assess the rate of change in blood pressure. Current guidelines are based on a single, one-off measure of blood pressure and doctors rarely prescribe blood pressure-lowering medications for people in their 30s, as the risk of them having a cardiovascular event in the next 10 years is low.

"If people have a rapid rise in blood pressure, early treatment should be considered, because we know from this study that, 30 years down the line, they're going to have more heart damage than somebody with a slower rise in blood pressure," Dr. Ghosh said. "We're potentially talking about a completely new way of assessing and treating blood pressure in younger people."

The results revealed people who experienced a relatively rapid increase in blood pressure during midlife typically had a larger left ventricle – an independent risk factor for heart disease and other health problems – than those whose blood pressure edged up more slowly or later in life. Those taking medication to manage high blood pressure had a larger left ventricle than those with the same blood pressure who had never taken medication, suggesting that treatment in later life did not reverse the consequences of a rapid rise in blood pressure in earlier years.

Doctors are currently more likely to recommend blood pressure medications for older people who have a higher overall cardiovascular risk, thanks in part to their age, and few monitor patients' blood pressure frequently enough to track the rate of increase.

However, said Dr. Ghosh, "that approach may be fundamentally incorrect, because you're not taking into account your previous life-course blood pressure. You need to watch more closely, and you need to identify if there is a rapid rise in blood pressure."

The findings resulted from a study of 1,653 men and women born in Britain in one week in March 1946. Now entering its 66th year, the study represents the longest-running birth cohort in the U.K. and is also one of the longest-running in the world. Participants were screened for blood pressure and other health indicators at ages 36, 43 and 53. From age 60-64, participants underwent echocardiography imaging to allow researchers to assess their heart health.

This study is based on data from the Medical Research Council National Survey of Health and Development, a long-term birth cohort study funded by the Medical Research Council of the United Kingdom. Dr. Ghosh has no conflicts of interest to report. Another analysis of the same study cohort revealed people with diabetes are at greater risk of heart problems the longer they have diabetes, a finding that has implications for risk prevention and treatment. The study, "Duration of Diabetes is a Significant Independent Predictor of Elevated Left Ventricular Mass," will be recognized as the year's top study from the U.K. at a joint session of the British Cardiovascular Society and the ACC. Dr. Ghosh will present those findings on Sunday, March 25 at 11 a.m. in McCormick Place South, Hall A.

http://www.bbc.co.uk/news/health-17511012

Third of UK babies 'will live to 100'

A third of babies born in 2012 in the UK are expected to live to 100, according to a new report.

The Office for National Statistics experts base their projections on current and future survival trends. And if their calculations are borne out, more than 95,000 of those who turn 65 this year can expect to celebrate their 100th birthday in 2047.

The number of centenarians has been steadily increasing - from 600 in 1961 to nearly 13,000 in 2010. In 2012, the figure is expected to hit 14,500, and by 2035 will have breached the 100,000 mark. And more of these will be women than men.

In 2012 there are 826,000 babies aged under one year. Although more are boys - 423,000 compared to 403,000 girls - the survival odds are greater for females. Women have higher life expectancies than men at every age. Of those born in 2012, 135,000 men and 156,000 women are expected to still be alive by age 100.

The report - ***What are the Chances of Surviving to Age 100?*** - comes as ministers have pledged to double funding for dementia research in the UK.

In the next decade, the number with the disease - mostly elderly - is expected to top one million.

http://bit.ly/GRwGF1

Question Arises over Theory that Moon Resulted from Collision with Earth

A titanium signature is posing a new puzzle for the popular theory that the Moon formed when a Mars-size body smacked into Earth some 4.5 billion years ago

By Ron Cowen of Nature magazine

A chemical analysis of lunar rocks may force scientists to revise the leading theory for the Moon's formation: that the satellite was born when a Mars-sized body smacked into the infant Earth some 4.5 billion years ago.

If that were the case, the Moon ought to bear the chemical signature of both Earth and its proposed 'second' parent. But a study published today in Nature Geoscience suggests that the Moon's isotopic composition reflects only Earth's contribution.

Junjun Zhang at the University of Chicago in Illinois and her colleagues used a mass spectrometer to make the most precise measurement so far of the relative abundance of titanium-50 and titanium-47 in Moon rocks gathered by the Apollo missions in the 1970s. The authors report that the lunar ratio of the two isotopes is identical to that found in Earth's mantle, within about 4 parts per million.

This presents a conundrum for the lunar-formation model, Zhang says, because any Mars-sized body that might have collided with the fledgling Earth is believed to have been chemically distinct. Studies of meteorites -- the modern stand-ins for planet-sized bodies that once roamed the Solar System -- indicate that such objects had an isotopic titanium abundance that could have deviated from the terrestrial value by as much as 600 parts per million. And because simulations suggest that the second body contributed more than 40% of the Moon's bulk, the lunar isotopic ratio shouldn't mirror the terrestrial value so closely.

Vapor trail

Zhang and colleagues' chemical analysis is not the first to challenge the theory. Researchers have long known that the isotopic ratio of oxygen in Moon rocks bears the same signature as Earth's mantle. But because oxygen is easily vaporized in a collision, it could have been readily exchanged between Earth and the cloud of vapor and magma that was produced by the impact and coalesced to form the moon, allowing both bodies to reach the same isotopic abundance. Titanium does not vaporize as easily and it would have been more difficult -- although not impossible -- for both bodies to have reached the same ratio, notes Zhang.

"That's why this is not just another similarity between Earth and the Moon," but a finding to be reckoned with, notes planetary scientist Robin Canup of the Southwest Research Institute in Boulder, Colorado.

Other models that merit consideration, Zhang says, include the fission model, according to which the Moon was spun out of Earth's mantle early on, when the planet's centrifugal force might have exceeded its gravitational force.

But Canup says that although the collision model may need revision, it need not be abandoned. She has modeled a collision between Earth and a renegade protoplanet about twice the mass of Mars -- heavier than previously considered. A more massive second body would have substantially altered Earth's original isotopic composition, leading to a newborn Moon and evolving Earth that are more similar than in previous simulations.

Zhang agrees there are still ways for the collision model to work. If the fledgling Moon had cooled more slowly than assumed, there could have been enough time for an exchange of titanium isotopes between the cloud of vapor and magma and the Earth. In their most recent simulation of the moon's formation after a giant

impact, Canup and her colleague Julien Salmon found evidence of a longer formation time. They presented the findings at the Lunar and Planetary Science Conference in The Woodlands, Texas, on 22 March.

"Our study cannot provide a definite answer to the origin of the Moon yet," says Zhang. "The message we hope to convey is that isotopic homogeneity between the Earth and Moon is a fundamental new constraint on the evolution of the Earth-Moon system."

http://www.physorg.com/news/2012-03-european-neandertals-extinct-humans.html

New research suggests European Neandertals were almost extinct long before humans showed up

Focusing on mitochondrial DNA sequences from 13 Neandertal individuals, a research team some surprising results.

Western Europe has long been held to be the "cradle" of Neandertal evolution since many of the earliest discoveries were from sites in this region. But when Neandertals started disappearing around 30,000 years ago, anthropologists figured that climactic factors or competition from modern humans were the likely causes. Intriguingly, new research suggests that Western European Neandertals were on the verge of extinction long before modern humans showed up. This new perspective comes from a study of ancient DNA carried out by an international research team. Rolf Quam, a Binghamton University anthropologist, was a co-author of the study led by Anders Götherström at Uppsala University and Love Dalén at the Swedish Museum of Natural History, and published in the journal Molecular Biology and Evolution.

"The Neandertals are our closest fossil relatives and abundant evidence of their lifeways and skeletal remains have been found at many sites across Europe and western Asia," said Quam, assistant professor of anthropology. "Until modern humans arrived on the scene, it was widely thought that Europe had been populated by a relatively stable Neandertal population for hundreds of thousands of years. Our research suggests otherwise and in light of these new results, this long-held theory now faces scrutiny."

Focusing on mitochondrial DNA sequences from 13 Neandertal individuals, including a new sequence from the site of Valdegoba cave in northern Spain, the research team found some surprising results. When they first started looking at the DNA, a clear pattern emerged. Neandertal individuals from western Europe that were older than 50,000 years and individuals from sites in western Asia and the Middle East showed a high degree of genetic variation, on par with what might be expected from a species that had been abundant in an area for a long period of time. In fact, the amount of genetic variation was similar to what characterizes modern humans as a species. In contrast, Neandertal individuals that come from Western Europe and are younger than 50,000 years show an extremely reduced amount of genetic variation, less even than the present-day population of remote Iceland.

These results suggest that western European Neandertals went through a demographic crisis, a population bottleneck that severely reduced their numbers, leaving Western Europe largely empty of humans for a period of time. The demographic crisis seems to coincide with a period of extreme cold in Western Europe. Subsequently, this region was repopulated by a small group of individuals from a surrounding area. The geographic origin of this source population is currently not clear, but it may be possible to pinpoint it further with more Neandertal sequences in the future.

"The fact that Neandertals in western Europe were nearly extinct, but then recovered long before they came into contact with modern humans came as a complete surprise to us," said Dalén, associate professor at the Swedish Museum of Natural History in Stockholm. "This indicates that the Neandertals may have been more sensitive to the dramatic climate changes that took place in the last Ice Age than was previously thought."

Quam concurs and suggests that this discovery calls for a major rethink of the idea of cold adaptation in Neandertals. "At the very least, this tells us that without the aid of material culture or technology, there is a limit to our biological adaptation," said Quam. "It may very well have been the case that the European Neandertal populations were already demographically stressed when modern humans showed up on the scene."

The results presented in the study are based entirely on severely degraded ancient DNA, and the analyses have therefore required both advanced laboratory and computational methods. The research team has involved experts from a number of countries, including statisticians, experts on modern DNA sequencing and paleoanthropologists from Sweden, Denmark, Spain and the United States.

"This is just the latest example of how studies of ancient DNA are providing new insights into an important and previously unknown part of Neandertal history, "said Quam. "Ancient DNA is complementary to anthropological studies focusing on the bony anatomy of the skeleton, and these kinds of results are only possible with ancient DNA studies. It's exciting to think about what will turn up next."

Provided by Binghamton University

http://news.yahoo.com/high-court-throws-human-gene-patents-161634977.html

High court throws out human gene patents

The Supreme Court on Monday threw out a lower court ruling allowing human genes to be patented, a topic of enormous interest to cancer researchers, patients and drug makers.

WASHINGTON (AP) - The court overturned patents belonging to Myriad Genetics Inc. of Salt Lake City on two genes linked to increased risk of breast and ovarian cancer.

Myriad's BRACAnalysis test looks for mutations on the breast cancer predisposition gene, or BRCA. Those mutations are associated with much greater risks of breast and ovarian cancer.

The American Civil Liberties Union has been arguing that genes couldn't be patented, a position taken by a district court judge but overturned on appeal.

The justices' decision sends the case back down for a continuation of the battle between the scientists who believe that genes carrying the secrets of life should not be exploited for commercial gain and companies that argue that a patent is a reward for years of expensive research that moves science forward.

In 2010, a federal judge ruled that genes cannot be patented. U.S. District Judge Robert Sweet said he invalidated the patents because DNA's existence in an isolated form does not alter the fundamental quality of DNA as it exists in the body nor the information it encodes.

But last year, a divided panel of the federal appeals court in Washington that handles patent cases reversed Sweet's ruling. The appeals court said genes can be patented because the isolated DNA has a "markedly different chemical structure" from DNA within the body.

The Supreme Court threw out that decision, and sent the case back to the lower courts for rehearing. The high court said it sent the case back for rehearing because of its decision in another case last week saying that the laws of nature are unpatentable.

In that case, the court unanimously threw out patents on a Prometheus Laboratories, Inc., test that could help doctors set drug doses for autoimmune diseases like Crohn's disease.

"The question before us is whether the claims do significantly more than simply describe these natural relations," said Justice Stephen Breyer, who wrote the opinion in the Prometheus Laboratories case. "To put the matter more precisely, do the patent claims add enough to their statements of the correlations to allow the processes they describe to qualify as patent-eligible processes that apply natural law? We believe the answer to this question is no."

The U.S. Patent and Trademark Office has been awarding patents on human genes for almost 30 years. Testing for mutations in the so-called BRCA genes has been around for just over a decade. Women with a faulty gene have a three to seven times greater risk of developing breast cancer and a higher risk of ovarian cancer. Men can also carry a BRCA mutation, raising their risk of prostate, pancreatic and other types of cancer. The mutations are most common in people of eastern European Jewish descent.

Myriad Genetics Inc. sells the only BRCA gene test. The case is Association for Molecular Pathology v. Myriad Genetics, 11-725.

http://www.sciencedaily.com/releases/2012/03/120325173210.htm

Inner Weapons Against Allergies: Gut Bacteria Control Allergic Diseases, Study Suggests

Researchers have found that commensal bacteria might play an important role in influencing and controlling allergic inflammation.

ScienceDaily - When poet Walt Whitman wrote that we "contain multitudes," he was speaking metaphorically, but he was correct in the literal sense. Every human being carries over 100 trillion individual bacterial cells within the intestine -- ten times more cells than comprise the body itself.

Now, David Artis, PhD, associate professor of Microbiology, along with postdoctoral fellow David Hill, PhD, from the Perelman School of Medicine at the University of Pennsylvania, and collaborators from The Children's Hospital of Philadelphia and institutions in Japan and Germany, have found that these commensal bacteria might play an important role in influencing and controlling allergic inflammation. The commensal relationship that develops between humans and internal bacteria is one in which both humans and bacteria derive benefits.

The study -- appearing this week in Nature Medicine -- suggests that therapeutic targeting of immune cell responses to resident gut bacteria may be beneficial in treating allergic diseases.

The researchers build on previous work demonstrating that selective manipulation of the commensal bacterial population could affect the immune system. "Studies in human patients suggest that changes in commensal populations or exposure to broad spectrum antibiotics can predispose patients to the development of systemic allergic diseases," Hill explains. "In addition, previous studies in animal models have shown that

commensal bacteria can influence local immune cells in the intestine. However, the cellular and molecular mechanisms by which commensal bacteria influence the host immune system, in particular the branches of the host immune system that regulate allergic inflammation, are not well understood."

Artis and his colleagues focused on the role of basophils, a type of white blood cell, in causing allergic inflammation, and the relationship between basophil responses and allergic disease.

The investigators administered broad-spectrum oral antibiotics to deplete certain types of bacteria in mice and to subsequently examine the affects on levels of circulating basophils in the blood. Using an animal-based model of allergic inflammation in the lung that shares characteristics with asthma in humans, they found that antibiotic treatment resulted in significantly elevated basophil responses and a marked increase in the amount of basophil-mediated allergic airway inflammation. Elevated serum levels of IgE, an important mediator in allergic disease, were also observed.

After the antibiotic-treated mice were exposed to house dust mite allergen (HDM), a human allergen and a model of allergic airway disease in mice, they showed higher basophil responses in the blood and lymph nodes as well as a heightened allergic response with increased inflammation in the lungs.

Germ-free mice, which are reared in a sterile environment and thus lack all live commensal bacteria, also showed similar responses to those observed in antibiotic-treated mice when exposed to HDM. This finding indicates that commensal bacteria-derived signals are responsible for maintaining normal basophil numbers in the steady-state.

Artis and his colleagues also found that serum concentrations of IgE and circulating basophil numbers were limited by B cell-intrinsic expression of myeloid differentiation factor 88 (MyD88), a protein known to play a role in the recognition of bacteria-derived factors. Signals derived from the commensal bacteria were found to act via IgE to control the number of circulating basophils by limiting the proliferation of basophil precursor cells in the bone marrow.

All of these findings indicate important new processes by which resident commensal bacterial populations influence and control basophil responses and thus influence the response to allergens in our environment.

"The identification of a mechanistic connection between commensal bacteria, basophils, and allergic disease illuminates several new avenues that could be targeted by future therapeutics to block or inhibit the development of allergic disease," Artis notes. Further study and identification of these commensal pathways could also have implications for other chronic diseases related to immune system functioning.

Artis and his colleagues hope to further understand this intricate interplay between the immune system and commensal bacteria. "It may be beneficial to identify the specific commensals and commensal-derived signals that regulate circulating basophil populations as this could lead to the development of new probiotic or other commensal-derived therapies," he says. The work makes clear that the bacterial multitudes within our bodies may have a function and a value never before appreciated.

This work was funded by grants from the National Institute of Allergy and Infectious Disease, the National Cancer Institute, the Burroughs Wellcome Fund, the Penn Genome Frontiers Institute, and the Penn Center for the Molecular Studies in Digestive and Liver Diseases.

The above story is reprinted from materials provided by University of Pennsylvania School of Medicine.

David A Hill, Mark C Siracusa, Michael C Abt, Brian S Kim, Dmytro Kobuley, Masato Kubo, Taku Kambayashi, David F LaRosa, Ellen D Renner, Jordan S Orange, Frederic D Bushman, David Artis. Commensal bacteria–derived signals regulate basophil hematopoiesis and allergic inflammation. Nature Medicine, 2012; DOI: 10.1038/nm.2657

http://www.eurekalert.org/pub_releases/2012-03/uoc--rce032012.php

Regular chocolate eaters are thinner

Katherine Hepburn famously said of her slim physique: "What you see before you is the result of a lifetime of chocolate." New evidence suggests she may have been right.

Beatrice Golomb, MD, PhD, associate professor in the Department of Medicine at the University of California, San Diego, and colleagues present new findings that may overturn the major objection to regular chocolate consumption: that it makes people fat. The study, showing that adults who eat chocolate on a regular basis are actually thinner that those who don't, will be published online in the Archives of Internal Medicine on March 26.

The authors dared to hypothesize that modest, regular chocolate consumption might be calorie-neutral –in other words, that the metabolic benefits of eating modest amounts of chocolate might lead to reduced fat deposition per calorie and approximately offset the added calories (thus rendering frequent, though modest, chocolate consumption neutral with regard to weight). To assess this hypothesis, the researchers examined dietary and other information provided by approximately 1000 adult men and women from San Diego, for whom weight and height had been measured.

The UC San Diego findings were even more favorable than the researchers conjectured. They found that adults who ate chocolate on more days a week were actually thinner – i.e. had a lower body mass index – than those who ate chocolate less often. The size of the effect was modest but the effect was "significant" –larger than could be explained by chance. This was despite the fact that those who ate chocolate more often did not eat fewer calories (they ate more), nor did they exercise more. Indeed, no differences in behaviors were identified that might explain the finding as a difference in calories taken in versus calories expended.

"Our findings appear to add to a body of information suggesting that the composition of calories, not just the number of them, matters for determining their ultimate impact on weight," said Golomb. "In the case of chocolate, this is good news –both for those who have a regular chocolate habit, and those who may wish to start one."

http://www.eurekalert.org/pub_releases/2012-03/jaaj-mfe032212.php

More frequently eating chocolate appears related to lower BMI

More frequently eating chocolate was linked to lower body mass index

CHICAGO – More frequently eating chocolate was linked to lower body mass index (BMI), according to a research letter in the March 26 issue of Archives of Internal Medicine, one of the JAMA/Archives journals.

Consumption of certain types of chocolate has been linked to some favorable metabolic associations with blood pressure, insulin sensitivity and cholesterol level. However, because chocolate can be a calorie-laden sweet there are concerns about eating it.

Beatrice A. Golomb, M.D., Ph.D., and colleagues with the University of California, San Diego, studied 1,018 men and woman without known cardiovascular disease, diabetes or extremes of low-density lipoprotein cholesterol (LDL-C) levels who were screened for participation in a clinical study examining noncardiac effects of statins. To measure chocolate consumption, 1,017 of the participants answered a question about how many times per week they ate chocolate. BMI was calculated for 972 of them. Of the participants, 975 completed a food frequency questionnaire. "Adults who consumed chocolate more frequently had a lower BMI than those who consumed chocolate less often," the authors note.

Participants had a mean (average) age of 57 years, 68 percent were men and the mean BMI was 28. They ate chocolate a mean (average) of two times a week and exercised 3.6 times a week.

"In conclusion, our findings – that more frequent chocolate intake is linked to lower BMI – are intriguing," the authors conclude. "A randomized trial of chocolate for metabolic benefits in humans may be merited."

(Arch Intern Med. 2012;172[6]:519-521. Available pre-embargo to the media at www.jamamedia.org.)

Editor's Note: The study was funded by a grant from the National Heart, Lung and Blood Institute, National Institutes of Health, and was supported by the University of California San Diego General Clinical Research Center. Please see the article for additional information, including other authors, author contributions and affiliations, financial disclosures, funding and support, etc.

http://www.eurekalert.org/pub_releases/2012-03/uow-trm032612.php

Tiny reader makes fast, cheap DNA sequencing feasible

Researchers have devised a nanoscale sensor to electronically read the sequence of a single DNA molecule, a technique that is fast and inexpensive and could make DNA sequencing widely available.

The technique could lead to affordable personalized medicine, potentially revealing predispositions for afflictions such as cancer, diabetes or addiction. "There is a clear path to a workable, easily produced sequencing platform," said Jens Gundlach, a University of Washington physics professor who leads the research team. "We augmented a protein nanopore we developed for this purpose with a molecular motor that moves a DNA strand through the pore a nucleotide at a time."

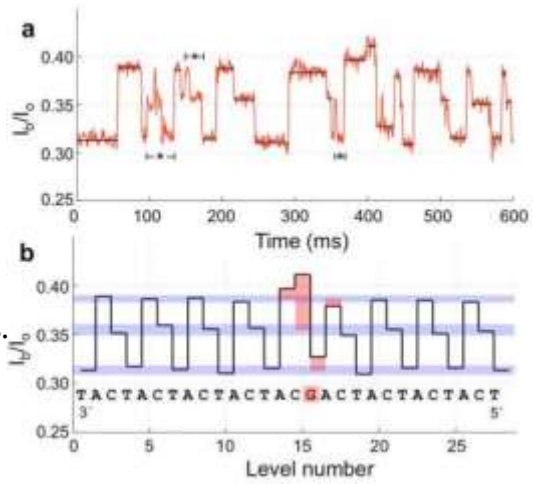
The researchers previously reported creating the nanopore by genetically engineering a protein pore from a mycobacterium. The nanopore, from Mycobacterium smegmatis porin A, has an opening 1 billionth of a meter in size, just large enough for a single DNA strand to pass through.

To make it work as a reader, the nanopore was placed in a membrane surrounded by potassium-chloride solution, with a small voltage applied to create an ion current flowing through the nanopore. The electrical signature changes depending on the type of nucleotide traveling through the nanopore. Each type of DNA nucleotide – cytosine, guanine, adenine and thymine – produces a distinctive signature. The researchers attached a molecular motor, taken from an enzyme associated with replication of a virus, to pull the DNA strand through the nanopore reader. The motor was first used in a similar effort by researchers at the University of California, Santa Cruz, but they used a different pore that could not distinguish the different nucleotide types.

Gundlach is the corresponding author of a paper published online March 25 by Nature Biotechnology that reports a successful demonstration of the new technique using six different strands of DNA. The results corresponded to the already known DNA sequence of the strands, which had readable regions 42 to 53 nucleotides long. "The motor pulls the strand through the pore at a manageable speed of tens of milliseconds per nucleotide, which is slow enough to be able to read the current signal," Gundlach said.

Gundlach said the nanopore technique also can be used to identify how DNA is modified in a given individual. Such modifications, referred to as epigenetic DNA modifications, take place as chemical reactions within cells and are underlying causes of various conditions.

"Epigenetic modifications are rather important for things like cancer," he said. Being able to provide DNA sequencing that can identify epigenetic changes "is one of the charms of the nanopore sequencing method."



The various levels of electrical signal from the sequence of a DNA strand pulled through a nanopore reader (top) corresponds to specific DNA nucleotides, thymine, adenine, cytosine and guanine (bottom). **University of Washington**

Coauthors of the Nature Biotechnology paper are Elizabeth Manrao, Ian Derrington, Andrew Laszlo, Kyle Langford, Matthew Hopper and Nathaniel Gillgren of the UW, and Mikhail Pavlenok and Michael Niederweis of the University of Alabama at Birmingham. The work was funded by the National Human Genome Research Institute in a program designed to find a way to conduct individual DNA sequencing for less than $1,000. When that program began, Gundlach said, the cost of such sequencing was likely in the hundreds of thousands of dollars, but "with techniques like this it might get down to a 10-dollar or 15-minute genome project. It's moving fast."

http://www.sciencedaily.com/releases/2012/03/120326113113.htm

Aspirin: High or Low Dose Following Heart Attack?

Researchers report no significant difference in high versus low dose aspirin in preventing recurring cardiovascular events.

ScienceDaily - Each year, more than one million Americans suffer a heart attack and nearly all patients are prescribed a daily aspirin and an antiplatelet medication during recovery. However, the optimal aspirin dose has been unclear. Now, new research from Brigham and Women's Hospital (BWH) reports that there is no significant difference between high versus low dose aspirin in the prevention of recurring cardiovascular events in patients who suffer from acute coronary syndromes (ACS), which are characterized by symptoms related to obstruction in coronary arteries, which supply blood to the heart.

These findings are presented at the American College of Cardiology Scientific Sessions on March 24, 2012.

"We observed no difference between patients taking a high dose versus a low of aspirin as it relates to cardiovascular death, heart attack, stroke or stent thrombosis," said Payal Kohli, MD, cardiology fellow at BWH and researcher in the TIMI Study Group, who is the lead author on this study. "Interestingly, we did find a dramatic difference in practice patterns of physicians in North America compared to those in the rest of the world," Kohli said. "North American physicians prescribed a high dose of aspirin for two-thirds of all their patients, while the exact reverse was true of the rest of the world. International physicians prescribed a low dose of aspirin to more than two-thirds of their patients." Dr. Stephen D. Wiviott, a cardiologist at BWH and researcher in the TIMI Study Group, is the senior author on the study.

Researchers analyzed data from more than 11000 patients from around the world that were enrolled in the TRITON-TIMI 38 trial, which randomized ACS patients to receive either clopidigrel or prasugrel, two different antiplatelet medications.Some patients were prescribed high doses of aspirin following a heart attack, while others, low doses. The aspirin dose was prescribed at the clinician investigator's discretion and the analysis included 7,106 patients who received low dose aspirin, defined as 150 mg or less, and 4,610 patients who received high dose aspirin, defined as 150 mg or more.

Researchers reported that there was no significant difference observed in the prevention of the combination of heart attack, stroke, cardiovascular death or the prevention of stent thrombosis between the groups that received high or low dose aspirin. Prasugrel was more effective at preventing major adverse cardiovascular events than clopidogrel, regardless of whether patients received low or high dose aspirin.

Researchers also present that patients who received high dose aspirin were more likely to have more cardiac risk factors and have higher cholesterol. Patients who received low dose aspirin were more likely to be white and have no prior history of high blood pressure.

The authors caution that because this is not a randomized study, there may be other treatment differences that could have affected the results and a randomized controlled trial would be needed to definitively establish that no difference existed in outcomes between aspirin dose regimens. These data are, however, consistent with previous reports.

The authors reinforce that all medication changes should be made only after discussion with your physician.

http://www.sciencedaily.com/releases/2012/03/120326160700.htm

'Could My Child Have Autism?'

Ten Signs of Possible Autism-Related Delays in 6 To 12-Month-Old Children

ScienceDaily - Though autism is often not diagnosed until the age of three, some children begin to show signs of developmental delay before they turn a year old. While not all infants and toddlers with delays will develop autism spectrum disorders (ASD), experts point to early detection of these signs as key to capitalizing on early diagnosis and intervention, which is believed to improve developmental outcomes.

According to Dr. Rebecca Landa, director of the Center for Autism and Related Disorders at the Kennedy Krieger Institute in Baltimore, Md., parents need to be empowered to identify the warning signs of ASD and other communication delays.

"We want to encourage parents to become good observers of their children's development so that they can see the earliest indicators of delays in a baby's communication, social and motor skills," says Dr. Landa, who also cautions that some children who develop ASD don't show signs until after the second birthday or regress after appearing to develop typically.

For the past decade, Dr. Landa has followed infant siblings of children with autism to identify red flags of the disorder in their earliest form. Her research has shown that diagnosis is possible in some children as young as 14 months and sparked the development of early intervention models that have been shown to improve outcomes for toddlers showing signs of ASD as young as one and two years old.

Dr. Landa recommends that as parents play with their infant (6 -- 12 months), they look for the following signs that have been linked to later diagnosis of ASD or other communication disorders:

1. Rarely smiles when approached by caregivers 2. Rarely tries to imitate sounds and movements others make, such as smiling and laughing, during simple social exchanges 3. Delayed or infrequent babbling 4. Does not respond to his or her name with increasing consistency from 6 -- 12 months 5. Does not gesture to communicate by 10 months 6. Poor eye contact 7. Seeks your attention infrequently 8. Repeatedly stiffens arms, hands, legs or displays unusual body movements such as rotating the hands on the wrists, uncommon postures or other repetitive behaviors 9. Does not reach up toward you when you reach to pick him or her up 10. Delays in motor development, including delayed rolling over, pushing up and crawling

"If parents suspect something is wrong with their child's development, or that their child is losing skills, they should talk to their pediatrician or another developmental expert," says Dr. Landa. "Don't adopt a 'wait and see' perspective. We want to identify delays early in development so that intervention can begin when children's brains are more malleable and still developing their circuitry."

http://www.sciencedaily.com/releases/2012/03/120326160817.htm

Single Antibody Shrinks Variety of Human Tumors Transplanted Into Mice, Study Shows

Human tumors transplanted into laboratory mice disappeared or shrank when scientists treated the animals with a single antibody

ScienceDaily - Human tumors transplanted into laboratory mice disappeared or shrank when scientists treated the animals with a single antibody, according to a new study from the Stanford University School of Medicine. The antibody works by masking a protein flag on cancer cells that protects them from macrophages and other cells in the immune system. The scientists achieved the findings with human breast, ovarian, colon, bladder, brain, liver and prostate cancer samples.

It is the first antibody treatment shown to be broadly effective against a variety of human solid tumors, and the dramatic response -- including some overt cures in the laboratory animals -- has the investigators eager to begin phase-1 and -2 human clinical trials within the next two years.

"Blocking this 'don't-eat-me' signal inhibits the growth in mice of nearly every human cancer we tested, with minimal toxicity," said professor of pathology Irving Weissman, MD, who directs Stanford's Institute of Stem Cell Biology and Regenerative Medicine and the Ludwig Center for Cancer Stem Cell Research and Medicine at Stanford. "This shows conclusively that this protein, CD47, is a legitimate and promising target for human

cancer therapy." The antibody treatment also significantly inhibited the ability of the tumors to metastasize throughout the animals' bodies.

"This is exciting work and will surely trigger a worldwide wave of research designed to convert this strategy into useful therapies," said Robert Weinberg, PhD, a professor of biology at the Whitehead Institute for Biomedical Research in Massachusetts who was not involved in the research. "Mobilizing the immune system to attack solid tumors has been a longstanding goal of many cancer researchers for decades."

The research was published online March 26 in the Proceedings of the National Academy of Sciences. Weissman, who is the Virginia & D.K. Ludwig Professor for Clinical Investigation in Cancer Research at Stanford and a member of the Stanford Cancer Institute, is the senior author of the research. Postdoctoral scholars Stephen Willingham, PhD, and Jens-Peter Volkmer, MD, are the co-first authors of the study.

Previous work in Weissman's lab has shown that CD47 is normally expressed on the surfaces of circulating blood stem cells to protect them from immune cells called macrophages. Macrophages patrol the body looking for signs of trouble in the form of invaders or rogue cells, but they sometimes latch onto the wrong targets. CD47 prompts them to release cells they've grabbed by mistake.

Weissman and his colleagues also showed previously that some types of cancer cells -- particularly those of blood cancers such as leukemia and lymphoma -- have figured out a way to game the system and use this "don't-eat-me signal" to their advantage by expressing CD47 on their own surfaces. In 2010, they found that blocking CD47 with a specific antibody (plus adding another to further stimulate the macrophages' killing instinct) can cure some cases of human non-Hodgkin's lymphoma in mice. But it wasn't known until now how widespread or clinically important the phenomenon would be in human solid tumors.

In the current study, Willingham and Volkmer collected surgical samples of a variety of human tumors, including ovarian, breast, colon, bladder, brain, liver and prostate. To do so, they enlisted the help of clinical experts from across the School of Medicine, including those specializing in oncology, urology, obstetrics and gynecology, radiation oncology, neurosurgery, hematology, pathology, otolaryngology and hepatology.

They showed that nearly every human cancer cell they examined expressed CD47 -- usually at higher levels (on average, about three times more) than did non-cancerous cells. Furthermore, people whose cancer cells express a lot of CD47 tend to have shorter life spans than people with similar cancers that express less CD47. This suggests that an analysis of the levels of CD47 expression in some types of tumors could be a valuable prognostic tool for patients and their doctors.

Willingham and Volkmer then implanted the different human tumor cells into matching locations in the bodies of mice -- breast cancer tumors into the mammary fat pads, and ovarian cancer tumors into the abdomen, for example. Once the tumors were well-established (after two weeks or more), they treated the animals with the anti-CD47 antibody.

The researchers saw that most of the established tumors begin to shrink and even, in some cases, disappear within weeks of treatment with the antibody. In one case, antibody treatment cured five mice injected with the same human breast cancer cells. When the tumor was gone, the treatment was discontinued; the mice were monitored for four months with no signs of recurrence.

"These results indicate that anti-CD47 antibodies can dramatically inhibit the growth of human solid tumors by blocking the ability of CD47 to transmit the 'don't-eat-me' signal to macrophages," concluded the authors.

"If the tumor was highly aggressive," said Weissman, "the antibody also blocked metastasis. It's becoming very clear that, in order for a cancer to survive in the body, it has to find some way to evade the cells of the innate immune system." The innate immune system is the body's first line of defense against pathogens like bacteria and viruses. Unlike the adaptive immunity conferred by antibodies and T cells that recognize and battle specific molecules, cells of the innate immune system, like macrophages, respond non-specifically to a variety of threats.

The researchers' approach didn't work in every animal, though. A set of mice with breast cancer cells from a one human patient experienced no benefit from antibody treatment. "There's certainly more to learn," said Weissman. "We need to learn more about the relationship between macrophages and tumor cells, and how to draw more macrophages to the tumors." He suggested that reducing the size of a tumor with surgery or radiotherapy before antibody treatment could make the treatment more effective. Another option, he added, would be to use a second antibody in addition to CD47 that would further stimulate the ability of the macrophages or other immune cells to kill the cancer cells.

While treatment modifications may be beneficial, the findings about the effect of the single antibody are promising in their own right and set the stage for advancing the research. "We believe these results show that

we should move forward quickly but cautiously into human clinical trials for many types of solid tumors," Weissman said.

Badreddin Edris, Kipp Weiskopf, Anne K. Volkmer, Jens-Peter Volkmer, Stephen B. Willingham, Humberto Contreras-Trujillo, Jie Liu, Ravindra Majeti, Robert B. West, Jonathan A. Fletcher, Andrew H. Beck, Irving L. Weissman, and Matt van de Rijn. Antibody therapy targeting the CD47 protein is effective in a model of aggressive metastatic leiomyosarcoma. Proceedings of the National Academy of Sciences, March 26, 2012 DOI: 10.1073/pnas.1121629109

http://www.sciencedaily.com/releases/2012/03/120326160819.htm

Chronic Stress Spawns Protein Aggregates Linked to Alzheimer's

Repeated stress triggers the production and accumulation of insoluble tau protein aggregates inside the brain cells of mice

ScienceDaily - Repeated stress triggers the production and accumulation of insoluble tau protein aggregates inside the brain cells of mice, say researchers at the University of California, San Diego School of Medicine in a new study published in the March 26 Online Early Edition of the Proceedings of the National Academy of Sciences.

The aggregates are similar to neurofibrillary tangles or NFTs, modified protein structures that are one of the physiological hallmarks of Alzheimer's disease. Lead author Robert A. Rissman, PhD, assistant professor of neurosciences, said the findings may at least partly explain why clinical studies have found a strong link between people prone to stress and development of sporadic Alzheimer's disease (AD), which accounts for up to 95 percent of all AD cases in humans.

"In the mouse models, we found that repeated episodes of emotional stress, which has been demonstrated to be comparable to what humans might experience in ordinary life, resulted in the phosphorylation and altered solubility of tau proteins in neurons," Rissman said. "These events are critical in the development of NFT pathology in Alzheimer's disease."

The effect was most notable in the hippocampus, said Rissman, a region of the brain linked to the formation, organization and storage of memories. In AD patients, the hippocampus is typically the first region of the brain affected by tau pathology and the hardest-hit, with substantial cell death and shrinkage.

Not all forms of stress are equally threatening. In earlier research, Rissman and colleagues reported that acute stress -- a single, passing episode -- does not result in lasting, debilitating long lasting changes in accumulation of phosphorylated tau. Acute stress-induced modifications in the cell are transient, he said, and on the whole, probably beneficial.

"Acute stress may be useful for brain plasticity and helping to facilitate learning. Chronic stress and continuous activation of stress pathways may lead to pathological changes in stress circuitry. It may be too much of a good thing." As people age, perhaps their neuronal circuits do too, he said, becoming less robust and perhaps less capable of completely rebounding from the effects of stress. "Age is the primary, known risk factor for Alzheimer's disease. It may be that as we age, our neurons just aren't as plastic as they once were and some succumb."

The researchers observed that stress cues impacted two key corticotropin-releasing factor receptors, suggesting a target for potential therapies. Rissman noted drugs already exist and are in human trials (for other conditions) that modulate the activity of these receptors. "You can't eliminate stress. We all need to be able to respond at some level to stressful stimuli. The idea is to use an antagonist molecule to reduce the effects of stress upon neurons. The stress system can still respond, but the response in the brain and hippocampus would be toned down so that it doesn't result in harmful, permanent damage."

The authors dedicate this work to long time mentor and colleague, Dr. Wylie Vale, whose years of pioneering work deciphering and describing the stress system were fundamental to this paper. Vale passed away earlier this year at the age of 70.

Robert A. Rissman, Michael A. Staup, Allyson Roe Lee, Nicholas J. Justice, Kenner C. Rice, Wylie Vale, and Paul E. Sawchenko. Corticotropin-releasing factor receptor-dependent effects of repeated stress on tau phosphorylation, solubility, and aggregation. Proceedings of the National Academy of Sciences, 2012 DOI: 10.1073/pnas.1203140109

http://www.eurekalert.org/pub_releases/2012-03/ucl-dtc032712.php

DNA traces cattle back to a small herd domesticated around 10,500 years ago

All cattle are descended from as few as 80 animals that were domesticated from wild ox in the Near East some 10,500 years ago, according to a new genetic study.

An international team of scientists from the CNRS and National Museum of Natural History in France, the University of Mainz in Germany, and UCL in the UK were able to conduct the study by first extracting DNA from the bones of domestic cattle excavated in Iranian archaeological sites. These sites date to not long after the invention of farming and are in the region where cattle were first domesticated.

The team examined how small differences in the DNA sequences of those ancient cattle, as well as cattle living today, could have arisen given different population histories. Using computer simulations they found that the DNA differences could only have arisen if a small number of animals, approximately 80, were domesticated from wild ox (aurochs).

The study is published in the current issue of the journal Molecular Biology and Evolution. Dr Ruth Bollongino of CNRS, France, and the University of Mainz, Germany; lead author of the study, said: "Getting reliable DNA sequences from remains found in cold environments is routine.

"That is why mammoths were one of the first extinct species to have their DNA read. But getting reliable DNA from bones found in hot regions is much more difficult because temperature is so critical for DNA survival. This meant we had to be extremely careful that we did not end up reading contaminating DNA sequences from living, or only recently dead cattle." The number of animals domesticated has important implications for the archaeological study of domestication.

Prof Mark Thomas, geneticist and an author of the study based at the UCL Research Department of Genetics, Evolution and Environment: "This is a surprisingly small number of cattle. We know from archaeological remains that the wild ancestors of modern-day cattle, known as aurochs, were common throughout Asia and Europe, so there would have been plenty of opportunities to capture and domesticate them."

Prof Joachim Burger, an author of the study based at the University of Mainz, Germany, said: "Wild aurochs are very different beasts from modern domestic cattle.

"They were much bigger than modern cattle, and wouldn't have had the domestic traits we see today, such as docility. So capturing these animals in the first place would not have been easy, and even if some people did manage snare them alive, their continued management and breeding would still have presented considerable challenges until they had been bred for smaller size and more docile behavior."

Archaeological studies on the number and size of prehistoric animal bone have shown that not only cattle, but also goats, sheep and pigs were all first domesticated in the Near East. But saying how many animals were domesticated for any of those species is a much harder question to answer. Classical techniques in archaeology cannot give us the whole picture, but genetics can help - especially if some of the genetic data comes from early domestic animals.

Dr Jean-Denis Vigne, a CNRS bio-archaeologist and author on the study, said: "In this study genetic analysis allowed us to answer questions that – until now –archaeologists would not even attempt to address.

"A small number of cattle progenitors is consistent with the restricted area for which archaeologists have evidence for early cattle domestication ca. 10,500 years ago. This restricted area could be explained by the fact that cattle breeding, contrary to, for example, goat herding, would have been very difficult for mobile societies, and that only some of them were actually sedentary at that time in the Near East."

Dr Marjan Mashkour, a CNRS Archaeologist working in the Middle East added "This study highlights how important it can be to consider archaeological remains from less well-studied regions, such as Iran. Without our Iranian data it would have been very difficult to draw our conclusions, even though they concern cattle at a global scale".

1. For more information or to interview Professor Mark Thomas, please contact Clare Ryan in the UCL Media Relations Office on tel: 44-20-3108-3846, mobile: 44-07747-565-056, out of hours 44-7917-271-364, e-mail: clare.ryan@ucl.ac.uk.
2. 'Modern Taurine Cattle descended from small number of Near-Eastern founders" is published in the current issue of Molecular Biology and Evolution. Journalists can obtain copies of the paper by contacting UCL Media Relations.
3. Images for download are available from: http://www.uni-mainz.de/presse/31690.php

http://www.eurekalert.org/pub_releases/2012-03/bmj-cds032612.php

Cervical disease sufferers could benefit from HPV vaccine

Research: Effect of the human papillomavirus quadrivalent vaccine in a subgroup of women with cervical and vulvar disease: Retrospective pooled analysis of trial data

Women who are diagnosed with pre-cancerous cervical conditions after receiving the HPV vaccine can still benefit from a considerably reduced risk of reoccurring disease, a study published today on bmj.com shows.

A team of international researchers studied data involving 1350 women from 24 developed and developing countries across the world. All of the women were between the ages of 15 and 26 between 2001 and 2003. They had had either human papillomavirus (HPV) quadrivalent vaccine or placebo during one of two randomised controlled trials and were then diagnosed with HPV-related vaginal or vulval diseases (including genital warts) or had cervical surgery. A total of more than 17,000 women took part in the two trials and were followed for approximately four years, but this new study looks only at those women who then developed HPV-related disease.

Previous studies have shown that HPV vaccination does not reduce progression to cervical pre-cancers in women with ongoing infections at the time of vaccination. However, no studies to date have looked at the impact of HPV vaccination in preventing subsequent disease after treatment for such pre-cancers. This new study aimed to see if the vaccine decreased the risk of developing subsequent disease after the first definitive treatment.

Among women who needed cervical surgery after the trials, the risk of getting any subsequent HPV related disease was 6.6 cases per 100 woman per year among the 587 women who had had HPV vaccine. For the 763 women who had had placebo the risk was 12.2 cases per 100 woman per year. So vaccinated women had 46.2% less risk (the reduced risk ranged between 22.5% to 63.2% using a measure called the 95% confidence interval). In addition, vaccination was associated with a significant reduction in risk of any subsequent high grade disease of the cervix by 64.9% (20.1% to 86.3%).

For the women who were diagnosed with vaginal or vulvar disease the reduction in risk of any HPV disease after diagnosis and treatment among those who had had HPV vaccine was 35.2% (13.8% to 51.8%).

In conclusion, the authors reinforce that vaccination does not reduce progression to disease in women who are infected with HPV at the time of vaccination, but vaccinated women who developed disease after taking part in these randomised controlled trials had less frequent subsequent disease, so vaccination offered substantial benefit. The authors suggest that only long-term surveillance of the vaccinated population can "determine the population effectiveness of vaccination" and state that there are several programmes currently in place to monitor the safety and impact of HPV vaccines on subsequent diseases.

In an accompanying editorial, Dr Jane Kim from the Harvard School of Public Health says that clear communication of the beneficial yet complex properties of HPV vaccines is crucial to ensure that effective and successful decisions can be made on HPV vaccination worldwide.

http://www.eurekalert.org/pub_releases/2012-03/wuso-pcp032712.php

Poor colonoscopy prep hides pre-cancerous polyps

What happens on the day before a colonoscopy may be just as important as the colon-screening test itself.

Gastroenterologists at Washington University School of Medicine in St. Louis have found that when patients don't adequately prep for the test by cleansing their colons, doctors often can't see potentially dangerous pre-cancerous lesions.

Reporting in the journal Gastrointestinal Endoscopy, the researchers say that doctors often missed at least one pre-cancerous growth in about one-third of patients who did not properly prepare for their colonoscopy. Those polyps and other markers of cancer risk were only discovered months later when patients had their next colonoscopy.

Although several studies have found that up to a quarter of colonoscopy patients don't prepare adequately for the test, the new study is the first to point out the potential consequences of poor bowel preparation in outpatients at average risk. "Because so many of the patients had a follow-up screening less than a year after the initial test, we strongly suspect that most of the pre-cancerous growths found during the second colonoscopy already were present at the time of the initial test," says first author Reena Chokshi, MD, a gastroenterology fellow at Washington University.

The researchers say their findings suggest that if a physician is having difficulty seeing the colon due to inadequate bowel prep, the colonoscopy should be stopped and rescheduled. "We often can detect preparation problems during the first few minutes of the procedure," Chokshi says. "And based on this study, we would say that rather than subjecting a patient to the potential risks of a full colonoscopy when we may not be able to detect polyps, or other pre-cancerous growths called adenomas, it may be better to bring that patient back as soon as possible for a repeat procedure with better bowel preparation."

On the day before a colonoscopy exam, people are asked to stop eating solid food and to consume only clear liquids. Later in the day and the next morning, patients drink bowel-cleansing mixtures to empty the colon prior to the examination.

The test itself usually takes less than an hour, and patients are sedated during that time. Using a tiny camera, doctors are able to look at the walls of the colon in an attempt to detect polyps and other pre-cancerous growths. Once detected, those growths can be removed during the course of the colonoscopy. Patients often must miss two days of work: the day of preparation and the day of the test. Recently, the outpatient endoscopy center at Washington University and Barnes-Jewish Hospital in St. Louis has begun screening patients on Saturday mornings to reduce the number of vacation days some patients have to use.

"Many patients say that the bowel preparation before the colonoscopy is the worst part of having the test, but it's also very important because in order to see polyps or cancers, we really have to be able to clearly see the entire wall of the colon," says senior author Jean S. Wang, MD, PhD, assistant professor of medicine in the Division of Gastroenterology. "Inadequate preparation makes that very difficult for a physician."

The researchers retrospectively studied patients who had an average risk of colon cancer and got screening colonoscopies in the outpatient endoscopy center. Individuals with a history of inflammatory bowel disease, a family history of colorectal cancer or a medical history of colon polyps were not included in the study.

AUDIO: Proper preparation for a colonoscopy exam may be almost as important to the eventual detection of colon polyps as the screening test itself. Up to one in four colonoscopy patients don't prepare adequately for the test, and gastroenterologists at Washington University School of Medicine in St. Louis have found that when preparation is poor, doctors often miss dangerous, pre-cancerous growths.

In the five-year span between 2004-09, 373 patients at the center were identified as having inadequate bowel preparation. Of the 133 patients who later had a second colonoscopy during the study period, 33.8 percent had at least one pre-cancerous adenoma detected in that repeat screening. And almost one in five of that group were considered to be at high risk for colon cancer because they either had more than three adenomas detected, or the test discovered at least one large lesion.

In fact, the researchers found that 18 percent of the patients who had a second colonoscopy would have been given different recommendations if their polyps and adenomas had been detected during the initial screening, such as more frequent colonoscopies to monitor the development of growths in the colon.

"It generally takes several years for an adenoma to become cancerous," Chokshi says. "But it's hard to know where in that sequence a particular adenoma is when we detect it. So it certainly is possible that any lesion we miss during a colonoscopy could develop into a malignancy before a person's next colonoscopy, especially if it doesn't happen until 10 years later."

Chokshi RV, Hovis CD, Hollander T, Early DS Wang JS. Prevalence of missed adenomas in patients with inadequate bowel preparation on screening colonoscopy. Gastrointestinal Endoscopy, vol. 75, 2012 [Epub. ahead of print]. 10.1016/j.gie.2012.01.005

http://www.eurekalert.org/pub_releases/2012-03/drnl-opc032712.php

ORNL process converts polyethylene into carbon fiber

Common material such as polyethylene used in plastic bags could be turned into something far more valuable through a process being developed at the Department of Energy's Oak Ridge National Laboratory.

In a paper published in Advanced Materials, a team led by Amit Naskar of the Materials Science and Technology Division outlined a method that allows not only for production of carbon fiber but also the ability to tailor the final product to specific applications."Our results represent what we believe will one day provide industry with a flexible technique for producing technologically innovative fibers in myriad configurations such as fiber bundle or non-woven mat assemblies," Naskar said.

Using a combination of multi-component fiber spinning and their sulfonation technique, Naskar and colleagues demonstrated that they can make polyethylene-base fibers with a customized surface contour and manipulate filament diameter down to the submicron scale. The patent-pending process also allows them to tune the porosity, making the material potentially useful for filtration, catalysis and electrochemical energy harvesting.

Naskar noted that the sulfonation process allows for great flexibility as the carbon fibers exhibit properties that are dictated by processing conditions. For this project, the researchers produced carbon fibers with unique cross-sectional geometry, from hollow circular to gear-shaped by using a multi-component melt extrusion-based fiber spinning method.

The possibilities are virtually endless, according to Naskar, who described the process. "We dip the fiber bundle into an acid containing a chemical bath where it reacts and forms a black fiber that no longer will melt," Naskar said. "It is this sulfonation reaction that transforms the plastic fiber into an infusible form.

"At this stage, the plastic molecules bond, and with further heating cannot melt or flow. At very high temperatures, this fiber retains mostly carbon and all other elements volatize off in different gas or compound forms."

The researchers also noted that their discovery represents a success for DOE, which seeks advances in lightweight materials that can, among other things, help the U.S. auto industry design cars able to achieve more miles per gallon with no compromise in safety or comfort. And the raw material, which could come from grocery store plastic bags, carpet backing scraps and salvage, is abundant and inexpensive.

Other authors of the paper, titled "Patterned functional carbon fibers from polyethylene," are Marcus Hunt, Tomonori Saito and Rebecca Brown of ORNL and Amar Kumbhar of the University of North Carolina's Chapel Hill Analytical and Nanofabrication Laboratory. The paper is published on line here: http://onlinelibrary.wiley.com/doi/10.1002/adma.201104551/pdf

http://www.eurekalert.org/pub_releases/2012-03/uom-ptp032712.php

Parsing the Pill's impact on women's wage

Although women continue to lag behind men in pay, the gender wage gap has narrowed considerably since the 1960s. Now a new University of Michigan study is the first to quantify the impact of the pill on women's labor market advances.

ANN ARBOR, Mich. - The study shows that roughly one-third of women's wage gains through the 1990s are due to the availability of oral contraceptives. Published online this week by the National Bureau of Economic Research as a working paper, the study was conducted by U-M economist Martha Bailey and colleagues Brad Hershbein at U-M and Amalia Miller at the University of Virginia.

"We found that women who had early access to the pill in the 1960s and 1970s earned 8 percent more on average by the 1980s and 1990s than women without early access," said Bailey, an assistant professor of economics in the U-M College of Literature, Science, and the Arts and a research affiliate at the U-M Institute for Social Research. Bailey and colleagues analyzed the careers of approximately 4,300 women, born from 1943 to 1954, using the National Longitudinal Survey of Young Women. These women varied in their legal ability to obtain the pill from their doctors between the ages of 18 and 21

"The difficulty of parsing the pill's effect on women's careers relates to the timing of its appearance," Bailey said. "By cause or coincidence, the pill's diffusion coincided with important changes in norms and ideas about women's work and the end of the baby boom."

Bailey and colleagues developed a novel analytic strategy to answer this question. After the U.S. Federal Drug Administration approved the pill in 1960, laws in different states placed different age limits on when women could legally obtain it. As these laws changed in almost every state in the country, largely due to reducing the legal voting age to 18, the inadvertent side-effect was that women could obtain the pill at younger ages. This meant that women no longer had to decide between looking for a mate (and the risk of pregnancy) and investing in their educations and careers. They could do both.

The researchers found that early access laws doubled contraceptive pill use among women between the ages of 18 and 20 – precisely the ages affected by access laws – but not beyond age 21, when the laws did not bind. Pill use by age 18 was 140 percent higher, and by age 20 was 43 percent higher than national mean use at those ages.

"As the pill provided younger women the expectation of greater control over childbearing, women invested more in their human capital and careers," Bailey said. "Most affected were women with some college, who benefitted from these investments through remarkable wage gains over their lifetimes."

Their analysis shows that nearly two-thirds of these pill-access induced gains in wages were due to increasing labor-market experience; another third came through to greater educational attainment and entry in non-traditionally female occupations.

But even these results may not do justice to the over-arching importance of the pill. "Our results may understate the pill's broader influence because they do not explore the effect of changes in access to the pill beyond age 20 and fail to capture the potentially large social multiplier effects," Bailey said. "The pill's availability likely altered norms and expectations about marriage and childbearing. It also likely affected the decisions of companies to hire and promote women."

http://www.eurekalert.org/pub_releases/2012-03/uomm-uom032712.php

University of Maryland completes most extensive full face transplant to date

The University of Maryland released details today of the most extensive full face transplant completed to date, including both jaws, teeth, and tongue.

Baltimore, MD - The 36-hour operation occurred on March 19-20, 2012 at the R Adams Cowley Shock Trauma Center at the University of Maryland Medical Center and involved a multi-disciplinary team of faculty physicians from the University of Maryland School of Medicine and a team of over 150 nurses and professional staff. The face transplant, formally called a vascularized composite allograft (VCA), was part of a 72-hour marathon of transplant activity at one of the busiest transplant centers in the world. The family of one anonymous donor generously donated his face and also saved five other lives through the heroic gift of organ donation. Four of these transplants took place over the course of two days at the University of Maryland Medical Center.

The face transplant team was led by Eduardo D. Rodriguez, M.D., D.D.S., associate professor of surgery at the University of Maryland School of Medicine and chief of plastic, reconstructive and maxillofacial surgery at the R Adams Cowley Shock Trauma Center at the University of Maryland Medical Center. Dr. Rodriguez is board-certified in plastic and reconstructive surgery as well as in oral and maxillofacial surgery. This marks the first time in the world that a full face transplant was performed by a team of plastic and reconstructive surgeons with specialized training and expertise in craniofacial surgery and reconstructive microsurgery.

"We utilized innovative surgical practices and computerized techniques to precisely transplant the mid-face, maxilla and mandible including teeth, and a portion of the tongue. In addition, the transplant included all facial soft tissue from the scalp to the neck, including the underlying muscles to enable facial expression, and sensory and motor nerves to restore feeling and function," explains Dr. Rodriquez. "Our goal is to restore function as well as have aesthetically pleasing results."

The face transplant recipient, 37-year-old Richard Lee Norris of Hillsville, Virginia, was injured in 1997 in a gun accident. Since that time, he has undergone multiple life-saving and reconstructive surgeries. Due to the accident, Mr. Norris lost his lips and nose and had limited movement of his mouth. Mr. Norris first came to the University of Maryland Medical Center in 2005 to discuss reconstructive options with Dr. Rodriguez.

Grant funding from the Office of Naval Research (ONR) in the Department of Defense to Dr. Stephen Bartlett has supported the University of Maryland basic and clinical research program in vascularized composite transplantation leading up to and supporting this groundbreaking face transplant. The ONR funds medical research to support military operational medicine and clinical care of returning veterans. In addition to conducting research, the University of Maryland supports military medicine in a variety of ways, including training military medical staff prior to deployment and performing organ transplant surgeries for patients at Walter Reed/Bethesda National Naval Medical Center.

"The future of medicine depends on rapid translation of research and creating high-performing teams. The face transplant is a perfect example of the life-changing options we can provide for our patients when we combine the expertise of our research and clinical teams to pursue procedures that would have seemed unfathomable not so long ago," says E. Albert Reece, M.D., Ph.D., M.B.A., vice president of medical affairs at the University of Maryland and dean of the University of Maryland School of Medicine.

The team of face transplant surgeons benefited greatly from their experience treating high-velocity ballistic facial injuries at the R Adams Cowley Shock Trauma Center at the University of Maryland Medical Center. The team also includes research scientists and physician scientists from the University of Maryland's nationally recognized Division of Transplantation who have been researching ways to reduce rejection of donated organs and minimize the side effects of long-term immunosuppressive use after transplantation.

"A project like the face transplant requires multi-disciplinary collaboration between numerous clinical services and in many ways is very similar to trauma care," says Thomas M. Scalea, M.D., Francis X. Kelly Professor of Trauma Surgery, director, Program in Trauma, University of Maryland School of Medicine, and physician-in-chief, R Adams Cowley Shock Trauma Center. "Because we have an infrastructure built around multi-disciplinary care, it made sense for the facial transplant program to be housed at the Shock Trauma Center in the University of Maryland Medical Center."

The scientific team that includes Drs. Stephen Bartlett, Rolf Barth, and Eduardo Rodriguez focused on the anatomic and immunologic challenges to craniofacial transplantation. This work has been the basis for Dr. Rodriguez and his surgical team's groundbreaking surgical achievement.

"This accomplishment is the culmination of more than 10 years researching the immune system's response to vascular composite allograft transplants," says Stephen T. Bartlett, M.D., Peter Angelos Distinguished Professor and Chair of the Department of Surgery at the University of Maryland School of Medicine and Surgeon-in-Chief at the University of Maryland Medical Center. "Our solid organ transplant immunosuppressive protocol has led to excellent outcomes for our patients and will be part of the long-term care plan for the face transplant patient."

The face transplant team collaborated with the Living Legacy Foundation of Maryland, the organ and tissue donation program serving most of Maryland. The Living Legacy Foundation of Maryland is a non-profit organization that helps facilitate the donation and recovery of human organs and tissues for transplantation and research, and provides public and professional education on organ donation.

"The resources and talent that made this complex organizational effort a reality was months in the making and touched all areas of the hospital," says Jeffrey A. Rivest, president and chief executive officer of the University of Maryland Medical Center. "The Medical Center staff is honored to care for patients and families facing such tremendously complex medical challenges."

http://www.eurekalert.org/pub_releases/2012-03/w-o2m032712.php

Over 20 million individuals infected with hepatitis E in Asia and Africa

70,000 deaths and 3,000 stillbirths caused by infections

New research funded by the World Health Organization (WHO) estimates that 20.1 million individuals were infected with hepatitis E virus (HEV) genotypes 1 and 2 across 9 world regions in 2005. According to findings available in the April issue of Hepatology, a journal published by Wiley-Blackwell on behalf of the American Association for the Study of Liver Diseases, there were 3.4 million symptomatic cases, 70,000 deaths, and 3,000 stillbirths from HEV that year in countries throughout Asia and Africa.

Unlike hepatitis virus B and C strains that lead to chronic disease states, HEV causes acute illness. Previous studies show HEV genotypes 1 and 2 specifically infect humans, and are associated with large outbreaks in developing countries where sanitation conditions are poor. There is evidence that HEV increases mortality risk among pregnant women. While a safe and effective HEV vaccine has been developed, it has not been widely implemented.

"Our study represents the first attempt to estimate the annual global impact of hepatitis E," said lead author Dr. David Rein of the social science research organization NORC at the University of Chicago. Estimates were created by modeling the disease burden of HEV genotypes 1 and 2 in the 9 regions, representing 71% of the world's population. Based on published evidence the team - a collaboration between researchers from NORC, WHO and RTI International - also estimated annual incidence of infection to determine symptomatic, asymptomatic, and mortality cases.

The team determined that the prevalence pattern of HEV was consistent across the regions, with the largest incident increase occurring in those between the ages of 5 and 20 years. The average age of infection was 17 years with the lowest age of infection in North Africa (8 years) and highest in East Asia (21 years).

Of the more than 20 million people infected with HEV, 61% of the cases occurred in East and South Asia, two regions which also accounted for 65% of deaths from HEV. Researchers also noted that North Africa accounted for 14% of all global HEV infections, but only 8.3% of symptomatic cases and 8% of deaths, which the authors attribute to the younger average age of infection in that region.

The authors caution there are limitations to the study which only estimated incidence of HEV genotypes 1 and 2, leaving out genotype 3 that prevalently occurs in Europe and the U.S., and genotype 4. "Future HEV estimates should include genotypes 3 and 4 to provide a complete picture of the global burden of HEV," concludes Dr. Rein.

Full Citation: "The Global Burden of Hepatitis E Virus Genotypes 1 and 2 in 2005." David B. Rein, Gretchen Stevens, Jordan Theaker, John S. Wittenborn and Steven T. Wiersma. Hepatology; Published Online: November 26, 2011 (DOI: 10.1002/hep.25505); Print Issue Date: April 2012. http://onlinelibrary.wiley.com/doi/10.1002/hep.25505/abstract.

http://www.eurekalert.org/pub_releases/2012-03/uab-asa032712.php

Afterbirth: Study asks if we could derive benefits from ingesting placenta

Almost all non-human mammals eat placenta for good reasons -- are we missing something?

BUFFALO, N.Y. -- A paper by neuroscientists at the University at Buffalo and Buffalo State College suggests that ingestion of components of afterbirth or placenta -- placentophagia -- may offer benefits to human mothers and perhaps to non-mothers and males. They say this possibility does not warrant the wholesale ingestion of afterbirth, for some very good reasons, but that it deserves further study.Mark Kristal, PhD, professor of psychology and neuroscience at UB, directs the graduate program in behavioral neuroscience, and has studied placentophagia for more than 40 years. He is recognized as a principle expert in the field.

Kristal's article "Placentophagia in Human and Nonhuman Mammals: Causes and Consequences," will be published in the March 30 issue of the journal Ecology of Food and Nutrition, which will be devoted to the subject of placentophagia. It will be available after March 30 at http://www.tandfonline.com/toc/gefn20/current.

Kristal's co-authors are Jean M. DiPirro, PhD, associate professor, Department of Psychology, Buffalo State College, and Alexis C. Thompson, PhD, research associate professor, UB Department of Psychology and a research scientist in the UB Research Institute on Addictions.

They point out that the benefits of placenta ingestion (as well as the ingestion of amniotic fluid) by non-human mammalian mothers are significant. It provokes an increase in mother-infant interaction, for instance, and increases the effects of pregnancy-mediated analgesia in the delivering mother. It also potentiates opioid circuits in the maternal brain that facilitate the onset of caretaking behavior, and suppresses postpartum pseudopregnancy, thereby increasing the possibilities for fertilization.

"Human childbirth is fraught with additional problems for which there are no practical nonhuman animal models," says Kristal, citing postpartum depression, failure to bond and maternal hostility toward the infant.

He says ingested afterbirth may contain components that ameliorate these problems, but although there have been many anecdotal claims made for human placentophagia, the issue has not been tested empirically.

"If such studies are undertaken," he says, "the results, if positive, will be medically relevant. If the results are negative, speculations and recommendations will persist, as it is not possible to prove the negative."

Kristal says there is a current fad of ingesting encapsulated placenta, which mirrors unverified reports in the 1960s and 1970s of people in back-to-nature communes cooking and eating human placentas. The upsurge in recent anecdotal reports of the benefits of taking placenta by new mothers, irrespective of dose, method of preparation, or time course, suggests more of a placebo effect than a medicinal effect.

"People will do anything," Kristal says, "but we shouldn't read too much significance into reports of such exceptions, even if they are accurate, because they are neither reliable nor valid studies. My own studies found no evidence of the routine practice of placentophagia in other cultures, findings supported by a recent extensive study by anthropologists at the University of Nevada, Las Vegas.

"The more challenging anthropological question is," he says, "'Why don't humans engage in placentophagia as a biological imperative as so many other mammals apparently do?' because we clearly do not do this as a matter of course today and apparently never have. Perhaps for humans, there is a greater adaptive advantage to not eating the placenta." The paper discusses some possibilities in this regard.

"Whether or not we learn why humans do not do this, it is important for us to search for the medicinal or behavioral benefits of components of afterbirth for the same reasons that we search for plant-based medicinal substances," Kristal says. "The outcome of such a quest need not be an exhortation for women to eat afterbirth, but for scientists to isolate and identify the molecule or molecules that produce the beneficial effect and use it to design pharmacological tools," he says.

He adds, "In the case of Placental Opioid-Enhancing Factor or POEF and enhanced opioid-mediated analgesia, for instance, we have determined through earlier studies that not only is the effect nonspecific in regard to species, but it is also nonspecific in regard to sex. "That means that although males, who in all probability do not make the molecule, have the ability to respond to it," Kristal says.

Kristal conducts research and publishes on opioid and hormonal mechanisms underlying periparturitional phenomena and the psychobiology of motivated behaviors. DiPirro's areas of research include psychostimulant-induced neural adaptations in neuropeptide neurotransmission in the forebrain and experience-induced adaptations in defensive and affiliative behaviors. Thompson's research includes studies of aspects of maternal behavior and behavioral regulation of pain and analgesia.

http://www.physorg.com/news/2012-03-bacterial-recapture-essential-phosphate.html

'Bacterial shock' to recapture essential phosphate

Bacteria could be exploited to recapture dwindling phosphate reserves from wastewater according to research presented at the Society for General Microbiology's Spring Conference in Dublin this week.

Phosphorus – in the form of phosphate - is essential for all living things as a component of DNA and RNA and its role in cellular metabolism. Around 38 million tonnes of phosphorus are extracted each year from rock. Most of this extracted phosphorus goes into the production of fertilizers to replace the phosphates that plants remove from the soil. However, it is a scare natural resource and current estimates suggest that reserves of phosphate rock may only last for the next 45-100 years.

Researchers at Queen's University Belfast (QUB) are developing a novel biological process to remove extracted phosphate from wastewater – where it ultimately ends up after manufacturing. Dr John McGrath who is leading the project explained, "Phosphate in wastewater is a pollutant that causes increased growth of algae and plants, reducing the oxygen available for aquatic organisms. This is known as eutrophication and poses the single biggest threat to water quality in Northern Ireland and indeed globally."

The work at QUB has focused on microorganisms that capture and store phosphate from wastewater, and how this process varies under different nutritional and environmental conditions. "A variety of microbes in wastewater accumulate phosphorus inside their cells and store it as a biopolymer known as polyphosphate. In some cases, this can represent up to 20% of the dry weight of the microorganism!" explained Dr McGrath. "If we can harness this process we have a feasible biotechnological route to remove and recycle phosphate from wastewater."

The team have recently discovered a physiological 'shock' treatment which significantly increases microbial uptake of phosphorus and its accumulation inside cells. "It's similar to jumping into the sea on a winter's day – the first thing you do is take a sharp intake of breath. When we shock the microorganisms, their response is to take in phosphorus," explained Dr McGrath. "We've demonstrated this using activated sludge, containing a

variety of microbes, from wastewater treatment works and shown this shock treatment is effective at producing a phosphorus-rich biomass suitable for phosphorus recycling."

Dr McGrath believes that developing such biotechnological processes is essential for regenerating valuable mineral resources. "No alternative to phosphorus exists – we urgently need to find ways of recovering and recycling phosphates. It's a pollutant we can't live without." he said. "Phosphates are currently removed from wastewater by chemical methods, however this is expensive and results in the production of large volumes of sludge. In contrast, the process we are developing is sustainable and efficient."

Provided by Society for General Microbiology

http://www.sciencedaily.com/releases/2012/03/120327134209.htm

New Evidence On Effects of Green Coffee Beans in Weight Loss

Scientists have just reported striking new evidence that green, or unroasted, coffee beans can produce a substantial decrease in body weight in a relatively short period of time.

ScienceDaily - In a study presented at the 243rd National Meeting & Exposition of the American Chemical Society (ACS), the world's largest scientific society, Joe Vinson, Ph.D., and colleagues described how a group of overweight or obese people who consumed a fraction of an ounce of ground green coffee beans each day lost about 10 percent of their body weight. "Based on our results, taking multiple capsules of green coffee extract a day -- while eating a low-fat, healthful diet and exercising regularly -- appears to be a safe, effective, inexpensive way to lose weight," Vinson said at the ACS meeting, being held in San Diego the week of March 26. He is with the University of Scranton in Pennsylvania.

Unroasted coffee beans. **Credit: © Nongnuch Leelaphasuk / Fotolia**

The study involved 16 overweight or obese people aged 22-26 years who took capsules of the extract or capsules containing a placebo, an inactive powder, for a total of 22 weeks. The subjects alternated between a low dose and a higher dose of the extract. The low dose consisted of 700 mg of the coffee extract, and the high dose was 1,050 mg. It was a so-called "cross-over" study in which people cycled through the two doses and the placebo, each for six weeks. Such studies have advantages because each person serves as his or her own "control," improving the chances of getting an accurate result.

All of the participants were monitored for their overall diet (calories, food eaten, etc.) and exercise over the study period. "Their calories, carbohydrates, fats and protein intake did not change during the study, nor did their exercise regimen change," Vinson said.

Participants lost an average of 17 pounds during the 22 weeks of the study. It included an average of a 10.5 percent decrease in overall body weight and a 16 percent decrease in body fat. Vinson noted that weight loss might have been significantly faster, except that participants received the placebo and the lower dose of green coffee extract for part of the study period.

Vinson pointed out that previous studies have shown weight loss with green coffee. But this was the first to use higher amounts of the coffee extract and the first to measure the response to various doses. Based on those studies, Vinson believes that green coffee beans' effects likely are due to a substance called chlorogenic acid that is present in unroasted coffee beans. Chlorogenic acid breaks down when coffee beans are roasted (usually at a temperature of 464-482 degrees Fahrenheit). Roasting gives coffee beans their distinctive color, aroma and flavor. Green coffee beans, in contrast, have little aroma and a slightly bitter taste.

http://nyti.ms/GSiyse

Prevention: Easy Way to Head Off Altitude Sickness

A trial has found that acute mountain sickness can effectively be prevented with a common and inexpensive over-the-counter medicine: ibuprofen.

By NICHOLAS BAKALAR

A small randomized trial has found that acute mountain sickness - the headache, fatigue, dizziness, nausea and vomiting that can occur at altitudes above 8,000 feet - can effectively be prevented with a common and inexpensive over-the-counter medicine: ibuprofen, sold as Advil and other brands.

Usually, the illness goes away by itself, but if left untreated, it can progress to extreme debility and, in rare cases, fatal swelling of the brain. Ibuprofen may be safer and have fewer side effects than the usual medicines for altitude sickness: dexamethasone, a steroid, and acetazolamide, a diuretic.

In the study, published online in Annals of Emergency Medicine, researchers randomly assigned 86 hikers to take either 600 milligrams of ibuprofen or a placebo at four intervals as they climbed from 4,100 feet to 12,570 feet. The subjects responded to a questionnaire reporting symptoms and rating their severity.

In the placebo group, 69 percent developed severe mountain sickness, compared with 43 percent of those on ibuprofen. Among those who fell ill, symptoms were slightly milder among those taking ibuprofen, but that difference was not statistically significant.

The lead author, Dr. Grant S. Lipman, an assistant professor of emergency medicine at Stanford, said ibuprofen may not work at higher altitudes than those in his test. Still, he said, "it's a very tangible option for people traveling to high altitudes."

http://www.sciencedaily.com/releases/2012/03/120327215559.htm?

Capsule for Removing Radioactive Contamination from Milk, Fruit Juices, Other Beverages

Scientists have described a capsule that can be dropped into beverages to remove more than a dozen radioactive substances

ScienceDaily - Amid concerns about possible terrorist attacks with nuclear materials, and fresh memories of environmental contamination from the 2011 Fukushima Daiichi nuclear disaster in Japan, scientists have described the development of a capsule that can be dropped into water, milk, fruit juices and other foods to remove more than a dozen radioactive substances.

In a presentation at the 243rd National Meeting & Exposition of the American Chemical Society (ACS), they said the technology could be used on a large scale by food processors or packaged into a small capsule that consumers at the home-kitchen level could pop into beverage containers to make them safe for consumption.

"We repurposed and repackaged for radioactive decontamination of water and beverages a tried-and-true process that originally was developed to mine the oceans for uranium and remove uranium and heavy metals from heavily contaminated water," said Allen Apblett, Ph.D., who led the research team. "The accident at the Fukushima nuclear plant in Japan and ongoing concerns about possible terrorist use of nuclear materials that may contaminate food and water led us to shift the focus of this technology."

Scientists have developed a capsule that removes radioactive decontamination from milk and other beverages. **Allen Apblett, Ph.D.**

The technology also can remove arsenic, lead, cadmium and other heavy metals from water and fruit juices, Apblett said, adding that higher-than-expected levels of some of those metals have been reported in the past in certain juices. He is with Oklahoma State University in Stillwater.

Nanoparticles composed of metal oxides, various metals combined with oxygen, are the key ingredients in the process. The particles, so small that hundreds would fit on the period at the end of this sentence, react with radioactive materials and other unwanted substances and pull them out of solution. The particles can absorb all 15 of the so-called "actinide" chemical elements on the periodic table of the elements, as well as non-actinide radioactive metals (e.g., strontium), lead, arsenic and other non-radioactive elements. The actinides all are radioactive metals, and they include some of the most dangerous substances associated with nuclear weapons and commercial nuclear power plant accidents like Fukushima. Among them are plutonium, actinium, curium and uranium.

In the simplest packaging of the technology, the metal-oxide nanoparticles would be packed inside a capsule similar to a medicine capsule, and then stirred around in a container of contaminated water or fruit juice. Radioactive metals would exit the liquid and concentrate inside the capsule. The capsule would be removed, leaving the beverage safe for consumption. In laboratory tests, it reduced the concentrations of these metals to levels that could not be detected, Apblett noted.

The technology is moving toward commercialization, with the first uses probably in purifying calcium dietary supplements to remove any traces of lead, cadmium and radiostrontium. Apblett said the capsule version could have appeal beyond protection against terrorist attacks or nuclear accidents, among consumers in areas with heavy metals in their water or food supplies, for instance.

The scientists acknowledged funding from the Oklahoma Economic Development Generating Excellence Program.

http://www.sciencedaily.com/releases/2012/03/120327215605.htm?

Hot Pepper Compound Could Help Hearts

Scientists have reported the latest evidence that chili peppers are a heart-healthy food with potential to protect against the No. 1 cause of death in the developed world

ScienceDaily - The food that inspires wariness is on course for inspiring even more wonder from a medical standpoint as scientists have reported the latest evidence that chili peppers are a heart-healthy food with potential to protect against the No. 1 cause of death in the developed world. The report was part of the 243rd National Meeting and Exposition of the American Chemical Society (ACS), being held in San Diego the week of March 26.

The study focused on capsaicin and its fiery-hot relatives, a piquant family of substances termed "capsaicinoids." The stuff that gives cayennes, jalapenos, habaneros and other chili peppers their heat, capsaicin already has an established role in medicine in rub-on-the-skin creams to treat arthritis and certain forms of pain. Past research suggested that spicing food with chilies can lower blood pressure in people with that condition, reduce blood cholesterol and ease the tendency for dangerous blood clots to form.

"Our research has reinforced and expanded knowledge about how these substances in chilies work in improving heart health," said Zhen-Yu Chen, Ph.D., who presented the study. "We now have a clearer and more detailed portrait of their innermost effects on genes and other mechanisms that influence cholesterol and the health of blood vessels. It is among the first research to provide that information."

The team found, for instance, that capsaicin and a close chemical relative boost heart health in two ways. They lower cholesterol levels by reducing accumulation of cholesterol in the body and increasing its breakdown and excretion in the feces. They also block action of a gene that makes arteries contract, restricting the flow of blood to the heart and other organs. The blocking action allows more blood to flow through blood vessels.

"We concluded that capsaicinoids were beneficial in improving a range of factors related to heart and blood vessel health," said Chen, a professor of food and nutritional science at the Chinese University of Hong Kong. "But we certainly do not recommend that people start consuming chilies to an excess. A good diet is a matter of balance. And remember, chilies are no substitute for the prescription medications proven to be beneficial. They may be a nice supplement, however, for people who find the hot flavor pleasant."

Chen and his colleagues turned to hamsters for the study, animals that serve as stand-ins for humans in research that cannot be done in people. They gave the hamsters high-cholesterol diets, divided them into groups, and supplemented each group's food with either no capsaicinoids (the control group) or various amounts of capsaicinoids. The scientists then analyzed the effects.

In addition to reducing total cholesterol levels in the blood, capsaicinoids reduced levels of the so-called "bad" cholesterol (which deposits into blood vessels), but did not affect levels of so-called "good" cholesterol. The team found indications that capsaicinoids may reduce the size of deposits that already have formed in blood vessels, narrowing arteries in ways that can lead to heart attacks or strokes.

Capsaicinoids also blocked the activity of a gene that produces cyclooxygenase-2, a substance that makes the muscles around blood vessels constrict. By blocking it, muscles can relax and widen, allowing more blood to flow.

http://www.eurekalert.org/pub_releases/2012-03/e-mbo032612.php

Many billions of rocky planets in the habitable zones around red dwarfs in the Milky Way

About 40% of all red dwarf stars have a super-Earth orbiting in the habitable zone where liquid water can exist on the surface of the planet

This first direct estimate of the number of light planets around red dwarf stars has just been announced by an international team using observations with the HARPS spectrograph on the 3.6-metre telescope at ESO's La Silla Observatory in Chile [1]. ***A recent announcement - eso1204*** showing that planets are ubiquitous in our galaxy used a different method that was not sensitive to this important class of exoplanets.

The HARPS team has been searching for exoplanets orbiting the most common kind of star in the Milky Way - red dwarf stars (also known as M dwarfs [2]). These stars are faint and cool compared to the Sun, but very common and long-lived, and therefore account for 80% of all the stars in the Milky Way.

"Our new observations with HARPS mean that about 40% of all red dwarf stars have a super-Earth orbiting in the habitable zone where liquid water can exist on the surface of the planet," says Xavier Bonfils (IPAG, Observatoire des Sciences de l'Univers de Grenoble, France), the leader of the team. "Because red dwarfs are so common - there are about 160 billion of them in the Milky Way - this leads us to the astonishing result that there are tens of billions of these planets in our galaxy alone."

The HARPS team surveyed a carefully chosen sample of 102 red dwarf stars in the southern skies over a six-year period. A total of nine super-Earths (planets with masses between one and ten times that of Earth) were found, including two inside the habitable zones of ***Gliese 581 - eso0915*** and Gliese 667 C respectively. The astronomers could estimate how heavy the planets were and how far from their stars they orbited.

By combining all the data, including observations of stars that did not have planets, and looking at the fraction of existing planets that could be discovered, the team has been able to work out how common different sorts of planets are around red dwarfs. They find that the frequency of occurrence of super-Earths [3] in the habitable zone is 41% with a range from 28% to 95%.

On the other hand, more massive planets, similar to Jupiter and Saturn in our Solar System, are found to be rare around red dwarfs. Less than 12% of red dwarfs are expected to have giant planets (with masses between 100 and 1000 times that of the Earth). As there are many red dwarf stars close to the Sun the new estimate means that there are probably about one hundred super-Earth planets in the habitable zones around stars in the neighbourhood of the Sun at distances less than about 30 light-years [4].

"The habitable zone around a red dwarf, where the temperature is suitable for liquid water to exist on the surface, is much closer to the star than the Earth is to the Sun," says Stephane Udry (Geneva Observatory and member of the team). "But red dwarfs are known to be subject to stellar eruptions or flares, which may bathe the planet in X-rays or ultraviolet radiation, and which may make life there less likely."

One of the planets discovered in the HARPS survey of red dwarfs is Gliese 667 Cc [5]. This is the second planet in this triple star system ***see eso0939 - for the first*** and seems to be situated close to the centre of the habitable zone. Although this planet is more than four times heavier than the Earth it is the closest twin to Earth found so far and almost certainly has the right conditions for the existence of liquid water on its surface. This is the second super-Earth planet inside the habitable zone of a red dwarf discovered during this HARPS survey, after Gliese 581d was announced in 2007 and confirmed in 2009.

"Now that we know that there are many super-Earths around nearby red dwarfs we need to identify more of them using both HARPS and future instruments. Some of these planets are expected to pass in front of their parent star as they orbit - this will open up the exciting possibility of studying the planet's atmosphere and searching for signs of life," concludes Xavier Delfosse, another member of the team (eso1210 - http://www.eso.org/public/news/eso1210/).

This research was presented in a paper "The HARPS search for southern extra-solar planets XXXI. The M-dwarf sample", by Bonfils et al. to appear in the journal Astronomy & Astrophysics.

http://www.eurekalert.org/pub_releases/2012-03/osu-vd032712.php

Viral disease - particularly from herpes - gaining interest as possible cause of coral decline

As corals continue to decline in abundance around the world, researchers are turning their attention to a possible cause that's almost totally unexplored – viral disease.

CORVALLIS, Ore. – It appears the corals that form such important parts of marine ecosystems harbor many different viruses – particularly herpes. And although they don't get runny noses or stomach upset, corals also are home to the adenoviruses and other viral families that can cause human colds and gastrointestinal disease.

In a research review published in the Journal of Experimental Marine Biology and Ecology, scientists point out that coral declines are reaching crisis proportions but little has been done so far to explore viral disease as one of the mechanisms for this problem.

"Coral abundance in the Caribbean Sea has gone down about 80 percent in the past 30-40 years, and about one-third of the corals around the world are threatened with extinction," said Rebecca Vega-Thurber, an assistant professor of microbiology at Oregon State University.

"We've identified 22 kinds of emerging disease that affect corals, but still don't know the pathogens that cause most of them," Vega-Thurber said. "Most researchers have looked only at bacteria. But we suspect viruses may play a role in this as well, and it's important to learn more about what is causing this problem. Corals are the building blocks of the tropical seas."

A research program at OSU, one of only two of its type in the world, is studying viral "metagenomics" in corals, meaning the analysis of multiple genomes at the same time. It may help explain one of the underlying causes of coral decline, Vega-Thurber said, and is one of the most comprehensive analyses yet done on the types of viruses in a marine animal. It may also shed light on the broader range of viruses that affect not only corals but many other animals, including humans.

One of the surprises from recent research was the predominance in corals of herpes viruses – similar but not identical to the herpes virus that can infect humans. Herpes viruses appear to constitute a majority of the viruses

found in corals, and one experiment showed that herpes-like viral sequences were produced in coral tissues after acute episodes of stress.

"We were shocked to find that so many coral viruses were in the herpes family," Vega-Thurber said. "But corals are one of the oldest animal life forms, evolving around 500 million years ago, and herpes is a very old family of viruses that can infect almost every kind of animal. Herpes and corals may have evolved together."

It's not yet certain, researchers say, whether the viruses being found on corals are actually causing diseases.

"Just because you harbor a virus doesn't mean you are getting sick from it," Vega-Thurber said. "This is part of what we have to pin down with further research."

Some of the possible causes of coral decline that have been identified so far include global warming that causes coral bleaching, loss of symbiotic algae that help nourish corals, pollution such as sewage runoff, and human-coral interactions.

A "mucus" sometimes found on corals can harbor human-borne viruses, and levels of these viruses have been correlated with terrestrial human population density.

"We have found that nutrient increases from pollution can cause increased levels of viral infection, as do warmer water and physical handling," Vega-Thurber said. "Now we have to determine if those increases in infection cause actual diseases that are killing the coral."

Corals are often a major component of marine ecosystems and biodiversity, especially in the tropics. They host thousands of species of fish and other animals. And whether or not viruses are implicated in coral disease, it may also be that they are passing diseases along to fish.

Research is "likely to reveal that viruses have numerous and profound roles on coral reefs," the scientists wrote in their study. "As the diversity, distribution and function of reef-associated viruses becomes increasingly well defined, so will our ability to predict, prevent and/or mitigate disease epizootics on coral reefs."

http://www.eurekalert.org/pub_releases/2012-03/uop-prp032812.php

Penn research points to new way of preserving fertility for boys undergoing cancer treatment

A research team has completed a 14-year experiment that gives hope for a technique that could restore boys' fertility.

PHILADELPHIA - Treatments for childhood cancers are increasingly successful with cure rates approaching 80%, but success often comes with a downside for the surviving men: the cancer treatments they received as boys can leave them sterile as adults. Now, a research team led by Ralph Brinster of the University of Pennsylvania School of Veterinary Medicine has completed a 14-year experiment that gives hope for a technique that could restore their fertility.

Brinster is the Richard King Mellon Professor of Reproductive Physiology at Penn Vet and was recently awarded the National Medal of Science for his lifetime of research on the genetics of the mammalian germline, the cells that give rise to sperm and eggs. In his most recent research, Brinster collaborated with fellow members of the Department of Animal Biology at Penn Vet, with members of the Department of Cell and Developmental Biology at Penn's Perelman School of Medicine and with the Penn Bioinformatics Core. Their study was published in the journal Human Reproduction.

For males, fertility begins with spermatogonial stem cells, which are present at birth, embedded in the basement membrane of the testes' seminiferous tubules. As a boy approaches puberty, these cells begin to make daughter cells that eventually become sperm. While they normally continue this process throughout a post-pubescent man's life, factors like radiation and chemotherapy drugs can destroy them, rendering him sterile.

About 1 in 3 boys surviving childhood cancer will be in danger of having severely decreased fertility as an adult; as many as 1 in 5,000 men of reproductive age currently suffer this serious quality-of-life problem as a result. Adult men who undergo cancer treatment that might damage their fertility can preemptively freeze their sperm, an option not available to pre-pubescent boys. But if a sample of a boy's spermatogonial stem cells could be extracted and preserved before cancer treatment and re-implanted after the boy reached adulthood, this fertility problem could be circumvented.

"There are a number of places, including at the Children's Hospital of Philadelphia," Brinster said, "that are already freezing cells for patients to use later, with the expectation that the necessary culture system and implantation techniques will be developed. A logical question for patients to ask is, How do we know that, after 10 years or more of being stored, these cells are any good? That's what our study addresses."

The techniques for extracting these cells and re-implanting them have been developed, so a critical question for researchers was whether spermatogonial stem cells could survive the decade-plus period they might need to remain frozen.

Fortunately, Brinster had a large collection of cryopreserved spermatogonial stem cells stored in the mid-'90s. The collection consisted mostly of cells taken from mice but included a small number of rat, rabbit and baboon samples. Between their age and variety, these samples represented an important resource to address questions regarding long-term cryopreservation of spermatogonial stem cells, before the technique could be used in humans.

After being thawed, the spermatogonial stem cells of rabbits and baboons were labeled with a fluorescent dye so that the researchers could track where in the testes they would eventually migrate and embed once they were implanted in mice. This was a critical step for the rabbit and baboon cells, which lacked appropriate experimental recipients; once implanted in mice, the studies showed that the cells migrated correctly and embedded in the recipient testes' basement membrane, indicating their viability.

A complete functional test could only be done for the mouse spermatogonial stem cells, as they could be implanted into mice and tested to see if they could produce sperm, and whether that sperm could lead to healthy offspring. After demonstrating that the cryopreserved cells implanted in the right region of the testes and underwent normal spermatogenesis, the researchers extracted the sperm and successfully fertilized eggs in vitro.

One of the recipient mice was also placed with females and successfully sired offspring. The offspring resulting from eggs fertilized in vitro as well as those resulting from natural mating all produced normal appearing young. Most importantly, the offspring arising from the cryopreserved spermatogonial stem cells appeared free of genetic damage.

This experiment clearly points in the right direction for the feasibility of a similar fertility treatment in humans. "Human and animal spermatagonial stem cells have been successfully frozen for short periods of time, but this is completely different," Brinster said. "Here we had cells frozen for over a decade that implanted in the right place and made sperm, and that sperm made offspring without apparent genetic defects."

In addition to Brinster, the research was conducted by research associates Xin Wu, Shaun M. Goodyear and Mary R. Avarbock of the Department of Animal Biology at Penn Vet; graduate student Lara K. Abramowitz and professor Marisa S. Bartolomei of the Department of Cell and Developmental Biology at Penn's Perelman School of Medicine; and John W. Tobias, director of the Penn Bioinformatics Core.

The research was supported by the National Institutes of Child Health and Human Development, the Institute of General Medicine and the Robert J. Kleberg Jr. and Helen C. Kleberg Foundation.

http://www.eurekalert.org/pub_releases/2012-03/acs-nmb030512.php

New more-sensitive blood test catches recurring breast cancer a year earlier

A new blood test is twice as sensitive and can detect breast cancer recurrence a full year earlier than current blood tests

SAN DIEGO - A new blood test is twice as sensitive and can detect breast cancer recurrence a full year earlier than current blood tests, according to a scientist who reported here today at the 243rd National Meeting & Exposition of the American Chemical Society (ACS). The report was among more than 11,000 presentations on new developments in science scheduled this week at the meeting, held by the world's largest scientific society.

Daniel Raftery, Ph.D., who reported on the test, pointed out that breast cancer survivors - 2.5 million in the U.S. alone - face about a 1-in-5 chance that the cancer will come back, or recur, within 10 years of treatment. Research shows that early detection of these recurrences and treatment can save lives. However, currently available blood tests are not very sensitive. Perhaps the best known test for a biological "marker" protein, or "biomarker," called CA 27.29, misses many cases of recurrence and detects them late - often after symptoms, such as difficulty breathing or bone pain, surface.

"We have identified a group of nine biomarkers that signal recurrence of breast cancer," Raftery said. "Our markers detect twice as many recurrences as the CA marker does at the same specificity. They also detect cancer recurrence earlier, about 11-12 months sooner than existing tests. They accomplish this with blood samples, rather than biopsies, with less discomfort to patients."

To find these markers, Raftery's team at Purdue University and Matrix-Bio, Inc., a company he founded, analyzed many hundreds of "metabolites" in the blood of breast cancer survivors. Metabolites are small molecules, biological byproducts formed as the body's cells go about the business of life. Some are released into the bloodstream and urine. The rapidly emerging scientific field called "metabolite profiling" seeks to understand how these metabolites relate to health and disease. Groups of metabolites already have been linked to a range of diseases.

Many of Raftery's biomarkers were known to be involved in cancer. But no one knew that this group of metabolites could serve as biomarkers for breast cancer recurrence, he said. The markers are detected with an instrument called a mass spectrometer, which is common in clinical laboratories.

Raftery explained that these markers would be used in combination with results from CA 27.29 blood tests. "We take both of those results together and roll them into the profile so that the score we generate is a combination of the CA value and our nine metabolites," he said. "If the score indicates that the cancer probably has returned, the patient would then likely undergo imaging tests to locate the tumor."

Raftery hopes that the new test will become available later this year. In the meantime, the researchers are conducting another clinical study with the test. He also said that, in the future, the test might be useful in the early detection of breast cancer, not just recurrences.

The scientists acknowledged partial funding from the National Institutes of Health.

Abstract

The need for improved diagnostics in oncology is driving efforts to develop advanced methods for molecular based medicine. For example, the detection of recurrent breast cancer is limited by poorly performing CA markers that are both insensitive and late markers. Because of their sensitivity to biological status, metabolite markers may provide better diagnostic performance and earlier detection, which should result in improved therapy outcomes. We have found that combining MS and NMR methods improves the ability to perform global metabolite profiling, and has revealed a set of biomarkers that are very sensitive and specific for detecting early breast cancer recurrence. The derived metabolite profile is twice as sensitive as the CA 27.29 assay, and detects recurrence 12 months earlier. The profile has been ported to a single MS platform and validated using an independent set of ~100 patient samples. Assay performance, and an outlook of the approach will be discussed.

http://www.eurekalert.org/pub_releases/2012-03/wuso-mth032612.php

More than half of all cancer is preventable

Public health researchers outline obstacles standing in the way of prevention

More than half of all cancer is preventable, and society has the knowledge to act on this information today, according to Washington University public health researchers at the Siteman Cancer Center in St. Louis.

In a review article published in Science Translational Medicine March 28, the investigators outline obstacles they say stand in the way of making a huge dent in the cancer burden in the United States and around the world.

"We actually have an enormous amount of data about the causes and preventability of cancer," says epidemiologist Graham A. Colditz, MD, DrPH, the Niess-Gain Professor at the School of Medicine and associate director of prevention and control at the Siteman Cancer Center. "It's time we made an investment in implementing what we know."

What we know, according to Colditz and his co-authors, is that lifestyle choices people make and that society can influence in a number of ways - from tobacco use to diet and exercise - play a significant role in causing cancer. Specifically, the researchers cite data demonstrating that smoking alone is responsible for a third of all cancer cases in the United States. Excess body weight and obesity account for another 20 percent.

But beyond individual habits, they argue that the structure of society itself - from medical research funding to building design and food subsidies - influences the extent of the cancer burden and can be changed to reduce it.

The obstacles they see to implementing broad cancer prevention strategies are:

* Skepticism that cancer can be prevented. Smoking rates in different states demonstrate that 75 percent of lung cancer in the United States could be prevented with elimination of cigarette smoking.
* The short-term focus of cancer research. Benefits of prevention may be underestimated because they take decades to show up, and research funding often spans five years or less.
* Intervening too late in life to prevent cancer. Strategies like vaccination against cancer-causing viruses, such as the human papilloma virus that causes cervical cancer, work best when begun early, in this case before young people begin sexual activity.
* Research focuses on treatment, not prevention. Treatments focus only on a single organ after diagnosis but behavioral changes reduce cancer and death rates from many chronic diseases.
* Debate among scientists. They say health experts have a moral responsibility to highlight cancer risk factors even without knowing the biological mechanism by which they cause cancer.
* Societal factors that affect health. Tobacco policy and government subsidies don't do enough to discourage unhealthy behavior, and in some cases they make the unhealthy options more accessible, especially in low-income communities.
* Lack of collaboration across disciplines. Scientists and health experts must work together to learn what causes cancer, communicate that to the public and work with community leaders to implement policies that help people lead healthier lives, they say.
* The complexity of implementing broad changes. With so many players involved, from health-care providers to government regulators to individuals, it will be difficult to implement broad change over the long term.

According to the American Cancer Society, an estimated 1,638,910 new cancer cases will be diagnosed this year in the United States. Also this year, 577,190 Americans are expected to die of cancer. Only heart disease kills more people in this country. And Colditz's research has shown that these cancer prevention strategies would reduce the burden of heart disease and other chronic conditions as well.

Despite the obstacles, Colditz and his colleagues point to some successes that they say demonstrate that broad change is possible. One example is the relatively quick elimination of unhealthy trans fats from the national diet. And the National Cancer Institute (NCI) has reported that lung cancer rates are declining in both men and women, supporting the benefits of tighter tobacco control policy.

"After working in public health for 25 years, I've learned that if we want to change health, we need to change policy," says co-author Sarah J. Gehlert, PhD, the E. Desmond Lee Professor of Racial and Ethnic Diversity at the Brown School of Social Work and the School of Medicine. "Stricter tobacco policy is a good example. But we can't make policy change on our own. We can tell the story, but it requires a critical mass of people to talk more forcefully about the need for change."

Colditz GA, Wolin KY, Gehlert S. Applying what we know to accelerate cancer prevention. Science Translational Medicine. March 28, 2012.

http://www.eurekalert.org/pub_releases/2012-03/plos-afv032612.php

Adjuvanted flu vaccine associated with child narcolepsy in Finland

A sudden increase in narcolepsy in Finnish children at the beginning of 2010 was likely related to the Pandemrix vaccine used in response to the H1N1 2009 flu pandemic

A sudden increase in narcolepsy in Finnish children at the beginning of 2010 was likely related to the Pandemrix vaccine used in response to the H1N1 2009 flu pandemic, according to two reports published Mar. 28 in the open access journal PLoS ONE.

The authors of the studies, led by Markku Partinen of the Helsinki Sleep Clinic and Hanna Nohynek of the National Institute for Health and Welfare in Finland, found that the average annual incidence of narcolepsy between 2002 and 2009 among children younger than 17 was 0.31 per 100,000, and in 2010, this incidence was about 17 times higher, at 5.3 cases per 100,000. In contrast, the incidence rate for adults over 20 was essentially unchanged over that same time period.

To further evaluate the potential connection between the vaccine and narcolepsy, the researchers collected vaccination and childhood narcolepsy data for children born between January 1991 and December 2005.

They found that the narcolepsy incidence for vaccinated individuals within this age group was 9.0 per 100,000 people, as compared to just 0.7 per 100,000 for unvaccinated individuals – almost 13 times lower.

Together, these results provide compelling evidence that the Pandemrix vaccine, used in 2009 and 2010 in association with the H1N1 flu pandemic, contributed to narcolepsy in patients between the age of 4 and 19 in Finland, the authors conclude.

Citation: Nohynek H, Jokinen J, Partinen M, Vaarala O, Kirjavainen T, et al. (2012) AS03 Adjuvanted AH1N1 Vaccine Associated with an Abrupt Increase in the Incidence of Childhood Narcolepsy in Finland. PLoS ONE 7(3): e33536. doi:10.1371/journal.pone.0033536

Citation: Partinen M, Saarenpa¨a¨-Heikkila¨ O, Ilveskoski I, Hublin C, Linna M, et al. (2012) Increased Incidence and Clinical Picture of Childhood Narcolepsy following the 2009 H1N1 Pandemic Vaccination Campaign in Finland. PLoS ONE 7(3): e33723. doi:10.1371/journal.pone.0033723

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Financial Disclosure: The authors have no external support or funding to report. The collection of data from the registries and from different hospitals was funded by THL. The study group had freedom for the study design, data collection, data analysis, data interpretation, and writing of the report. The authors had access to all the data, take responsibility for the integrity of the data and the accuracy of the analysis, and had final responsibility for the reporting of the data.

Competing Interest Statement: HN received honoraria for technical consultancy from GlaxoSmithKline (GSK), and Pfizer for development of pneumococcal conjugate vaccines. JJ is co-investigator of a nationwide effectiveness study of the ten-valent pneumococcal conjugate vaccine mainly funded by GlaxoSmithKline. MP has been consultant for Bioprojet and UCB Pharma and received funding support and travel grants from Boehringer-Ingelheim, Bioprojet, GSK, Cephalin, MSD, Leiras and Servier. T. Kilpi is principal investigator of a nationwide effectiveness study of the ten-valent pneumococcal conjugate vaccine mainly funded by GlaxoSmithKline, and her unit received funding for a clinical trial on the safety and immunogenicity of a prototype pandemic influenza vaccine from Solvay Pharmaceuticals. This does not alter the authors' adherence to all the PLoS ONE policies on sharing data and materials. All other authors confirm they have no conflicts of interest.

Competing Interest Statement: The authors have declared that no competing interests exist.

http://www.eurekalert.org/pub_releases/2012-03/yu-wyi032812.php

With you in the room, bacteria counts spike

A person's mere presence in a room can add 37 million bacteria to the air every hour - material largely left behind by previous occupants and stirred up from the floor

New Haven, Conn. - A person's mere presence in a room can add 37 million bacteria to the air every hour - material largely left behind by previous occupants and stirred up from the floor - according to new research by Yale University engineers.

"We live in this microbial soup, and a big ingredient is our own microorganisms," said Jordan Peccia, associate professor of environmental engineering at Yale and the principal investigator of a study recently published online in the journal Indoor Air. "Mostly people are re-suspending what's been deposited before. The floor dust turns out to be the major source of the bacteria that we breathe."

Many previous studies have surveyed the variety of germs present in everyday spaces. But this is the first study that quantifies how much a lone human presence affects the level of indoor biological aerosols.

Peccia and his research team measured and analyzed biological particles in a single, ground-floor university classroom over a period of eight days - four days when the room was periodically occupied, and four days when the room was continuously vacant. At all times the windows and doors were kept closed. The HVAC system was operated at normal levels. Researchers sorted the particles by size.

Overall, they found that "human occupancy was associated with substantially increased airborne concentrations" of bacteria and fungi of various sizes. Occupancy resulted in especially large spikes for larger-sized fungal particles and medium-sized bacterial particles. The size of bacteria- and fungi-bearing particles is important, because size affects the degree to which they are likely to be filtered from the air or linger and recirculate, the researchers note. "Size is the master variable," Peccia said.

Researchers found that about 18 percent of all bacterial emissions in the room - including both fresh and previously deposited bacteria - came from humans, as opposed to plants and other sources. Of the 15 most abundant varieties of bacteria identified in the room studied, four are directly associated with humans, including the most abundant, Propionibacterineae, common on human skin.

Peccia said carpeted rooms appear to retain especially high amounts of microorganisms, but noted that this does not necessarily mean rugs and carpets should be removed. Extremely few of the microorganisms commonly found indoors - less than 0.1 percent - are infectious, he said. Still, understanding the content and dynamics of indoor biological aerosols is helpful for devising new ways of improving air quality when necessary, he said.

"All those infectious diseases we get, we get indoors," he said, adding that Americans spend more than 90 percent of their time inside. The researchers have begun a series of similar studies outside the United States.

The paper's lead author is J. Qian of Yale. Other contributors are D. Hospodsky and N. Yamamoto, both of Yale, and W.W. Nazaroff of the University of California–Berkeley.

The research was supported by the Alfred P. Sloan Foundation.

http://www.scientificamerican.com/article.cfm?id=mercury-polar-craters-water-ice

New Maps of Mercury Show Icy Looking Craters on the Solar System's Innermost Planet

A NASA spacecraft bolsters the case that ice lines the inside of polar craters on Mercury

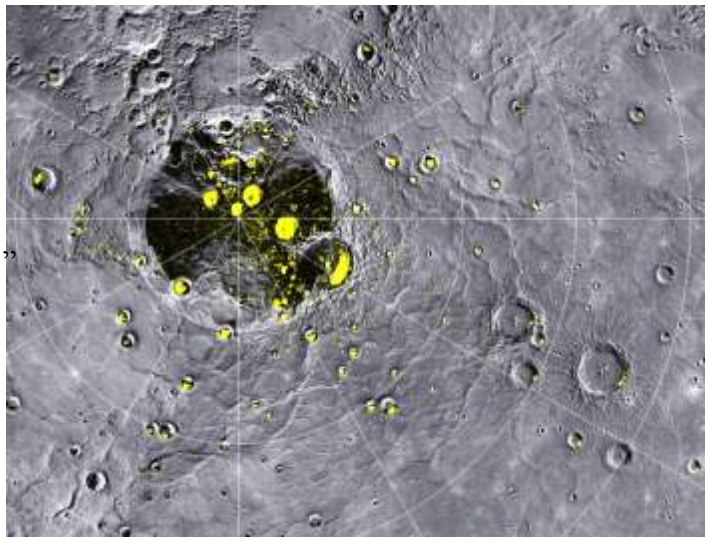
By John Matson | Wednesday, March 28, 2012 | 3

THE WOODLANDS, Tex.- Mercury is a world of extremes. Daytime temperature on the planet closest to the sun can soar as high as 400 degrees Celsius near the equator, hot enough to melt lead. When day turns to night, the planet's surface temperature plunges to below –150 degrees C.

But some places on Mercury are slightly more stable. Inside polar craters on the diminutive planet are regions that never see the light of day, shaded as they are by their crater rims. The temperature there remains cold throughout the Mercury day - and during the Mercury year. Now new data from NASA's MESSENGER spacecraft, presented at the annual Lunar and Planetary Science Conference, corroborate a long-held hypothesis that Mercury has squirreled away pockets of water ice in those shadowy craters, despite the sun's proximity.

Beginning with a series of radar observations of Mercury two decades ago using some of the biggest radio dishes on Earth, planetary scientists have had good reason to suspect that the polar craters harbored ice deposits at or just below the surface. Radar images of the poles showed anomalously bright features - patches that reflected radio waves much better than the surrounding terrain, just as ice does. Many of those radar-bright features corresponded to the location of large impact craters as mapped by the Mariner 10 spacecraft in the 1970s. But Mariner saw less than half of Mercury, and researchers have long lacked a comprehensive atlas of the poles to compare with the radar imagery.

That all changed following MESSENGER's 2011 arrival at Mercury. MESSENGER (a somewhat strained acronym for Mercury Surface, Space Environment, Geochemistry and Ranging) has orbited the innermost planet for just over a year and has charted Mercury's surface in unprecedented detail. As Nancy Chabot of the Johns Hopkins University Applied Physics Laboratory demonstrated in a conference talk, the maps MESSENGER has made match up nicely with the radar imagery of the poles.



"There is an excellent correlation between the radar-bright features and the shadowed locations in the craters," Chabot said. "All of the radar-bright regions are within a few pixels of a region that is shadowed on Mercury's surface." In other words, the putative ice deposits fall in the few perpetually cold locales on Mercury - the places where ice could plausibly remain stable over long periods of time. The available evidence, she noted, remains consistent with the hypothesized presence of water ice on Mercury.

ICE FISHING: New maps from a Mercury orbiter support the long-standing hypothesis that the innermost planet harbors pockets of water ice. In this composite image radar imagery from Earth-based radio telescopes appears in yellow. **Image: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington**

The putative ice is essentially ubiquitous in the coldest northern craters, the large impact basins within 10 degrees of the north pole. "In this region, nearly every crater that's greater than 10 kilometers hosts a radar-bright deposit, which I think is really striking," Chabot said.

But the apparently icy craters cover more of the northern hemisphere than might be expected. "Craters hosting radar-bright features extend to latitudes as low as 67 degrees North," Chabot said. "These lower latitudes are a thermally challenging environment."

The radar hot spots also line craters less than 10 kilometers across, where the heat radiating from the basin's sunlit rim would make for ice-unfriendly temperatures across the crater floor. At lower latitudes or in smaller craters, any ice deposits would likely require a thin insulating blanket, perhaps a layer of fine-grained surface material, or regolith, to keep it from sublimating away.

In fact, MESSENGER's altimeter, which has fired more than 10 million laser pulses at Mercury to make detailed maps of the planet's topography, seems to confirm that some insulating material blankets whatever ice may line the craters. Whereas radar can penetrate a thin layer of regolith to bounce off the ice beneath, the laser pulses are sensitive to reflectivity at the surface. Ice is very reflective at the 1.06-micron laser wavelength of the Mercury Laser Altimeter, Gregory Neumann of the NASA Goddard Space Flight Center explained in a conference talk, so exposed ice would return laser pulses more readily than its surroundings. "Surprisingly, we've been reporting for some time that no, we don't see this," Neumann said. "In fact we see quite the opposite."

In the permanently shadowed craters, where radar observations have pointed to the presence of ice, the altimeter recorded dark patches of diminished laser reflectance. "We never see in these regions the large increase of return energy that you would see if it were so cold that ice were exposed on the surface," Neumann said. One possibility is that the radar-bright deposits, widely believed to be ice, could be overlaid by a dark material, such as a hydrocarbon, that can tolerate somewhat higher temperatures.

That hypothesis was supported by David Paige of the University of California, Los Angeles. He and his colleagues calculated surface and subsurface temperatures for the locations where radar-bright features tend to form and inferred a probable composition of ice pockets blanketed by regolith darkened by organic compounds.

Peak temperatures in the shadowed craters, which can often be too warm for exposed water ice, mesh well with conditions at which dark organic molecules would be stable. But just below the surface, temperatures in radar-bright craters tend to be colder, hovering near –170 degrees C. That is exactly the temperature at which water ice would be expected to remain stable, Paige said.

MESSENGER's new look at the features long ago spotted by Earth-based radars, he added, demonstrate "fairly conclusively now that they are predominantly composed of thermally stable water ice."

http://www.scientificamerican.com/article.cfm?id=orangutans-in-indonesias-aceh-fores

Orangutans in Indonesia's Aceh Forest May Die Out in Weeks

Forest fires and land clearing by palm oil firms could kill off within weeks about 200 orangutans in a forest in western Indonesia, an environmental group said on Wednesday.

Reporting by Olivia Rondonuwu; Editing by Neil Chatterjee and Ron Popeski

JAKARTA (Reuters) - Forest fires and land clearing by palm oil firms could kill off within weeks about 200 orangutans in a forest in western Indonesia, an environmental group said on Wednesday.

The orangutans, part of a population of around 6,600 on Sumatra island, used to live in a lush forest and peatland region called Rawa Tripa on the coast of Indonesia's Aceh province. But more than two-thirds of the area has been divided up into palm oil concessions, said the Coalition to Save Tripa.

Graham Usher, a member of the coalition and a landscape protection specialist, said satellite images showed forest fires had been burning in Tripa since last week, and if allowed to continue they could wipe out orangutans already forced onto the edge of remaining forests. "If there is any prolonged dry spell, which is quite likely, there's a very good chance that the whole piece of forest and everything in it, so that's orangutans, sun bears, tigers, and all the other protected species in it, will disappear in a few weeks and will be gone permanently," he told a news conference.

The palm oil industry has expanded to make Indonesia the world's top producer and exporter of the edible oil, used to make good ranging from cooking oil and biodiesel to biscuits and soap to feed growing Asian consumer demand. Deforestation has threatened animals like the Sumatran tiger and Javan rhino and pushed up carbon dioxide emissions. The Bali tiger and the Java tiger have disappeared in the last 70 years.

A two-year moratorium on new permits to clear primary forests came into effect in Indonesia last year, part of a $1 billion deal with Norway to cut emissions and slow expansion of plantations. But the moratorium was breached in Aceh on its first days, an environmental group has said.

The last Aceh permit for palm oil was issued by former Aceh governor Irwandi Yusuf in August last year to PT Kallista Alam, prompting environmental group Walhi to file a legal suit against Yusuf. A court verdict is expected next week. "If Kallista Alam win the case they will burn it and that whole bit of forest will disappear and we can say goodbye to the orangutan of Tripa peat swamps," Usher said.

Kallista Alam could not be reached for comment.

http://bit.ly/HmeMGo

Bacteria could be significant cause of OCD

How many cases of obsessive-compulsive disorder in children are caused by bacteria? The US National Institute of Mental Health intends to find out, and to test whether antibodies will cure it.

15:28 28 March 2012 by Debora MacKenzie

Streptococcus bacteria, which cause "strep throat", scarlet fever and other infections, evade the immune system by making surface proteins that mimic human ones. The immune system eventually catches on and makes antibodies to the proteins – but these can then attack human tissue including the heart, joints and brain. This has long been known to cause heart disease and a nervous disorder called Sydenham's chorea.

In children, it emerged several years ago that this attack on the brain can inflame brain structures called the basal ganglia, and may precipitate a syndrome whose symptoms include obsessive thoughts and compulsive rituals, identical to the psychological condition obsessive-compulsive disorder.

The NIMH has now launched a project to find such cases and improve diagnosis and treatment, including a study to see how well IVIG, a human antibody treatment used to dampen autoimmune reactions, reverses the syndrome. It also wants to find out how many such cases are related to strep infections, or if there are other causes. The NIMH has now put out guidelines for diagnosing Sydenham's chorea whenever it appears, whether or not the child is known to have had a recent strep infection. Tracking all cases this way should allow researchers to investigate causes more thoroughly, as well as diagnostic signs, and treatments.

http://n.pr/GK3XCx

Whooping Cough Bacteria May Be Changing Their Ways In Australia

Whooping cough has made a comeback lately, with big outbreaks in California and elsewhere. One factor is spotty vaccination.

by Ted Burnham

Now researchers in Australia think they've filled in another piece of the puzzle there. They say the vaccine is better at targeting some strains of the bacterium responsible for whooping cough, Bordetella pertussis, and that's allowing other strains to flourish. Now this this doesn't mean the vaccine is no longer effective, says microbiologist Ruiting Lan of the University of New South Wales, who oversaw the research. "It is still quite

important to stop the transmission" by getting vaccinated, he tells Shots. But in a study published this month in Infectious Disease, he says it looks like the whooping cough bacteria are changing.

Lan and his colleagues performed genetic tests of bacterial cultures, grown from samples taken to diagnose patients in clinics across Australia. His team was looking for bacteria with variants of two genes which Lan says make them "mismatched" to the vaccine. Until 1997, the whooping cough vaccine included whole cells of pertussis bacteria. That provided robust immunity, but the side effects could be nasty.

Now the vaccine uses only a few select parts of the cell, from which your body learns to detect and fight off infection. But previous research has shown that in certain strains of whooping cough, those parts of the cell have genetic differences that the vaccine doesn't target. And since the new vaccine was introduced, those variants have become more common.

Australia is in the midst of a whooping cough epidemic, with 38,000 cases last year in a country of just 22 million people. Lan says before 2008, when the epidemic started, the variant strains appeared in 31 percent of the bacteria in diagnostic cultures. In samples from the current epidemic, that number jumped to 84 percent.

Lan says this is evidence of the bacteria responding to the vaccine, learning to evade it. But Tom Clark, an epidemiologist at the Centers for Disease Control and Prevention, says that's not necessarily true.

Clark points to several factors that could explain the change. Culture samples aren't used to diagnose whooping cough very often, he says, because newer techniques are faster. That means Lan's samples might not represent the whole spectrum of bacterial strains that are circulating.

And Clark says the genetic variants Lan studied are nothing new. "We've seen them in the U.S. for a long time," he says. But when the CDC has studied the effectiveness of the whooping cough vaccine, as it did in the 1990s and again in 2010, they've found that it's quite high.

Immunity is "98 percent or 100 percent within a year" of vaccination, Clark says. But immunity does drop off over time. Both Clark and Lan say waning immunity is a problem in the adult population, many of whom were vaccinated decades ago. Whooping cough isn't a big deal for adults, but can be deadly to infants. Adults, including seniors, can get booster shots to reduce the risk that they'll pass the bacteria to children.

http://www.physorg.com/news/2012-03-microbes-enceladus.html

Is it snowing microbes on Enceladus?

There's a tiny moon orbiting beyond Saturn's rings that's full of promise, and maybe - just maybe - microbes.

In a series of tantalizingly close flybys to the moon, named "Enceladus," NASA's Cassini spacecraft has revealed watery jets erupting from what may be a vast underground sea. These jets, which spew through cracks in the moon's icy shell, could lead back to a habitable zone that is uniquely accessible in all the solar system.

"More than 90 jets of all sizes near Enceladus's south pole are spraying water vapor, icy particles, and organic compounds all over the place," says Carolyn Porco, an award-winning planetary scientist and leader of the Imaging Science team for NASA's Cassini spacecraft. "Cassini has flown several times now through this spray and has tasted it. And we have found that aside from water and organic material, there is salt in the icy particles. The salinity is the same as that of Earth's oceans."

Thermal measurements of Enceladus's fissures have revealed temperatures as high as -120 deg Fahrenheit (190 Kelvin). "If you add up all the heat, 16 gigawatts of thermal energy are coming out of those cracks," says Porco. She believes the small moon, with its sub-surface liquid sea, organics, and an energy source, may host the same type of life we find in similar environments on Earth.

"The kind of ecologies Enceladus might harbor could be like those deep within our own planet. Abundant heat and liquid water are found in Earth's subterranean volcanic rocks. Organisms in those rocks thrive on hydrogen (produced by reactions between liquid water and hot rocks) and available carbon dioxide and make methane, which gets recycled back into hydrogen. And it's all done entirely in the absence of sunlight or anything produced by sunlight."

But what makes Enceladus special is that its habitable zone offers itself up for easy access.

"It's erupting out into space where we can sample it. It sounds crazy but it could be snowing microbes on the surface of this little world. In the end, it's is the most promising place I know of for an astrobiology search. We don't even need to go scratching around on the surface. We can fly through the plume and sample it. Or we can land on the surface, look up and stick our tongues out. And voilà…we have what we came for."

The source of Enceladus's heat appears to be Saturn itself. Researchers say Saturn's gravitational pull causes the moon's shape to change slightly on a daily basis as it orbits. Flexing motions in its interior generate heat--like the heat you feel in a paperclip when you bend it back and forth rapidly. "But the tidal flexing occurring

now is not enough to account for all the heat presently coming out of Enceladus. One way out of this dilemma is to assume that some of the heat observed today was been generated and stored internally in the past."

Porco believes Enceladus's orbit could have been much more eccentric, and the greater the eccentricity, she says, the greater the tidal flexing and resulting structural variations that produce the heat. In this scenario, the heat would have been stored inside the little moon by melting some of the ice to recharge the liquid sea.

"Now that the orbit's eccentricity has lessened, the heat emanating from the interior is a combination of heat produced today and in the past. But since more heat is coming out presently than is being produced, Enceladus is in a cooling off stage and the liquid water is returning to ice. There are models to show that it never really freezes entirely, so the eccentricity may increase again, restarting the cycle."

Whatever is turning up the heat, Porco has a plan of action. It's simple: "We need to get back to Enceladus and check it out." *Source: Science@NASA*

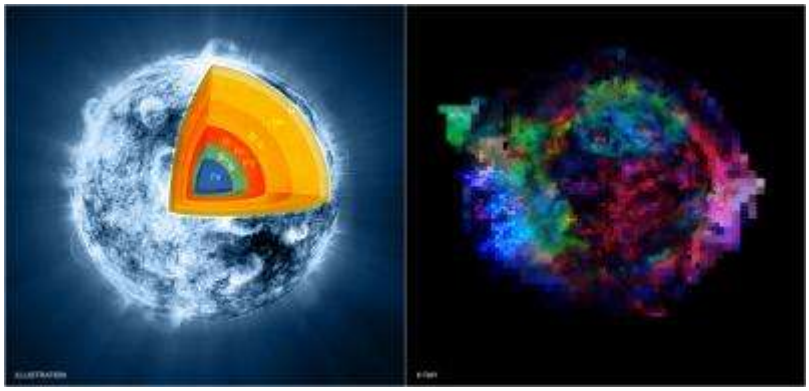
http://www.eurekalert.org/pub_releases/2012-03/cxc-ase032912.php

A star explodes and turns inside out

A new X-ray study of the remains of an exploded star indicates that the supernova that disrupted the massive star may have turned it inside out in the process.

Using very long observations of Cassiopeia A (or Cas A), a team of scientists has mapped the distribution elements in the supernova remnant in unprecedented detail. This information shows where the different layers of the pre-supernova star are located three hundred years after the explosion, and provides insight into the nature of the supernova.

An artist's illustration on the left shows a simplified picture of the inner layers of the star that formed Cas A just before it exploded, with the predominant concentrations of different elements represented by different colors: iron in the core (blue), overlaid by sulfur and silicon (green), then magnesium, neon and oxygen (red).



This two-panel graphic compares an artist's illustration (left) of a simplified picture of the inner layers of a star just before it exploded to form the Cassiopeia A supernova remnant with a Chandra image (right) of what we see today. The different elements are represented by different colors: iron (blue), sulfur and silicon (green), and magnesium, neon and oxygen (red). The Chandra image uses the same color scheme to show the distribution of iron, sulfur and magnesium in the supernova remnant. A comparison of the illustration and the Chandra element map shows clearly that most of the iron, which according to theoretical models of the pre-supernova was originally on the inside of the star, is now located near the outer edges of the remnant. **Illustration: NASA/CXC/M.Weiss; X-ray image: NASA/CXC/GSFC/U. Hwang & J. Laming**

The image from NASA's Chandra X-ray Observatory on the right uses the same color scheme to show the distribution of iron, sulfur and magnesium in the supernova remnant. The data show that the distributions of sulfur and silicon are similar, as are the distributions of magnesium and neon. Oxygen, which according to theoretical models is the most abundant element in the remnant, is difficult to detect because the X-ray emission characteristic of oxygen ions is strongly absorbed by gas in along the line of sight to Cas A, and because almost all the oxygen ions have had all their electrons stripped away.

A comparison of the illustration and the Chandra element map shows clearly that most of the iron, which according to theoretical models of the pre-supernova was originally on the inside of the star, is now located near the outer edges of the remnant. Surprisingly, there is no evidence from X-ray (Chandra) or infrared (Spitzer Space Telescope) observations for iron near the center of the remnant, where it was formed. Also, much of the silicon and sulfur, as well as the magnesium, is now found toward the outer edges of the still-expanding debris. The distribution of the elements indicates that a strong instability in the explosion process somehow turned the star inside out.

This latest work, which builds on earlier Chandra observations, represents the most detailed study ever made of X-ray emitting debris in Cas A, or any other supernova remnant resulting from the explosion of a massive star. It is based on a million seconds of Chandra observing time. Tallying up what they see in the Chandra data, astronomers estimate that the total amount of X-ray emitting debris has a mass just over three times that of the Sun. This debris was found to contain about 0.13 times the mass of the Sun in iron, 0.03 in sulfur and only 0.01 in magnesium.

The researchers found clumps of almost pure iron, indicating that this material must have been produced by nuclear reactions near the center of the pre-supernova star, where the neutron star was formed. That such pure iron should exist was anticipated because another signature of this type of nuclear reaction is the formation of the radioactive nucleus titanium-44, or Ti-44. Emission from Ti-44, which is unstable with a half-life of 63 years, has been detected in Cas A with several high-energy observatories including the Compton Gamma Ray Observatory, BeppoSAX, and the International Gamma-Ray Astrophysics Laboratory (INTEGRAL).

These results appeared in the February 20th issue of The Astrophysical Journal in a paper by Una Hwang of Goddard Space Flight Center and Johns Hopkins University, and (John) Martin Laming of the Naval Research Laboratory. NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

http://www.eurekalert.org/pub_releases/2012-03/epfd-gtt032712.php

Getting to the moon on drops of fuel

An ionic motor for small satellites

The first prototype of a new, ultra-compact motor that will allow small satellites to journey beyond Earth's orbit is just making its way out of the EPFL laboratories where it was built. The goal of the micro motor: to drastically reduce the cost of space exploration.

Imagine reaching the Moon using just a tenth of a liter of fuel. With their ionic motor, MicroThrust, EPFL scientists and their European partners are making this a reality and ushering in a new era of low-cost space exploration. The complete thruster weighs just a few hundred grams and is specifically designed to propel small (1-100 kg) satellites, which it enables to change orbit around the Earth and even voyage to more distant destinations – functions typically possible only for large, expensive spacecraft. The just-released prototype is expected to employed on CleanSpace One, a satellite under development at EPFL that is designed to clean up space debris, and on OLFAR, a swarm of Dutch nanosatellites that will record ultra-low radio-frequency signals on the far side of the Moon.

The motor, designed to be mounted on satellites as small as 10x10x10 cm3, is extremely compact but highly efficient. The prototype weighs only about 200 grams, including the fuel and control electronics.

"At the moment, nanosatellites are stuck in their orbits. Our goal is to set them free," explains Herbert Shea, coordinator of the European MicroThrust project and director of EPFL's Microsystems for Space Technologies Laboratory.

Small satellites are all the rage right now because their manufacturing and launch costs are relatively low – about half a million dollars, compared to conventional satellites that run into the hundreds of millions. But nanosatellites currently lack an efficient propulsion system that would render them truly autonomous and thus able to carry out exploration or observation missions.

A motor that doesn't burn fuel

Instead of a combustible fuel, the new mini motor runs on an "ionic" liquid, in this case the chemical compound EMI-BF4, which is used as a solvent and an electrolyte. It is composed of electrically charged molecules (like ordinary table salt) called ions, except that this compound is liquid at room temperature. The ions are extracted from the liquid and then ejected by means of an electric field to generate thrust. This is the principle behind the ionic motor: fuel is not burned, it is expelled.

In the motor developed at EPFL, the flow of ions is emitted from an array of tiny silicon nozzles – over 1,000 per square centimeter. The fuel is first guided by capillary action from a reservoir to the extremity of the micro-nozzles, where the ions are then extracted by an electrode held at 1,000 volts, accelerated, and finally emitted out the back of the satellite. The polarity of the electric field is reversed every second, so that all the ions – positive and negative – are ejected.

SystematIC Design, a MicroThrust project partner, designed the motor's electrical system. The ion ejection system requires a high electrical voltage, but the available energy aboard a 1-liter nanosatellite is limited to a few small solar cells – in practice, about four watts of power. The Dutch company was able to develop a system that overcame this difficulty.

Cruising speed: 40,000 km per hour

After six months of acceleration, the microsatellite's speed increases from 24,000 km/h, its launch speed, to 42,000 km/h. The acceleration is only about a tenth of a millimeter per square second, which translates into 0-100 km/h in 77 hours. But in space, where there is no friction to impede motion, gentle but steady acceleration is the way to go.

"We calculated that in order to reach lunar orbit, a 1-kg nanosatellite with our motor would travel for about six months and consume 100 milliliters of fuel," explains Muriel Richard, a scientist in EPFL's Swiss Space Center.

The ionic motor will power CleanSpace One – a nanosatellite whose mission is to tidy up space by grabbing space debris and pulling it into the Earth's atmosphere to be safely incinerated. According to the Swiss Space Center, CleanSpace One will take two to three months and more than 1,000 terrestrial revolutions to reach one of its targets, the decommissioned Swisscube cubesat or Tlsat-1 cubesat. And the scientists have just over a year to finalize their system.

"Our prototype still has a few flow problems at the nozzle extremities, which could cause short-circuits," explains Shea. The prototype was developed in the context of a European project coordinated by EPFL and involved Queen Mary and Westfield College in the UK, the Dutch companies TNO and SystematIC Design B.V., and Nanospace AB in Sweden.

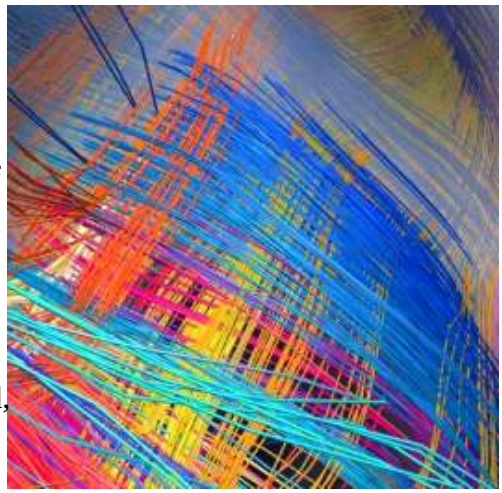
Project partners: Ecole polytechnique fédérale de Lausanne (EPFL), SWITZERLAND – coordination, development of MEMS micronozzle chips and mission calculations, Queen Mary and Westfield College (University of London), UK – electrospray physics and expertise in ion propulsion, TNO, THE NETHERLANDS– System engineering, SystematIC Design BV, THE NETHERLANDS – high voltage and control electronics, NanoSpace AB, SWEDEN – expertise in microfluidics and MEMS
Links: EPFL-LMTS site on microfabricated ion engines: http://lmts.epfl.ch/microthrust

http://www.eurekalert.org/pub_releases/2012-03/niom-bwa032312.php

Brain wiring a no-brainer?

Scans reveal astonishingly simple 3D grid structure -- NIH-funded study

The brain appears to be wired more like the checkerboard streets of New York City than the curvy lanes of Columbia, Md., suggests a new brain imaging study. The most detailed images, to date, reveal a pervasive 3D grid structure with no diagonals, say scientists funded by the National Institutes of Health.



"Far from being just a tangle of wires, the brain's connections turn out to be more like ribbon cables -- folding 2D sheets of parallel neuronal fibers that cross paths at right angles, like the warp and weft of a fabric," explained Van Wedeen, M.D., of Massachusetts General Hospital (MGH), A.A. Martinos Center for Biomedical Imaging and the Harvard Medical School. "This grid structure is continuous and consistent at all scales and across humans and other primate species."

Wedeen and colleagues report new evidence of the brain's elegant simplicity March 30, 2012 in the journal Science. The study was funded, in part, by the NIH's National Institute of Mental Health (NIMH), the Human Connectome Project of the NIH Blueprint for Neuroscience Research, and other NIH components.

This detail from a DSI scan shows a fabric-like 3-D grid structure of connections in monkey brain. **Van Wedeen, M.D., Martinos Center and Dept. of Radiology, Massachusetts General Hospital and Harvard University Medical School**

"Getting a high resolution wiring diagram of our brains is a landmark in human neuroanatomy," said NIMH Director Thomas R. Insel, M.D. "This new technology may reveal individual differences in brain connections that could aid diagnosis and treatment of brain disorders."

Knowledge gained from the study helped shape design specifications for the most powerful brain scanner of its kind, which was installed at MGH's Martinos Center last fall. The new Connectom diffusion magnetic resonance imaging (MRI) scanner can visualize the networks of crisscrossing fibers – by which different parts of the brain communicate with each other – in 10-fold higher detail than conventional scanners, said Wedeen.

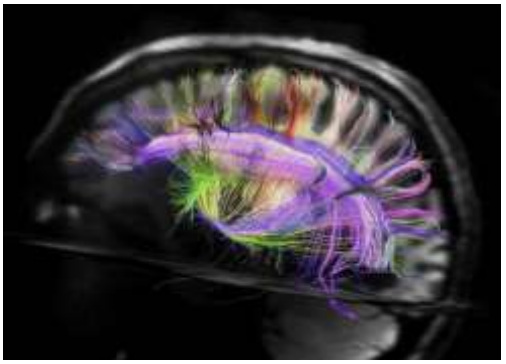
"This one-of-a-kind instrument is bringing into sharper focus an astonishingly simple architecture that makes sense in light of how the brain grows," he explained. "The wiring of the mature brain appears to mirror three primal pathways established in embryonic development."

As the brain gets wired up in early development, its connections form along perpendicular pathways, running horizontally, vertically and transversely. This grid structure appears to guide connectivity like lane markers on a highway, which would limit options for growing nerve fibers to change direction during development. If they can turn in just four directions: left, right, up or down, this may enforce a more efficient, orderly way for the fibers to find their proper connections – and for the structure to adapt through evolution, suggest the researchers.

Obtaining detailed images of these pathways in human brain has long eluded researchers, in part, because the human cortex, or outer mantle, develops many folds, nooks and crannies that obscure the structure of its connections. Although studies using chemical tracers in neural tracts of animal brains yielded hints of a grid structure, such invasive techniques could not be used in humans.

Wedeen's team is part of a Human Connectome Project Harvard/MGH-UCLA consortium that is optimizing MRI technology to more accurately to image the pathways. In diffusion imaging, the scanner detects movement of water inside the fibers to reveal their locations. A high resolution technique called diffusion spectrum imaging (DSI) makes it possible to see the different orientations of multiple fibers that cross at a single location – the key to seeing the grid structure.

In the current study, researchers performed DSI scans on postmortem brains of four types of monkeys – rhesus, owl, marmoset and galago – and in living humans. They saw the same 2D sheet structure containing parallel fibers crossing paths everywhere in all of the brains – even in local path neighborhoods. The grid structure of cortex pathways was continuous with those of lower brain structures, including memory and emotion centers. The more complex human and rhesus brains showed more differentiation between pathways than simpler species.



Among immediate implications, the findings suggest a simplifying framework for understanding the brain's structure, pathways and connectivity.

Curvature in this DSI image of a whole human brain turns out to be folding of 2-D sheets of parallel neuronal fibers that cross paths at right angles. This picture came from the new Connectom scanner. **Van Wedeen, M.D., Martinos Center and Dept. of Radiology, Massachusetts General Hospital and Harvard University Medical School**

The technology used in the current study was able to see only about 25 percent of the grid structure in human brain. It was only apparent in large central circuitry, not in outlying areas where the folding obscures it. But lessons learned were incorporated into the design of the newly installed Connectom scanner, which can see 75 percent of it, according to Wedeen.

Much as a telescope with a larger mirror or lens provides a clearer image, the new scanner markedly boosts resolving power by magnifying magnetic fields with magnetically stronger copper coils, called gradients. Gradients make it possible to vary the magnetic field and get a precise fix on locations in the brain. The Connectom scanner's gradients are seven times stronger than those of conventional scanners. Scans that would have previously taken hours – and, thus would have been impractical with living human subjects – can now be performed in minutes.

"Before, we had just driving directions. Now, we have a map showing how all the highways and byways are interconnected," said Wedeen. "Brain wiring is not like the wiring in your basement, where it just needs to connect the right endpoints. Rather, the grid is the language of the brain and wiring and re-wiring work by modifying it."

Reference: *Wedeen VJ, Rosene DL, Ruopeng W, Guangping D, Mortazavi F, Hagmann P, Kass JH, Tseng W-YI. The Geometric Structure of the Brain Fiber Pathways: A Continuous Orthogonal Grid. March 30, 2012 Science.*

http://www.eurekalert.org/pub_releases/2012-03/fhcr-sfh032612.php

Study finds HIV 'superinfection' boosts immune response

Findings may provide insight into HIV-vaccine development

SEATTLE – Women who have been infected by two different strains of HIV from two different sexual partners – a condition known as HIV superinfection – have more potent antibody responses that block the replication of the virus compared to women who've only been infected once. These findings, by researchers at Fred Hutchinson Cancer Research Center in Seattle, are published online March 29 in PLoS Pathogens.

"We found that women who had been infected twice not only had more potent antibody responses, but some of these women had 'elite' antibody activity, meaning that they had a broad and potent ability to neutralize a wide variety of strains of HIV over a sustained period time," said senior author Julie Overbaugh, Ph.D., a member of the Hutchinson Center's Human Biology Division. It is estimated that only about 1 percent of people with HIV are so-called "elite neutralizers" who are able to potently neutralize multiple subtypes of the virus.

"Individuals who become superinfected with a second virus from a different partner represent a unique opportunity for studying the antibody response and may provide insights into the process of developing broad neutralizing antibodies that could inform HIV-vaccine design," she said.

The study suggests that harboring a mixture of different viral strains may be one way to promote a robust antibody response. The findings also suggest that being infected with two different HIV strains not only leads to a strong response, but also a more rapid response that is capable of recognizing many other HIV strains.

The researchers tracked the immune activity of 12 superinfected women from Mombasa, Kenya, over a five-year period and compared each to a control group of three singly infected women. Overbaugh and lead author

Valerie Cortez, a doctoral student in her lab, assessed the ability of antibodies present in superinfected and singly infected women to neutralize a spectrum of circulating HIV-1 variants. In doing so they were able to determine whether the presence of two viruses compared to one made a difference in immune response. The researchers controlled for variables such as antibody response prior to superinfection and biomarkers of immunity such as CD4+ T cell count and viral load.

The study found that superinfected women had, on average, 1.68 times more neutralizing antibodies than non-superinfected women, and they scored much higher in their ability to neutralize the virus – superinfected women had 1.46 times greater potency than the singly infected women.

More than 1.1 million Americans are estimated to be living with HIV today, and every nine-and-a-half minutes someone in the U.S. becomes infected, according to the U.S. Department of Health and Human Services. An HIV vaccine is considered the best approach to long-term protection from HIV infection, but attempts to develop such a vaccine so far have meet with limited success.

"The holy grail of an HIV vaccine is to elicit antibodies to the virus because antibodies have been shown to block virus infection. But there has been little progress in determining how to elicit such antibodies with a vaccine. The study of individuals HIV infected who have developed strong antibody responses to the virus may shed light on the best approach to design a vaccine that will induce an effective immune response," Overbaugh said.

The National Institutes of Health and the Howard Hughes Medical Institute supported the research, which involved collaborators at the University of Washington and the University of Nairobi in Kenya.

http://www.scientificamerican.com/article.cfm?id=food-poisonings-hidden-legacy

Food Poisoning's Hidden Legacy

Most people think of foodborne illness as an unpleasant few days of fever and diarrhea, but for some there may be lifelong consequences

By Maryn McKenna | Thursday, March 29, 2012 | 10

Colette Dziadul struggled for years to understand her daughter's joint problems. Dana, who is now 14 years old, complained from toddlerhood that her knees and ankles hurt. The aches kept her up at night, made her wake her parents to ask for painkillers and forced her to sit out school sports. Nevertheless, two pediatricians and an orthopedist diagnosed the problem as "growing pains" that would fade as she grew older.

Then, when Dana was 11, Dziadul participated in a survey about foodborne illness. The questionnaire came from an organization called Safe Tables Our Priority (now STOP Foodborne Illness), which was canvassing survivors of outbreaks for details of their recoveries. When she was three years old, Dana had spent two weeks in the hospital - one of 50 people sickened after eating cantaloupe that had been contaminated with Salmonella. Among the complications of infection that the survey listed were symptoms of a form of joint damage known as reactive arthritis.

Dziadul was dumbfounded. She found Dana a rheumatologist, who confirmed that the pain was caused by arthritis for which there was no other explanation. Then she went back into Dana's medical records. On Dana's 10th day in the hospital a nurse had recorded that the youngster was limping and complaining of joint pain. Could those long-forgotten symptoms have been the first sign of arthritis, starting as her body reacted to the Salmonella infection? "That there could be a connection between Salmonella and arthritis never crossed my mind," Dziadul says. "And it never crossed most of the doctors' minds."

It is a scary idea that food poisoning - which we think of as lasting just a few days - could instead have lifelong aftereffects. The incidence of such "sequelae," in medical parlance, has been thought to be low, but not many researchers studied the problem until recently. New findings by several scientific teams suggest the phenomenon is more common than anyone thought.

A Common Problem?

Foodborne disease has an enormous public health impact even if you count only the initial, acute episodes of illness. The Centers for Disease Control and Prevention estimated in 2011 that the U.S. sees 48 million illnesses, 128,000 hospitalizations and 3,000 deaths every year from foodborne organisms. (The European Union had 48,964 cases and 46 deaths in 2009, the most recent year tallied.) The U.S. Department of Agriculture's Economic Research Service calculates the cost of foodborne illnesses just from bacterial infection to be at least $6.7 billion, counting medical care, premature deaths and lost productivity. Re-searchers who attempt to track chronic effects say that the actual bill is much higher.

"People don't understand the full consequences of foodborne disease," says Kirk Smith of the Minnesota Department of Health, which lends its investigators around the U.S. "They think you get diarrhea for a few days

and then you are better. They don't understand that there is a whole range of chronic sequelae. And although any of them may not be common individually, when you put them together they add up to a lot."

Long-term consequences are not limited to individuals who were hospitalized, as Dana was. They have also been recorded in people who experienced what seemed to be minor bouts of fever, vomiting or diarrhea. The consequences include reactive arthritis, urinary tract problems and damage to the eyes after Salmonella and Shigella infections; Guillain-Barré syndrome and ulcerative colitis (a chronic bowel inflammation) after Campylobacter infection; and kidney failure and diabetes after infection with Escherichia coli O157:H7. Those organisms are very common: federal investigators have identified them in meat, milk, poultry, eggs, seafood, fruit, vegetables and even processed foods.

As researchers look back at foodborne outbreaks, they are not only confirming that these complications appear in survivors but adding to the list of illnesses that may occur. A survey of 101,855 residents of Sweden who were made sick by food between 1997 and 2004 found, for instance, that they had higher-than-normal rates of aortic aneurysms, ulcerative colitis and reactive arthritis. A review of a major provincial health database in Australia revealed that people there who contracted any bacterial gastrointestinal infection were 57 percent more likely to develop either ulcerative colitis or Crohn's disease, another chronic bowel condition, than people born in the same place and era who had not had such infections. And several years after a 2005 outbreak of Salmonella in Spain, 65 percent of 248 victims said they had developed joint or muscle pain or stiffness, compared with 24 percent of a control group who were not affected by the outbreak.

Few comprehensive analyses have been conducted in the U.S. Traditionally, food-related investigations have aimed at finding and interviewing victims during the outbreak, Smith says. Because acute illness lasts a couple of weeks at most, little attention has been paid to keeping track of victims afterward - something that might be very complicated because they may go to different doctors and even live in different states.

One of the U.S. studies, published in 2008, traced victims of foodborne illness in Minnesota and Oregon between 2002 and 2004. Researchers determined whom to contact based on rec-ords collected by a CDC surveillance project known as the Foodborne Diseases Active Surveillance Network (FoodNet), which collects reports of lab-confirmed infections caused by 10 different organisms. Out of 4,468 victims, 575 (13 percent) reported later symptoms that matched reactive arthritis, although most - unlike Dana - were never diagnosed by a specialist.

The link between foodborne illness and long-term health consequences could be a coincidence, although advocates say that the chances are remote. A better way to prove the connection would be to identify victims when they first become ill and track them for years thereafter, a research arrangement called a prospective study. There are a few such studies worldwide, and a recently concluded one - the only one to take place in North America - was stunning and persuasive.

In May 2000 the drinking water in Walkerton, Ont., became contaminated with E. coli O157 after heavy rains washed manure from farm fields into its aquifer. More than 2,300 people, about half the town's population, developed fever and diarrhea soon afterward. In 2002 the Ontario government funded the Walkerton Health Study to assess any health effects that might persist among the victims. In 2010 the study published its findings: compared with residents who did not get very sick, those who endured several days of diarrhea during the outbreak had a 33 percent greater likelihood of developing high blood pressure, a 210 percent greater risk of heart attack or stroke, and a 340 percent greater risk of kidney problems in the eight years following the outbreak.

Those outcomes were not limited to people who developed the most serious consequences of E. coli O157 infection. Even Walkerton residents with milder symptoms experienced circulatory problems that would not have been linked to E. coli without the prospective monitoring. That discovery suggests how common the late-onset effects of E. coli infection might be, says William F. Clark, the study's leader and a professor of nephrology at the University of Western Ontario. Clark recommends that survivors of such illnesses have their blood pressure checked every year and their kidney function checked every two or three years.

Given how few scientists have studied the issue, most of the problems have come to light thanks to patient advocacy groups. STOP's original survey, in which Colette Dziadul participated, collected first-person accounts from patients. It was followed by a 2009 white paper from the nonprofit Center for Foodborne Illness Research and Prevention, which unearthed research on long-term sequelae that were buried in the medical literature.

That group now has a grant from the U.S. Food and Drug Administration to research how best to study the frequency of persistent aftereffects. Advocates want public health agencies to create better mechanisms for

identifying and tracking victims, and like Clark, they think victims should be connected as soon as possible to preventive medical care.

"We want to establish the true burden of disease because that is what policy makers use to decide what is a public health priority," says Barbara Kowalcyk, the center's co-founder. "As long as we focus only on the acute form of foodborne illness and not the long-term health consequences, we'll underestimate how significant a problem this is."

http://www.eurekalert.org/pub_releases/2012-03/f-sf-tlb033012.php

The link between fast food and depression has been confirmed

According to a recent study, eating commercial baked goods and fast food is linked to depression.

According to a recent study headed by scientists from the University of Las Palmas de Gran Canaria and the University of Granada, eating commercial baked goods (fairy cakes, croissants, doughnuts, etc.) and fast food (hamburgers, hotdogs and pizza) is linked to depression.

Published in the Public Health Nutrition journal, the results reveal that consumers of fast food, compared to those who eat little or none, are 51% more likely to develop depression. Furthermore, a dose-response relationship was observed. In other words this means that "the more fast food you consume, the greater the risk of depression," explains Almudena Sánchez-Villegas, lead author of the study, to SINC.

The study demonstrates that those participants who eat the most fast food and commercial baked goods are more likely to be single, less active and have poor dietary habits, which include eating less fruit, nuts, fish, vegetables and olive oil. Smoking and working more than 45 hours per week are other prevalent characteristics of this group.

A long-term study

With regard to the consumption of commercial baked goods, the results are equally conclusive. "Even eating small quantities is linked to a significantly higher chance of developing depression," as the university researcher from the Canary Islands points out. The study sample belonged to the SUN Project (University of Navarra Diet and Lifestyle Tracking Program). It consisted of 8,964 participants that had never been diagnosed with depression or taken antidepressants. They were assessed for an average of six months, and 493 were diagnosed with depression or started to take antidepressants.

This new data supports the results of the SUN project in 2011, which were published in the PLoS One journal. The project recorded 657 new cases of depression out of the 12,059 people analysed over more than six months. A 42% increase in the risk associated with fast food was found, which is lower than that found in the current study. Sánchez-Villegas concludes that "although more studies are necessary, the intake of this type of food should be controlled because of its implications on both health (obesity, cardiovascular diseases) and mental well-being."

The impact of diet on mental health

Depression affects 121 million people worldwide. This figure makes it one of the main global causes of disability-adjusted life year. Further still, in countries with low and medium income it is the leading cause.

However, little is known about the role that diet plays in developing depressive disorders. Previous studies suggest that certain nutrients have a preventative role. These include group B vitamins, omega-3 fatty acids and olive oil. Furthermore, a healthy diet such as that enjoyed in the Mediterranean has been linked to a lower risk of developing depression.

Reference: *Almudena Sánchez-Villegas, Estefanía Toledo, Jokin de Irala, Miguel Ruiz-Canela, Jorge Pla-Vidal and Miguel A Martínez-González. "Fast-food and commercial baked goods consumption and the risk of depression". Public Health Nutrition: page 1 of 9 doi:10.1017/S1368980011001856*

http://www.eurekalert.org/pub_releases/2012-03/vcu-bot032912.php

Benefits of taking Fido to work may not be far 'fetched'

Man's best friend may make a positive difference in the workplace by reducing stress and making the job more satisfying for other employees, according to a Virginia Commonwealth University study.

RICHMOND, Va. – Stress is a major contributor to employee absenteeism, morale and burnout and results in significant loss of productivity and resources. But a preliminary study, published in the March issue of the International Journal of Workplace Health Management, found that dogs in the workplace may buffer the impact of stress during the workday for their owners and make the job more satisfying for those with whom they come into contact. The VCU researchers compared employees who bring their dogs to work, employees

who do not bring their dogs to work and employees without pets in the areas of stress, job satisfaction, organizational commitment and support.

"Although preliminary, this study provides the first quantitative study of the effects of employees' pet dogs in the workplace setting on employee stress, job satisfaction, support and commitment," said principal investigator Randolph T. Barker, Ph.D., professor of management in the VCU School of Business.

"Dogs in the workplace can make a positive difference," he said. "The differences in perceived stress between days the dog was present and absent were significant. The employees as a whole had higher job satisfaction than industry norms."

The study took place at Replacements, Ltd., a service-manufacturing-retail company located in Greensboro, N.C., which employs approximately 550 people. Approximately 20 to 30 dogs are on the company premises each day. The study took place over a period of one work week in the company setting, during which time participants completed surveys and collected saliva samples. Pagers were assigned to prompt employees to complete surveys during the day.

The researchers did not observe a difference between the three employee groups on stress hormone levels, which was measured via a saliva sample, in the morning, but during the course of the work day, self-reported stress declined for employees with their dogs present and increased for non-pet owners and dog owners who did not bring their dogs to work. The team noted that stress significantly rose during the day when owners left their dogs at home compared to days they brought them to work.

According to Barker, the team observed unique dog-related communication in the workplace that may contribute to employee performance and satisfaction. For example, he said, although not part of the study, that employees without a dog were observed requesting to take a co-worker's dog out on a break. These were brief, positive exchanges as the dogs were taken and returned and also resulted in an employee break involving exercise.

Barker said that other findings revealed mostly positive comments from employees such as "pets in the workplace can be a great bonus for employee morale …," "having dogs here is great stress relief" and "dogs are positive; dogs increase coworker cooperation." "The effect of pets in reducing the impact of stress and enhancing communication found in other settings may extend to the workplace," said Barker.

"Pet presence may serve as a low-cost, wellness intervention readily available to many organizations and may enhance organizational satisfaction and perceptions of support. Of course, it is important to have policies in place to ensure only friendly, clean and well-behaved pets are present in the workplace," he said.

According to Barker, further research with larger sample sizes within the organizational setting is needed to replicate the findings of this initial study.

Randolph Barker collaborated with Janet S. Knisely, Ph.D., associate professor of psychiatry in the VCU School of Medicine; Sandra B. Barker, Ph.D., professor of psychiatry in the VCU School of Medicine; Rachel K. Cobb, Ph.D., research faculty in the VCU School of Nursing; and Christine M. Schubert, Ph.D., assistant professor of biostatistics at the Air Force Institute of Technology. The study was supported in part by the VCU Center on Human-Animal Interaction.

http://www.physorg.com/news/2012-03-bees-self-medicate-infected-pathogens.html

Bees 'self-medicate' when infected with some pathogens

Research from North Carolina State University shows that honey bees "self-medicate" when their colony is infected with a harmful fungus, bringing in increased amounts of antifungal plant resins to ward off the pathogen.

"The colony is willing to expend the energy and effort of its worker bees to collect these resins," says Dr. Michael Simone-Finstrom, a postdoctoral research scholar in NC State's Department of Entomology and lead author of a paper describing the research. "So, clearly this behavior has evolved because the benefit to the colony exceeds the cost."

Wild honey bees normally line their hives with propolis, a mixture of plant resins and wax that has antifungal and antibacterial properties. Domesticated honey bees also use propolis, to fill in cracks in their hives. However, researchers found that, when faced with a fungal threat, bees bring in significantly more propolis – 45 percent more, on average. The bees also physically removed infected larvae that had been parasitized by the fungus and were being used to create fungal spores.

When faced with pathogenic fungi, bees line their hives with more propolis -- the waxy, yellow substance seen here. Propolis is a combination of plant resins and wax that has antifungal and antibacterial properties. **Credit: Michael Simone-Finstrom, North Carolina State University**

Researchers know propolis is an effective antifungal agent because they lined some hives with a propolis extract and found that the extract significantly reduced the rate of infection.

And apparently bees can sometimes distinguish harmful fungi from harmless ones, since colonies did not bring in increased amounts of propolis when infected with harmless fungal species. Instead, the colonies relied on physically removing the spores.

However, the self-medicating behavior does have limits. Honey bee colonies infected with pathogenic bacteria did not bring in significantly more propolis – despite the fact that the propolis also has antibacterial properties. "There was a slight increase, but it was not statistically significant," Simone-Finstrom says. "That is something we plan to follow up on."

There may be a lesson here for domestic beekeepers. "Historically, U.S. beekeepers preferred colonies that used less of this resin, because it is sticky and can be difficult to work with," Simone-Finstrom says. "Now we know that this is a characteristic worth promoting, because it seems to offer the bees some natural defense."

More information: The paper, "Increased resin collection after parasite challenge: a case of self-medication in honey bees?," was co-authored by Dr. Marla Spivak of the University of Minnesota and is available online from PLoS ONE. Provided by North Carolina State University

http://www.sciencedaily.com/releases/2012/03/120330081203.htm?

Inside a Plant's Pharma Factory

A newly discovered enzyme brings scientists one step closer to understanding how plants manufacture a molecule with potent medicinal properties.

ScienceDaily - Plants of the genus Glycyrrhiza are best known as key ingredients in the popular treat licorice, but they also have a valuable place in the medicine cabinet. These plants employ a complex assembly line of enzymes to produce a molecule called glycyrrhizin, a potent sweetener that also acts as a highly effective anti-inflammatory and antiviral agent.

The process of glycyrrhizin biosynthesis is incompletely understood, but research from a team led by Kazuki Saito and Toshiyuki Muranaka at the RIKEN Plant Science Center in Yokohama helps to fill some of the gaps. According to Saito, these efforts depended on close collaboration between multiple research teams. Members of the 'All-Japan Licorice Research Consortium', pooled their research resources, which was the strong basis for the success of this project, according to Saito.

The researchers were particularly interested in enzymes known as cytochrome P450 mono-oxygenases. For a previous study, they prepared a large library of gene sequences expressed by Glycyrrhiza to identify previously uncharacterized P450s2. This time around, Saito and Muranaka performed a functional assay in which they expressed several of these putative P450s in cultured cells so they could identify enzymes that act on specific intermediates in glycyrrhizin manufacture.

They identified one protein, CYP72A154, which recognized the early glycyrrhizin intermediate 11-oxo-β-amyrin as a substrate. Remarkably, this enzyme appears to perform multiple sequential oxidation reactions on this compound, effectively moving the synthetic process forward three steps.

To confirm these findings, they tested the function of CYP72A154 by co-expressing it alongside other enzymes known to participate in this biological process. "We achieved biotechnological production of glycyrrhetinic acid, an intermediate of glycyrrhizin, by means of synthetic biology in yeast," says Muranaka.

This demonstration of partial glycyrrhizin biosynthesis represents an important step in the right direction: even though this valuable molecule is easily purified from licorice plants, scientists may ultimately find themselves forced to resort to laboratory production methods.

"There is a potential risk of a shortage of natural resources in the near future," says Saito. "Another problem is that China, the dominant supplier of licorice, is setting restrictions on licorice exports as a governmental policy."

Several pieces are still missing from the puzzle, but Saito and Muranaka are excited to learn what remains to be found, both from a biotechnology perspective and in terms of understanding aspects of plant evolutionary history.

"We still don't know why and how higher plants have evolved the production systems for such interesting compounds," says Muranaka.

The corresponding author for this highlight is based at the Metabolomic Function Research Group, RIKEN Plant Science Center

http://www.eurekalert.org/pub_releases/2012-04/foas-ndm033012.php

New discovery may lead to effective prevention and treatment of graft-versus-host dsease

New research in mice published in the Journal of Leukocyte Biology suggests that the platelet activating factor receptor plays a role in graft-versus-host disease, a major complication of bone marrow transplants

Bethesda, MD -- A new discovery in mice may lead to new treatments that could make bone marrow transplants more likely to succeed and to be significantly less dangerous. According to new research findings published in the Journal of Leukocyte Biology (https://www.jleukbio.org) Brazilian scientists may have found a way to prevent the immune system from attacking transplant grafts and damaging the host's own cells after a bone marrow transplant.

Specifically, they found that a receptor for a mediator of the inflammatory process, known as platelet activating factor plays a crucial role in the development of graft-versus-host disease. Platelet activating factor receptor appears to contribute to the attraction of immune cells that lead to graft-versus-host disease. When this mechanism was blocked, there was reduced tissue damage and mortality.

"Platelet activating factor receptor antagonists may decrease suffering caused by graft-versus-host disease in patients undergoing bone marrow transplant," said Vanessa Pinho, Ph.D., a researcher involved in the work from the Departamento de Morfologia, Instituto de Ciencias Biologicas, Universidade Federal de Minas Gerais in Brazil. "As graft-versus-host disease also may decrease quality of life, patients treated with platelet activating factor receptor antagonists may live longer and with better quality of life."

To make this discovery, scientists induced graft-versus-host disease by transferring cells between mice which were genetically incompatible. In mice subjected to graft-versus-host disease, there was significant injury to target organs, especially the liver and the intestine. In mice that received cells from genetically modified mice bred to not have platelet activating factor receptors, or in mice treated with platelet activating factor receptor antagonist, there was reduced tissue injury and reduced lethality.

"Immune rejection is one of the biggest risks of any transplant procedure, and this study sheds a new light on a receptor and pathway amenable to therapeutic intervention to reduce the serious complication of graft-versus-host disease," said John Wherry, Ph.D., Deputy Editor of the Journal of Leukocyte Biology. "The next step is to take these observations from the lab and see if the potential suggested by studies in mice hold true in humans with disease."

Details: *Marina G. M. Castor, Bárbara M. Rezende, Carolina B. Resende, Priscila T. T. Bernardes, Daniel isalpino, Angélica T. Vieira, Danielle G. Souza, Tarcília A. Silva, Mauro M. Teixeira, and Vanessa Pinho. Platelet-activating factor receptor plays a role in the pathogenesis of graft-versus-host disease by regulating leukocyte recruitment, tissue injury, and lethality. J Leukoc Biol. April 2012 91: 629-639; doi:10.1189/jlb.1111561 ; http://www.jleukbio.org/content/91/4/629.abstract*

http://mdn.mainichi.jp/perspectives/pulse/news/20120319p2a00m0na020000c.html

Onagawa nuke plant saved from tsunami by one man's strength, determination

While the town of Onagawa, Miyagi Prefecture, was hit hard by the March 2011 tsunami, the nuclear plant it shares with the equally devastated city of Ishinomaki survived.

The reason it did so, I discovered in a March 7 article in the Tokyo Shimbun newspaper, is mostly down to the personal strength and tenacity of one Yanosuke Hirai, who passed away in 1986.

There is a lot for us to learn from one episode involving Hirai, especially now as "stress tests" on idled nuclear reactors are conducted in a general atmosphere of public distrust. To help us understand Hirai's contribution, I turned to 82-year-old Tatsuji Oshima, who worked under Hirai at Onagawa plant operator Tohoku Electric Power Co.

According to Oshima, Hirai's true value as a person was in his sense of duty that made him "take responsibility for the results of his decisions." He wasn't the sort to believe that everything would be all right "as long as people keep to set standards." Rather, though he paid careful attention to regulations, compliance was never his goal. Hirai was the kind of manager and engineer to exceed regulations and do the checks needed to get to the heart of a problem.

The breakwater that proved so inadequate to the task of protecting the Fukushima No. 1 nuclear plant from the ocean was 10 meters high. The one defending the Onagawa nuclear plant is 14.8 meters tall, and it turns out Hirai had to fight a one-man war to get it built. The reason he was so determined was his careful study of the past, which revealed that in the year 869 a massive tsunami had hit the spot where the Onagawa plant now stands.

Hirai was born in 1902 in the town of Funaoka (now Shibata), southern Miyagi Prefecture. He studied civil engineering at Tokyo Imperial University (the present-day University of Tokyo), and afterward got a job at the Toho Denryoku power company, owned by the then "king of electric power" Yasuzaemon Matsunaga. He went on to work for Japan Electric Generation & Transmission Co. and, after World War II, Tohoku Electric, where he eventually became vice president.

After leaving the firm in 1962, Hirai became head of technology research at the Central Research Institute of the Electric Power Industry (CRIEPI), founded by his mentor Matsunaga. In 1968, he joined the coastal facilities planning committee for the construction of the Onagawa nuclear plant, and he poured his efforts into protecting the new reactors from tsunami damage.

Hirai was apparently the only person on the entire project to push for the 14.8-meter breakwater, while many of his colleagues said that 12 meters would be sufficient and derided Hirai's proposal as excessive. Hirai's authority and drive, however, eventually prevailed, and Tohoku Electric spent the extra money to build the 14.8-meter-tall shield. Some 40 years later, on March 11, 2011, a 13-meter-high tsunami slammed into the coast at Onagawa.

Another of Hirai's proposals also helped save the plant during the disaster. Expecting the sea to draw back before a tsunami, he made sure the plant's cooling system was designed so it could still draw water for the reactors.

The tsunami that Hirai anticipated came 25 years after his death, and we can say that he was absolutely right. What made him so implacable and gave him such a strong sense of responsibility?

"Corporate ethics and compliance may be similar, but their cores are different," says Oshima from his home in Sendai. "From the perspective of corporate social responsibility, we cannot say that there is no need to question a company's actions just because they are not a crime under the law."

In 1965, the then Crown Prince (and now Emperor) Akihito took a tour of CRIEPI, and a photo of His Highness and tour guide Hirai hangs on the wall of the Matsunaga memorial office. I went to have a look at it myself, and in Hirai's straight-lipped expression I could sense his determination. Appropriately, his posthumous Buddhist name translates roughly as "piercing truth."

Oshima provides yet another enlightening anecdote about Hirai. Just after the disasters last year, he got a phone call from his former boss' family. Hirai's youngest daughter apparently told Oshima, "I saw my father in a dream. He said, 'Tell Oshima I said all the time that the electricity industry should not get involved with nuclear power.'"

Hirai had helped make nuclear power a reality in Japan, and was already scaling back his duties before the first reactors were built. Oshima can't remember Hirai ever turning against nuclear power, making his daughter's dream all the more puzzling.

What Oshima learned from Hirai was, rather, to improve the quality of nuclear power generation. Hundreds of people would now stand as one to tell Hirai that such a thing is very difficult indeed, but I will leave that subject alone for now.

Reactors at Kansai Electric Power Co.'s Oi nuclear plant in Fukui Prefecture have passed government-mandated stress tests, and the firm is now seeking the official go-ahead to restart them. A final decision by Prime Minister Yoshihiko Noda and the Cabinet ministers concerned is likely within the month, and they are apparently calling for local residents to approve the move.

However, at its core the nuclear reactor restart issue is not a political one. Is there any expert with the same insight, powers of persuasion and spirit as Hirai advising and supporting the prime minister now? That's what I'd like to know. (By Takao Yamada, Expert Senior Writer) ***Click here for the original Japanese story***