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Researchers discover how underground rodent wards off cancer

Second mole rat species has different mechanism for resisting cancer

Biologists at the University of Rochester have determined how blind mole rats fight off cancer—and the mechanism differs from what they discovered three years ago in another long-lived and cancer-resistant mole rat species, the naked mole rat.

The team of researchers, led by Professor Vera Gorbunova and Assistant Professor Andrei Seluanov, found that abnormally growing cells in blind mole rats secrete the interferon beta protein, which causes those cells to rapidly die. Seluanov and Gorbunova hope the discovery will eventually help lead to new cancer therapies in humans. Their findings are being published this week in the Proceedings of the National Academy of Sciences.

A blind mole rat is shown on the background of dying necrotic blind mole rat cells. **University of Rochester**

Blind mole rats and naked mole rats—both subterranean rodents with long life spans—are the only mammals never known to develop cancer. Three years ago, Seluanov and Gorbunova determined the anti-cancer mechanism in the naked mole rat. Their research found that a specific gene—p16—makes the cancerous cells in naked mole rats hypersensitive to overcrowding, and stops them from proliferating when too many crowd together.

"We expected blind mole rats to have a similar mechanism for stopping the spread of cancerous cells," said Seluanov. "Instead, we discovered they've evolved their own mechanism."

Gorbunova and Seluanov made their discovery by isolating cells from blind mole rats and forcing them to proliferate in culture beyond what occurs in the animal. After dividing approximately 15-20 times, all of the cells in the culture dish died rapidly. The researchers determined that the rapid death occurred because the cells recognized their pre-cancerous state and began secreting a suicidal protein, called interferon beta. The precancerous cells died by a mechanism which kills both abnormal cells and their neighbors, resulting in a "clean sweep."

"Not only were the cancerous cells killed off, but so were the adjacent cells, which may also be prone to tumorous behavior," said Seluanov. "While people don't use the same cancer-killing mechanism as blind mole rats, we may be able to combat some cancers and prolong life, if we could stimulate the same clean sweep reaction in cancerous human cells," said Gorbunova.

The research team also included Christopher Hine, Xiao Tian, and Julia Ablaeva in Rochester, Andrei Gudkov at Roswell Park Cancer Institute in Buffalo, NY, and Eviatar Nevo at the University of Haifa in Israel.

Gorbunova and Seluanov say they next want to find out exactly what triggers the secretion of interferon beta after cancerous cells begin proliferating in blind mole rats.

Gorbunova believes the anti-cancer mechanism is an adaptation to subterranean life. "Blind mole rats spend their lives in underground burrows protected from predators," said Gorbunova. "Living in this environment, they could perhaps afford to evolve a long lifespan, which includes developing efficient anti-cancer defenses."

http://www.eurekalert.org/pub_releases/2012-11/uos-gpa110512.php

Grandfathers play a more prominent role

Past 70, grandfathers take the lead in spend time with their grandchildren

Europeans spend much time with their grandchildren. And past 70, the grandfather takes the lead. Norwegian sociologist Knud Knudsen sets great store by his grandchildren. In that respect, he is typical of the grandparents in Europe who are the subjects of his recent research.

"Europeans with grandchildren generally opt to spend a good deal of time with them," says 67-year-old Knudsen, who is professor of sociology at the University of Stavanger (UiS). "And grandfathers appear to be more involved than before," he adds.

In a new study, he found that grandmothers are clearly more involved with their grandchildren when a couple is younger. However, this gender disparity gradually changes with the years. Among the oldest age groups, grandfathers usually show greater solicitude.

At the same time, he has found that involvement with grandchildren naturally enough declines for both genders with advancing years.

Active grandfather of four

Knudsen himself has four grandchildren aged between one and 11 – one in Oslo and three in Stavanger – and he is together with them as often as possible for both play and more serious matters. He and wife Gro collect grandchildren every Tuesday both from nursery school and day care facilities before the youngsters start homework, sports, dinner and play. They often devote the weekend to their extended family and babysitting. "It provides new insights and instructive challenges, and gives more meaning to life," says Knudsen.

More than 5000 grandparents

His study embraces about 5,500 grandparents aged 60-85 in 11 European countries – Austria, Denmark, France, Greece, Germany, Italy, the Netherlands, Sweden, Switzerland, Spain and Belgium.

Called the survey of health, ageing and retirement in Europe (Share), this empirical dataset ranks as one of the largest in the continent.

"We're likely to see more grandparents spending time with their grandchildren," says Knudsen. "The basis for exercising this role can nevertheless differ between the genders". "It's an advantage for both of them to have a life partner at their side.

But grandfathers are more dependent on this than grandmothers when it comes to playing their grandparent role." This is because a grandfather who still has his wife with him finds it easier to share in the life of his grandchildren. "Grandmothers have traditionally had greater and more varied contact with the rest of the family, with responsibility for maintaining relationship," Knudsen observes. "As a woman, mother and grandmother, norms for caring are clearer for her and she inspires the grandfather.

A partner is accordingly important for contributing to the extended family. "That applies particularly for men as they get older. In line with other studies of gender and partnership, we see here that men in particular benefit from marriage."

More shared lives

Both social and demographic changes underlie the substantial involvement by grandparents with their grandchildren.

Three generations share more of their lives than before. And new patterns are emerging, Knudsen reports: "We live longer and stay healthy for more of our lives. We're better off and communicate more closely". "At the same time, today's parents are occupied with work and career. Unlike earlier generations, when children came before education and job, modern parents are often older and in full work when they become responsible for offspring." Noting that this is where grandparents come in, he describes this as a win-win position. "Healthier and fitter grandparents who want to be with their grandchildren can be a big help to careerist parents in a hectic daily life".

"At the same time, little has changed where marriage and partnership are concerned. As before, men often marry women who are a few years younger than them". "And women still live longer than men. Although this can vary greatly, a man of 70 has a partner beside him more often than a woman of the same age". "So while grandmothers are usually alone, a grandfather is in a marriage. Having a younger and healthy partner seems to be crucial for a man's involvement with grandchildren."

Investment for later help?

Some would undoubtedly explain this phenomenon as a reflection of the grandparents' desire to invest time with their grandchildren in order to be helped later, Knudsen observes. "But such arguments are only consistent with certain findings," he adds. "If they were correct, widowed grandmothers would be with the grandchildren most – and that's not the case." Sociological role theory appears to provide a better explanation, he says. Grandfathers and grandmothers can have very different personal and social starting points. "So although the latter spend more time with grandchildren than the former, the difference in participation shrinks steadily after 60. Past 70, the grandfather usually takes the lead." It might be thought that older men still identify most with other interests, he says, and that women were accordingly better grandparents throughout their lives.

Men manage well

"In fact, however, men generally manage relatively well as grandparents. One important reason, as mentioned earlier, is that they usually still have their partner at their side." But big differences nevertheless exist. "Many grandparents have other priorities or live a long way from the grandchildren. That naturally affects the time they spend together."

Norway is not one of the 11 countries in his study, but Knudsen says that its findings probably also apply to Norwegian conditions. "After all, the research shows that demographic conditions have marked consequences later in life for grandparents more or less regardless of their country of residence". "The differences between the European countries in the study are small - which represents an important finding in itself."

http://www.eurekalert.org/pub_releases/2012-11/haoq-sfa110512.php

Scientists find Achilles' heel of cancer cells

Several substances inhibiting so-called HDAC enzymes have been studied in trials searching for new anti-cancer drugs in recent years.

"Trials have shown that HDAC inhibitors are very effective in arresting growth of cultured cancer cells. But apart from a very rare type of lymphoma, these drugs unfortunately do not clinically affect malignant tumors," says Prof. Dr. Olaf Witt, who heads a research department at DKFZ and is pediatrician at the Center for Child and Adolescent Medicine of Heidelberg University Hospital.

In the cell, histone deacetylases (HDAC) are responsible for removing small chemical tags called acetyl groups from histone proteins. Histones serve as coils the genetic material wraps around in the nucleus. The presence or absence of acetyl tags determines where genetic material is accessible and can get transcribed.

Now this is where Witt and his colleagues suspect the reason for the problems in clinical application of HDAC inhibitors. Currently available substances equally block all members of the large family of HDAC enzymes. Thus, they interfere with vital cellular functions and also harm healthy cells. This can lead to severe side effects preventing their administration at a sufficient dosage.

Searching for a solution to this dilemma, Witt's team came across a member of the HDAC family, HDAC11, which was identified only recently. The researchers could show that many cancer cells, including cells of breast, liver and renal cancers, produce extraordinary high levels of HDAC11. This has not been observed in healthy cells, and hardly any specific functions of HDAC11 are known there. "It therefore seemed obvious that a specific HDAC11 inhibitor would specifically target tumor cells, where this enzyme appears to play a critical role," says Dr. Hedwig Deubzer, first author of the article.

As there are no specific HDAC11 inhibitors available yet, the team took a different approach to verify their hypothesis. Using molecular techniques, they turned off production of HDAC11 in breast, colon, prostate and ovarian cancer cell lines and likewise in control cells of healthy tissues. The result: Cancer cells without HDAC11 were impaired in viability and more often underwent cell death (apoptosis). By contrast, loss of HDAC11 did not cause any noticeable changes in normal cells.

"The result suggests that selective blocking of HDAC11 would act exclusively on tumor cells," says Hedwig Deubzer. Numerous highly specific inhibitors against various cancer-relevant enzymes have been developed in recent years, with some of them already approved as drugs. This encourages the Heidelberg research team, jointly with Bayer Healthcare, to look for a suitable substance that specifically targets HDAC11.

HDAC inhibitors belong to a group of drugs classified by researchers as "epigenetically effective" drugs. These agents influence the chemical tags that a cell attaches directly to the genetic material or to the packaging proteins of genetic material such as histones. These tags play a substantial role in regulating gene activity. In the past few years, evidence has been accumulating that epigenetic tagging defects promote cancer development. Novel agents such as HDAC inhibitors are intended to correct such defects.

Hedwig E. Deubzer, Marie C. Schier, Ina Oehme, Marco Lodrini, Bernard Haendler, Anette Sommer and Olaf Witt: HDAC11 is a novel drug target in carcinomas. International Journal of Cancer 2012, DOI:10.1002/ijc.27876

http://www.eurekalert.org/pub_releases/2012-11/cmaj-lvd110112.php

Low vitamin D levels associated with longevity

Low levels of vitamin D may be associated with longevity, according to a study involving middle-aged children of people in their 90s published in CMAJ (Canadian Medical Association Journal).

"We found that familial longevity was associated with lower levels of vitamin D and a lower frequency of allelic variation in the CYP2R1 gene, which was associated with higher levels of vitamin D," writes Dr. Diana van Heemst, Department of Gerontology and Geriatrics, Leiden University Medical Center, Leiden, the Netherlands, with coauthors.

Previous studies have shown that low levels of vitamin D are associated with increased rates of death, heart disease, diabetes, cancer, allergies, mental illness and other afflictions. However, it is not known whether low levels are the cause of these diseases or if they are a consequence.

To determine whether there was an association between vitamin D levels and longevity, Dutch researchers looked at data from 380 white families with at least 2 siblings over age 90 (89 years or older for men and 91 year or older for women) in the Leiden Longevity Study. The study involved the siblings, their offspring and their offsprings' partners for a total of 1038 offspring and 461 controls. The children of the nonagenarians were included because it is difficult to include controls for the older age group. The partners were included because they were of a similar age and shared similar environmental factors that might influence vitamin D levels.

The researchers measured levels of 25(OH) vitamin D and categorized levels by month as they varied according to season. Tanning bed use, which can affect vitamin D levels, was categorized as never, 1 times per year and 6

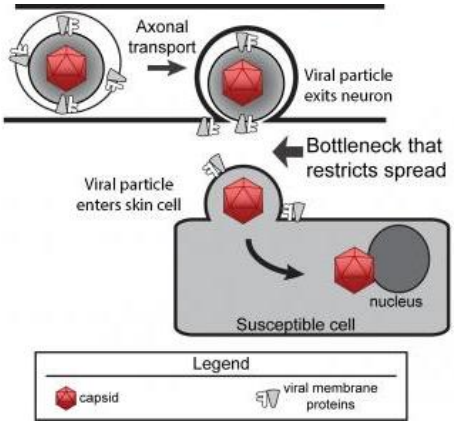
times per year. The researchers controlled for age, sex, BMI (body mass index), time of year, vitamin supplementation and kidney function, all factors that can influence vitamin D levels. They also looked at the influence of genetic variation in 3 genes associated with vitamin D levels.
"We found that the offspring of nonagenarians who had at least 1 nonagenarian sibling had lower levels of vitamin D than controls, independent of possible confounding factors and SNPs [single nucleotide polymorphisms] associated with vitamin D levels," write the authors. "We also found that the offspring had a lower frequency of common genetic variants in the CYP2R1 gene; a common genetic variant of this gene predisposes people to high vitamin D levels.
These findings support an association between low vitamin D levels and familial longevity." They postulate that offspring of nonagenarians might have more of a protein that is hypothesized to be an "aging suppressor" protein. More research is needed to understand the link between lower vitamin D levels, genetic variants and familial longevity.

http://www.eurekalert.org/pub_releases/2012-11/pu-pri110512.php

Princeton researchers identify unexpected bottleneck in the spread of herpes simplex virus

Princeton University research suggests that a common strain of herpes virus causes cold sores with only one or two viral particles, resulting in a bottleneck in which the infection is more vulnerable to medical treatment

New research suggests that just one or two individual herpes virus particles attack a skin cell in the first stage of an outbreak, resulting in a bottleneck in which the infection may be vulnerable to medical treatment.
Unlike most viruses that spread to new cells by bombarding them with millions of particles, herpes simplex virus type 1 (HSV-1) — a virus that causes cold sores and genital lesions — requires just one or two viral particles to infect a skin cell in the first stage of cold sore formation, Princeton University researchers reported this month in the Proceedings of the National Academy of Sciences.
"The fact that just one or two virus particles are involved is surprising because these viruses can replicate themselves hundreds of times in a single cell," said Matthew Taylor, first author on the study and a postdoctoral researcher in the laboratory of Lynn Enquist, the Henry L. Hillman Professor in Molecular Biology and the Princeton Neuroscience Institute.
The bottleneck occurs when HSV-1 particles, which can lie dormant in the cells of the nervous system for decades after initial infection, awaken and invade a nearby skin cell, the first stage in sore formation. Once inside the skin cell, a single viral particle multiplies and spreads millions of copies to nearby skin cells, creating a visible lesion or "cold sore." The virus can then spread to new individuals through skin-to-skin contact.
This restriction to one or two particles limits the genetic diversity of the virus that spreads to the next individual, Enquist said. This puts the virus at a disadvantage, he said, because having a variety of distinct genomes enhances the overall chances of the virus surviving and spreading. A well-known example of a virus that relies on genetic diversity to thrive is HIV, which involves large numbers of viral particles with distinct genomes.
In the case of herpes viruses, Enquist said: "The number of different genomes that infect the cell is remarkably low, so any mutations that weaken the virus are unlikely to survive. Only the most fit viral particles will survive and replicate in the epithelial [skin] cells, and be available to transmit to the next individual."
Although bottlenecks can ensure that only the most fit viruses are transmitted to the next individual, they also can be points at which the infection is more susceptible to immune system responses and drug treatments, according to Taylor. He and Enquist worked with co-author Oren Kobiler, a former Princeton postdoctoral researcher now at Tel Aviv University.
The researchers' findings suggest that other viruses related to HSV-1 — known as alpha-herpes viruses — may have similar bottlenecks, Taylor said, including herpes simplex viruses type 2, which causes cold sores and genital lesions, and varicella zoster virus, which causes chicken pox and shingles. It remains to be determined if this bottleneck exists for other viruses that spread from infected neurons, such as poliovirus and the West Nile virus, Taylor said.



This is a model of herpes virus spread from neuron to skin cell: Herpes virus particles move via axonal transport inside a neuron. Upon exiting the neuron, only one or two viral particles enter the susceptible skin cell, resulting in a bottleneck that restricts viral spread. **Image courtesy of Matthew Taylor**

Julie Pfeiffer, an associate professor of microbiology at the University of Texas Southwestern Medical Center, said the Princeton research is the first to tally how many viral particles are involved in HSV-1 infection — and reveal that as the virus' weak point.
"This work changes the way that we think about herpes virus spread," said Pfeiffer, who is familiar with the study but had no role in it. "This study demonstrated that these neuron-to-epithelial cell viral-transmission events are surprisingly efficient, but they are initiated by a very small number of viruses. This work has interesting implications for herpesvirus transmission and evolution."
To determine the number of virus particles that infect the skin cell, the researchers constructed three genetically unique viral genomes labeled with either red, green or blue fluorescent tags, and then infected cells with the particles and analyzed them for the presence of the three colors. They counted the number of cells containing one, two or all three colors and used statistical analysis to determine the number of unique viral genomes expressed in each cell. The method, which was originally developed by Kobiler, Enquist and colleagues in Princeton's mathematics department and initially published in 2010 in Nature Communications, revealed that most skin cells express less than two viral genomes on average.
Taylor then filmed individual virus particles of pseudorabies virus, a model alpha-herpes virus that infects animals, as the particles exited neurons and entered skin cells. He found that the bottleneck limiting infection to one or two particles exists for pseudorabies virus as well.
As shown in the ***video of the process***, viral particles, genetically altered to glow red, travel down long extensions of the neuron cell body called axons. The video reveals a handful of viral particles exiting an axon but only one particle entering a nearby epithelial cell. Once inside, the virus particle replicates and creates millions of particles that fill up the cell, turning it red in color. These viral particles later exit the infected cell and attack surrounding epithelial cells.
"It is really amazing to see this happening in living cells," Taylor said.
The paper, "Alphaherpesvirus axon-to-cell spread involves limited virion transmission," was published Oct. 16 in the Proceedings of the National Academy of Sciences. The work was supported by the National Institutes of Health and the American Cancer Society.

www.sciencedaily.com/releases/2012/11/121105140407.htm

Smell You Later! Chemosignals Communicate Human Emotions

Scientists investigated whether humans might actually be able to communicate our emotional states to each other through chemical signals.

ScienceDaily - Many animal species transmit information via chemical signals, but the extent to which these chemosignals play a role in human communication is unclear. In a new study published in Psychological Science, a journal of the Association for Psychological Science, researcher Gün Semin and colleagues from Utrecht University in the Netherlands investigate whether we humans might actually be able to communicate our emotional states to each other through chemical signals.
Existing research suggests that emotional expressions are multitaskers, serving more than one function. Fear signals, for example, not only help to warn others about environmental danger, they are also associated with behaviors that confer a survival advantage through sensory acquisition. Research has shown that taking on a fearful expression (i.e., opening the eyes) leads us to breathe in more through our noses, enhances our perception, and accelerates our eye movements so that we can spot potentially dangerous targets more quickly. Disgust signals, on the other hand, warn others to avoid potentially noxious chemicals and are associated with sensory rejection, causing us to lower our eyebrows and wrinkle our noses.
Semin and colleagues wanted to build on this research to examine the role of chemosignals in social communication. They hypothesized that chemicals in bodily secretions, such as sweat, would activate similar processes in both the sender and receiver, establishing an emotional synchrony of sorts. Specifically, people who inhaled chemosignals associated with fear would themselves make a fear expression and show signs of sensory acquisition, while people who inhaled chemosignals associated with disgust would make an expression of disgust and show signs of sensory rejection.
To test these hypotheses, experimenters collected sweat from men while they watched either a fear-inducing or a disgust-inducing movie. The men followed a strict protocol to avoid possible contamination. For two days prior to the collection, they were not allowed to smoke, engage in excessive exercise, or consume odorous food or alcohol. They were also instructed to use scent-free personal-care products and detergents provided by the experimenter.
Women were then exposed to the sweat samples while performing a visual search task. Their facial expressions were recorded and their eye movements were tracked as they completed the task.

As the researchers predicted, women who were exposed to chemosignals from "fear sweat" produced fearful facial expressions, while women who were exposed to chemosignals from "disgust sweat" produced disgusted facial expressions.
The researchers also found that exposure to fear and disgust sweat altered the women's perceptions during the visual search task and affected their sniffing and eye-scanning behaviors in accordance with either sensory acquisition or sensory rejection. Importantly, the women were not aware of these effects and there was no relationship between the effects observed and how pleasant or intense the women judged the stimuli to be.
These findings are important, Semin and colleagues argue, because they contradict the common assumption that human communication occurs exclusively through language and visual cues. Rather, the findings provide support for the embodied social-communication model, suggesting that chemosignals act as a medium through which people can be "emotionally synchronized" outside of conscious awareness.
The researchers acknowledge that these effects could very well contribute to the kind of emotional contagion that is often observed in situations involving dense crowds.
The study was co-authored by Jasper H. B. de Groot, Monique A. M. Smeets, Annemarie Kaldewaij, and Maarten J. A. Duijndam of the University of Utrecht.
J. H. B. de Groot, M. A. M. Smeets, A. Kaldewaij, M. J. A. Duijndam, G. R. Semin. Chemosignals Communicate Human Emotions. Psychological Science, 2012; DOI: 10.1177/0956797612445317

http://bit.ly/TxFHCV

'Hobbit' Banned as Name for Hobbit: DNews Nugget

They were just trying to get people to attend their lecture

Analysis by Lori Cuthbert

They were just trying to get people to attend their lecture: A New Zealand scientist was stopped from using the word "hobbit" in the title of his talk about a miniature species of early human, reports the Guardian.
Brent Alloway, a New Zealander and archaeologist, is holding a lecture soon featuring two of the scientists who found Homo floresiensis in 2003.
He wanted to call it "The Other Hobbit." But the company who made "The Hobbit" movie told him that he couldn't use it, even though it's a pretty common word that J.R. Tolkien actually coined.
Alloway has changed the name of his lecture to "A newly discovered species of Little People -- unravelling the legend behind Homo floresiensis." Not as catchy. *via The Guardian*

http://www.sciencedaily.com/releases/2012/11/121105161357.htm

Healthy Living Adds Fourteen Years to Your Life, Study Suggests

If you have optimal heart health in middle age, you may live up to 14 years longer, free of cardiovascular disease, than your peers who have two or more cardiovascular disease

ScienceDaily - If you have optimal heart health in middle age, you may live up to 14 years longer, free of cardiovascular disease, than your peers who have two or more cardiovascular disease (CVD) risk factors, according to a new Northwestern Medicine study.
The study was published Nov. 5 in the Journal of the American Medical Association (JAMA).
"We found that many people develop cardiovascular disease as they live into old age, but those with optimal risk factor levels live disease-free longer," said John T. Wilkins, M.D., first author of the study. "We need to do everything we can to maintain optimal risk factors so that we reduce the chances of developing cardiovascular disease and increase the chances that we'll live longer and healthier."
Wilkins is an assistant professor in medicine, cardiology and preventive medicine at Northwestern University Feinberg School of Medicine and a cardiologist at Northwestern Memorial Hospital.
For the study, researchers pulled data from five different cohorts included in the Cardiovascular Lifetime Risk Pooling Project and looked at the participants' risk of all forms of fatal and nonfatal cardiovascular disease from ages 45, 55 and 65 through 95 years of age.
All participants were free of CVD at entry into the study and data on the following risk factors was collected: blood pressure, total cholesterol, diabetes and smoking status. The primary outcome measure for the study was any CVD event (including fatal and nonfatal coronary heart disease, all forms of stroke, congestive heart failure, and other CVD deaths).
Key results from the study:
* Individuals with optimal risk factor profiles lived up to 14 years longer free of total CVD than individuals with at least two risk factors.
* Men in middle age had lifetime risks of approximately 60 percent for developing cardiovascular disease.
* Women in middle age had lifetime risks of approximately 56 percent for developing cardiovascular disease.
* Lifetime risks for cardiovascular disease were strongly associated with risk factor burden in middle age.

http://www.eurekalert.org/pub_releases/2012-11/bawh-nds110612.php

New drug significantly lowers bad cholesterol

New research from Brigham and Women's Hospital finds that AMG 145 added to statin therapy can reduce LDL cholesterol by up to 66 percent

BOSTON, MA—For many people with high cholesterol, statins serve as the first line of treatment. However, some patients are unable to effectively reduce their low-density lipoprotein cholesterol (LDL cholesterol) or "bad cholesterol" levels with statins, the most commonly used medication to treat high cholesterol, due to their bodies' inability to tolerate or sufficiently respond to the medicine.

Now researchers at Brigham and Women's Hospital have shown that in patients already on a statin, the addition of a new drug, called AMG 145, can reduce LDL cholesterol levels by up to 66 percent after 12 weeks.

The study was presented at the 2012 American Heart Association Scientific Sessions and electronically published in Lancet on November 6, 2012.

In a double-blind, dose-ranging, placebo-controlled study, 631 patients ages 18 to 80 years old with high cholesterol on a stable statin dose (with or without ezetimibe) were randomized to receive one of six different AMG 145 dose regimens or matching placebo. The treatments were given subcutaneously (an injection under the skin) every two or every four weeks for a total of twelve weeks.

In participants who received AMG 145 every two weeks, the drug reduced LDL cholesterol in a dose-dependent manner by 42 to 66 percent at the end of twelve weeks compared to placebo.

For those taking AMG 145 every four weeks, the drug reduced LDL cholesterol in a dose-dependent manner by 42 to 50 percent at the end of twelve weeks compared to placebo. Moreover, just one week after a dose, researchers saw LDL cholesterol reduced by up to 85 percent.

"The observed reductions in LDL cholesterol are extraordinary, especially when one considers that they are seen on top of statin therapy," said Robert Giugliano, MD, BWH Cardiovascular Division, Department of Medicine, investigator for the Thrombolysis in Myocardial Infarction (TIMI) Study Group, and lead study author.

The highest dose given every two weeks also allowed 93.5 percent of patients to achieve the most stringent cholesterol-lowering goals. Furthermore, the researchers noted that there were no serious adverse events that occurred with AMG 145 treatment. "These data are very exciting and may offer a new paradigm for LDL cholesterol reduction. The next step will be a large-scale, long-term cardiovascular outcomes trial," said Marc Sabatine, MD, chairman of the TIMI Study Group, and senior study author.

AMG 145 is a monoclonal antibody. It binds to a protein that normally shepherds LDL cholesterol receptors for destruction. By blocking that protein, AMG 145 protects the receptors from being destroyed, thereby increasing the number of LDL cholesterol receptors on the surface of the liver that help remove bad cholesterol from the bloodstream.

This research was supported by Amgen, Inc., who participated in the study design and data collection. Data analyses were performed and interpreted independently by the TIMI Study Group, Brigham and Women's Hospital.

http://www.eurekalert.org/pub_releases/2012-11/gumc-stc103112.php

Strong tobacco control policies in Brazil credited for more than 400,000 lives saved

Brazil's strong tobacco control policies are credited for a 50 percent reduction in smoking prevalence between 1989 and 2010

WASHINGTON – High cigarette prices, smoke-free air laws, marketing restrictions and other measures, all part of Brazil's strong tobacco control policies, are credited for a 50 percent reduction in smoking prevalence between 1989 and 2010. The reduction contributed to an estimated 420,000 lives saved during that time period. Those are the findings of a new study published today in PLOS Medicine by a team of researchers from Georgetown Lombardi Comprehensive Cancer Center and the Brazilian National Cancer Institute.

Adding to the dramatic conclusion of the study, which used modeling to determine projections, the researchers say the Latin American country's policies could result in as many as 7 million lives saved by 2050.

Tobacco kills up to half its users—more than 5 million smokers die every year in the world from tobacco-related causes, says David Levy, Ph.D., a professor of oncology at Georgetown Lombardi. It also kills more than half a million non-smokers annually who have been exposed to second-hand smoke.

Brazil has played a pioneering role among low and middle income countries in providing support for tobacco control measures. It introduced its first cigarette-specific tax in 1990, and in 1996 placed the first warnings on cigarette packages and introduced smoke-free air laws. Many of these measures have subsequently been strengthened, including stronger advertising restrictions, higher taxes and bold and graphic warnings.

To determine the impact of these measures on smoking prevalence and deaths, researchers developed the Brazil SimSmoke Policy Simulation Model. Using policy and population and smoking data for Brazil, the model

assesses the effect of several initiatives on premature deaths including cigarette taxes, smoke-free air laws, mass media campaigns, marketing restrictions, packaging requirements, cessation treatment programs and restrictions to youth access.

This is an example of a health warning placed on cigarette packages in Brazil. **Credit: Ministerio da Saude**

The model estimated that the smoking prevalence in Brazil since 1989 was reduced by 46 percent by 2010, because of the introduction of tobacco control measures. Almost half of this reduction was explained by price increases, 14 percent by smoke-free laws, another 14 percent by marketing restrictions, 10 percent by cessation treatment programs, 8 percent by health warnings, and 6 percent by anti-smoking media campaigns.

Levy has developed similar models for 30 different nations. He says one distinguishing factor in Brazil's tobacco policies is its use of graphic health warnings on cigarette packages.

"While our model credits only eight percent of the reduction in smoking to health warnings, this is likely greatly underestimated because the value assigned in the model was based on current literature. We believe that value doesn't accurately represent the impact health warnings have in Brazil – particularly for youths." Levy continues, "Brazil has extensively tested its warnings with younger smokers and found a greater impact on reducing smoking than is found in the other studies."

He points out that the U.S. Court of Appeals for the District of Columbia rejected a government mandate requiring the use of nine specific graphic health warnings on cigarette packaging based, in part, on its views of the proper role of warning labels and its questioning of evidence presented on the effectiveness of graphic warning labels. Levy suggests rigorous testing with graphic warnings in the youth population in the U.S. might also demonstrate a significant impact on smoking behaviors.

Levy also noted that Brazil recently decided to ban menthol cigarettes, and that the U.S. Food and Drug Administration, which is charged with regulating product content, is considering a similar policy in this country. While the U.S., particularly states such as California, have seen success in reducing smoking rates by implementing strong policies, none have had the kind of success seen in Brazil in such a short period of time.

"Everyone knows smoking exacts a devastating toll leading to premature death and suffering, but getting people to give up the habit or prevent it has proved challenging," Levy says. "Brazil's strong cigarette control policies should be a lesson to us all. If we are to implement policies here in the U.S. that will make a lasting impact we'll need the political will and the courts' support."

Levy conducted his research in collaboration with two scientists from the Brazilian National Cancer Institute including Liz Maria de Almeida, Ph.D., and André Szklo, Ph.D. The work in this study is supported by contracts with the Tobacco Control Research Branch of the National Cancer Institute and by Bloomberg Philanthropies. The authors report having no personal financial interests related to the study.

http://www.eurekalert.org/pub_releases/2012-11/plos-rpa103112.php

Regular physical activity increases life expectancy even if overweight

People who do regular physical activity, such as brisk walking, live longer than those who don't do any leisure time exercise

People who do regular physical activity, such as brisk walking, live longer than those who don't do any leisure time exercise, even when overweight, reports a study by international researchers published in this week's PLOS Medicine.

These findings are important because, according to the authors (led by Steven Moore from the National Cancer Institute in Bethesda, USA): "This finding may help convince currently inactive persons that a modest physical activity program is "worth it" for health benefits, even if it may not result in weight control."

The researchers from Sweden and the United States used information on leisure time physical activities and BMI (Body Mass Index, body weight in kilograms divided by height in meters squared) from more than 650,000 people aged over 40 years in a combined analysis of 6 long-term studies (one from Sweden and five from the US).

They found that even leisure time physical activity at a level equivalent to brisk walking for up to 75 minutes per week was associated with an average increase in life expectancy of 1.8 years compared to those who did not exercise. However, leisure time physical activity at the level recommended by the World Health Organization (a minimum of 150 minutes of brisk walking per week) was associated with an average of 3.4 to 4.5 years longer life expectancy than no exercise. More leisure time physical activity continued to be associated with

longer life expectancy when the subgroups of men and women, blacks and whites, and high school and college graduates were analyzed separately.
Overall, the authors found that less physical activity was associated with shorter life expectancy at all BMI levels, but being active and having a normal weight (BMI 18.5 – 24.9) was associated with a gain of 7.2 years of life compared to being inactive and obese class II (BMI of 35 or higher). However, being inactive and normal weight was associated with 3.1 fewer years of life compared to being active but obese class I(BMI 30.9).
The authors say: "adding even low amounts of leisure time physical activity to one's daily routine—such as 75 min of walking per week—may increase longevity." They continue: "Physical activity above the minimal level—at recommended levels, or even higher—appears to increase longevity even further, with the increase in longevity starting to plateau at approximately 300 minutes of brisk walking per week."
The authors add: "Finally, a lack of leisure time physical activity when combined with obesity is associated with markedly diminished life expectancy."
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Competing Interests: I-Min Lee served as a consultant to Virgin HealthMiles and served on their Scientific Advisory Board (2007). The authors have declared that no other competing interests exist.
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http://phys.org/news/2012-11-flexible-humans-linguistic.html

Flexible learning system allows humans to keep up with linguistic change, researchers find

How have humans developed so many different languages when other species have not?

November 6, 2012 by Susan Kelley

(Phys.org)—Unlike other species, humans speak to each other in remarkably diverse ways. Some of our 6,000 to 8,000 languages use clicks (!Kung). Others don't differentiate between nouns and verbs (Straits Salish). Still others pack a whole sentence into a single word (Cayuga). In comparison, the communication systems of other animals show precious little variation within species; vervet monkeys use the same communicative signals across their geographical range, just as honeybees, bacteria and every other species each have one way of communicating. So how have humans developed so many different languages when other species have not?
A Cornell researcher and his colleagues now say they know why. The diversity of human languages is made possible because we have evolved a flexible learning system to keep up with the rapid linguistic change associated with human migrations, according to a new study published Oct. 30 in the journal PLoS ONE.
"Only biological adaptations for flexible learning combined with cultural evolution can explain the astonishing linguistic diversity while still allowing each child to learn any human language," said co-author Morten Christiansen, professor of psychology and co-director of the Cornell Cognitive Science Program.
To reach their conclusions, the researchers created a computer model to explore the effects of human migration on language evolution. As humans spread across the globe, the languages of geographically separated groups quickly ended up becoming different from one another through processes of cultural evolution. The model indicates that humans have evolved a flexible learning system to follow such rapid linguistic change.
"Importantly, the model assigns a crucial role to linguistic change, which has been extraordinarily rapid during historical times. For example, the entire Indo-European language group diverged from a common source in less than 10,000 years—the blink of an eye in evolutionary terms," Christiansen said.
The researchers speculate that the cultural evolution of language may have "recruited" preexisting brain systems to facilitate its use, just as reading relies on neural substrates that predate the invention of writing.
The findings have important implications for understanding the origin of language and human cognition: Humans have evolved a flexible learning system for keeping up with the rapid cultural evolution of language, instead of a special-purpose linguistic system analogous to the visual system. Likewise, variation in social and religious practices may similarly be seen as products of such flexible learning, rather than evolved wiring for moral behavior.
More information: Christiansen, M. et al. The Biological Origins of Linguistic Diversity. PLoS ONE, Oct. 30, 2012.

http://www.eurekalert.org/pub_releases/2012-11/bch-raw110612.php

Rebuilding a whole heart for children born with only half of 1

New 'staged left ventricle recruitment,' or SLVR, approach could revolutionize treatment of severe form of congenital heart defect

Boston, Mass.—Using a combination of surgical procedures developed over the last 11 years, surgeons at Boston Children's Hospital have established a new approach for rebuilding the heart in children born with a severe heart defect called hypoplastic left heart syndrome (HLHS). This "staged left ventricle recruitment" (SLVR) strategy uses the existing standard single-ventricle treatment for HLHS and additional procedures to spur the body's capacity for healing and growth and encourage the small left ventricle in these children to grow and function. Members of Boston Children's Departments of Cardiac Surgery and Cardiology - including Sitaram M. Emani, MD; Wayne Tworetzky, MD; James E. Lock, MD; and Pedro J. del Nido, MD - reported their results to date with the SLVR strategy in the November 6 issue of the Journal of the American College of Cardiology.

HLHS is a rare but severe congenital heart defect in which the left ventricle, the chamber of the heart that pumps blood out into the body, does not develop properly.

The majority of children born with HLHS undergo a series of three procedures, together known as single ventricle palliation (SVP), culminating in the Fontan procedure. Surgeons use the sequence to reconstruct a child's heart so that it can function with only a single working ventricle, but only about half of patients treated in this way survive to adulthood. "Many of the children who reach adulthood eventually require a heart transplant because their Fontan circulation doesn't work effectively or causes additional complications," according to Emani, a pediatric cardiac surgeon who specializes in cardiovascular surgery for newborns and children with complex congenital heart disease.

In 2001, del Nido, Emani and their colleagues started considering ways to help children with HLHS avoid SVP as an end goal and improve long-term outcomes by reconstructing the heart so that it has two working ventricles. "Children have an enormous growth and healing potential," Emani explained. "We realized that rather than give up on the left ventricle and commit a child to single ventricle circulation for life, we could leverage that growth potential in a staged approach that would promote growth in the left ventricle and gradually recruit it back into operation."

With the SLVR approach, a child undergoes initial single ventricle palliation with the Norwood procedure - a procedure pioneered at Boston Children's in the 1980s—in order to stabilize their circulation. Surgeons then perform additional procedures over time, such as mitral or aortic valve repair, removal of endocardial fibroelastic (EFE) tissue (tough tissue that can restrict the heart's pumping motion) and closure of atrial septal defects (gaps in the wall between the heart's left and right atriums). Between each procedure, surgeons allow the child's heart to heal and strengthen, setting the stage for the next operation.

"The goal is to promote blood flow through the patient's left ventricle and thereby stimulate growth of the ventricle," Emani said. "If we can do that, we give the ventricle an opportunity to function."

Emani noted that the SLVR approach is highly customizable based on each individual child's unique heart anatomy. It also requires a high degree of collaboration and an open approach to cardiac care involving multiple medical and surgical subspecialties.

In their report, the authors document their experiences developing and refining the SLVR approach between 2001 and 2010. In that time, 34 children were treated using the approach, 12 of whom were successfully converted to complete, two-ventricle circulation. In the short term, survival rates among SLVR-treated patients have been slightly better than a comparable group of children who underwent SVP.

In addition, patients who underwent SLVR also displayed significant growth in the valves and chambers on the left side of the heart, even if surgeons could not get the left ventricle to function completely, demonstrating that the strategy can effectively rehabilitate the heart and successfully support its growth and function.

Compared to SVP, the SLVR approach has had equal if not better outcomes over the last decade. The approach's overall benefits are geared toward improved long-term outcomes and survival into adulthood.

The team notes that in the short term the SLVR approach is more invasive and intensive than the single ventricle approach. But they expect that the long-term benefits of SLVR—especially in terms of reduced risks of future hospitalization, surgery and heart transplantation—will far outweigh the initial costs.

"We believe the SLVR strategy could revolutionize the pediatric cardiology field's approach to treatment of HLHS," Emani says. "The general consensus has been that conversion to single ventricle circulation is the safest approach, but it has significant limitations when it comes to adult survival. While we are still refining the process, we think our two-ventricle approach will help children with HLHS not just survive but thrive into adulthood."

http://www.eurekalert.org/pub_releases/2012-11/yu-ets110612.php

Early treatment sparks striking brain changes in autism

When given early treatment, children with autism spectrum disorders (ASD) made significant improvements in behavior, communication, and most strikingly, brain function, Yale School of Medicine researchers report in a new study.

The study was published in the current issue of the Journal of Autism and Developmental Disorders by Yale Child Study Center researchers Fred Volkmar, M.D., Kevin A. Pelphrey, and their colleagues.

The results suggest that brain systems supporting social perception respond well to an early intervention behavioral program called pivotal response treatment. This treatment includes parent training, and employs play in its methods.

ASDs are complex neurobiological disorders that inhibit a person's ability to communicate and develop social relationships, and are often accompanied by behavioral challenges. Until recently, autism diagnosis typically did not occur until a child was about three- to five-years-old, and treatment programs were geared for this older age group. Today, Volkmar and his team are diagnosing children as young as age one. Pivotal response treatment, developed at the University of California-Santa Barbara, combines developmental aspects of learning and development, and is easy to implement in children younger than age two.

In the current study, the team used functional magnetic resonance imaging - for the first time - to measure changes in brain activity after two five-year-olds with ASD received pivotal response treatment. Study co-author Pamela Ventola used this treatment method to identify distinct behavioral goals for each child in the study, and then reinforced these targeted skills with treatment involving motivational play activities.

The team found that children who received this treatment showed improvements in behavior, and being able to talk to other people. In addition, the MRI and electroencephalogram revealed increased brain activity in the regions supporting social perception.

Their results are from two children, but the researchers are currently conducting a full-scale study of 60 children. Pelphrey said that while both children in the current study received the same type of treatment for ASD, the results were not homogenous because ASD is a multi-faceted disorder that has a unique effect on each child. Some children with ASD function on a higher level than others, for example.

"ASD is a heterogeneous disorder, and research aimed at understanding treatment must address this heterogeneity," said Pelphrey. "Both the children in our current study made progress, but their degree of progress and level of skills at the end of treatment were distinct."

Volkmar sees these results as a first step in a novel approach to treatment planning. "Autism research has come a long way," he said. "These findings are exciting because they show that early intervention works in autism."

http://www.sciencedaily.com/releases/2012/11/121106114141.htm

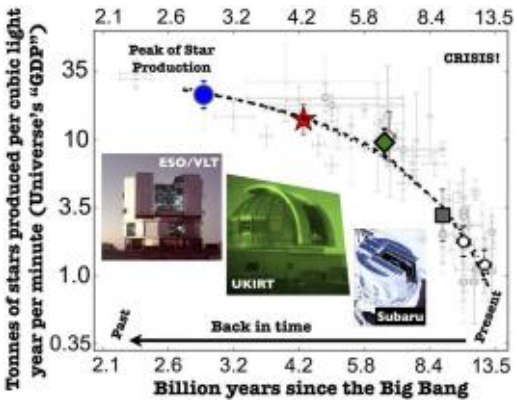
Star Formation Slumps to 1/30th of Its Peak

International team of astronomers establishes that the rate of formation of new stars in the Universe is now only 1/30th of its peak

ScienceDaily - While parts of the world experience economic hardship, a team of Portuguese, UK, Japanese, Italian and Dutch astronomers has found an even bigger slump happening on a cosmic scale. In the largest ever study of its kind, the international team of astronomers has established that the rate of formation of new stars in the Universe is now only 1/30th of its peak and that this decline is only set to continue.

The team, led by David Sobral of the University of Leiden in the Netherlands, publish their results in the journal Monthly Notices of the Royal Astronomical Society.

The accepted model for the evolution of the Universe predicts that stars began to form about 13.4 billion years ago, or around three hundred million years after the Big Bang. Many of these first stars are thought to have been monsters by today's standards, and were probably hundreds of times more massive than our Sun. Such beasts aged very quickly, exhausted their fuel, and exploded as supernovae within a million years or so. Lower mass stars in contrast have much longer lives and last for billions of years.



This diagram indicates the changing 'GDP' of the Universe over time. The new results indicate that, measured by mass, the production rate of stars has dropped by 97% since its peak 11 billion years ago. **(Credit: D. Sobral)**

Much of the dust and gas from stellar explosions was (and is still) recycled to form newer and newer generations of stars. Our Sun, for example, is thought to be a third generation star, and has a very typical mass

by today's standards. But regardless of their mass and properties, stars are key ingredients of galaxies like our own Milky Way. Unveiling the history of star formation across cosmic time is fundamental to understanding how galaxies form and evolve.
In the new study, scientists used the UK Infrared Telescope (UKIRT), the Very Large Telescope (VLT) and the Subaru telescope to carry out the most complete survey ever made of star-forming galaxies at different distances, with around ten times the data of any previous effort. With the range of distances, the time taken for the light to reach us means that we see identically selected galaxies at different periods in the history of the universe, so we can really understand how conditions change over time.
By looking at the light from clouds of gas and dust in these galaxies where stars are forming, the team are able to assess the rate at which stars are being born. They find that the production of stars in the universe as a whole has been continuously declining over the last 11 billion years, being 30 times lower today than at its likely peak, 11 billion years ago. Dr Sobral comments: "You might say that the universe has been suffering from a long, serious "crisis": cosmic GDP output is now only 3% of what it used to be at the peak in star production!"
'If the measured decline continues, then no more than 5% more stars will form over the remaining history of the cosmos, even if we wait forever. The research suggests that we live in a universe dominated by old stars. Half of these were born in the 'boom' that took place between 11 and 9 billion years ago and it took more than five times as long to produce the rest. "The future may seem rather dark, but we're actually quite lucky to be living in a healthy, star-forming galaxy which is going to be a strong contributor to the new stars that will form.
'Moreover, while these measurements provide a sharp picture of the decline of star-formation in the Universe, they also provide ideal samples to unveil an even more fundamental mystery which is yet to be solved: why?"
D. Sobral, I. Smail, P. N. Best, J. E. Geach, Y. Matsuda, J. P. Stott, M. Cirasuolo, J. Kurk. large Hα survey at z=2.23, 1.47, 0.84 & 0.40: the 11 Gyr evolution of star-forming galaxies from HiZELS. Monthly Notices of the Royal Astronomical Society, 2012 [link]

http://www.eurekalert.org/pub_releases/2012-11/aafc-iml110112.php

Inflammation marker linked to increased risk for death from cancer in Korean men

Blood levels of high-sensitive C-reactive protein, an important marker of inflammation, in apparently cancer-free men could potentially help identify those at increased risk for death from cancer

PHILADELPHIA — Measuring blood levels of high-sensitive C-reactive protein, an important marker of inflammation, in apparently cancer-free men could potentially help identify those at increased risk for death from cancer, in particular lung cancer, according to data published in Cancer Epidemiology, Biomarkers & Prevention, a journal of the American Association for Cancer Research.
"Inflammation has been linked to the initiation and progression of several types of cancer, as well as to the progression of atherosclerosis and cardiovascular disease," said Minseon Park, M.D., Ph.D., M.P.H., assistant professor in the Department of Family Medicine at the Center for Health Promotion at Seoul National University Hospital in South Korea. "We wanted to determine whether there was a relationship between a well-established marker of inflammation, high-sensitive C-reactive protein (hs-CRP), and death from all causes, death from cancer or death from a site-specific cancer in Koreans."
Park and colleagues retrospectively analyzed data from 33,556 individuals who had completed medical checkups, answered questions on cancer-related behavioral factors (like smoking status and exercise habits) and had been screened for blood hs-CRP at the health-screening center at Seoul National University Hospital between May 1995 and December 2006. During an average follow-up of 9.4 years, 1,054 deaths from all causes and 506 deaths from cancer were recorded.
When the researchers adjusted for several variables, including age, diabetes, smoking status and exercise habits, men with the highest level of hs-CRP in their blood (3 mg per liter or more) were 38 percent more likely to have died from any cause compared with men with the lowest hs-CRP level (1 mg per liter or less). They were also 61 percent more likely to have died from cancer.
For women, after adjusting for a number of variables, no statistically significant association was observed for hs-CRP level and death from any cause or death from cancer.
Through analysis of associations between hs-CRP levels and site-specific cancers, the researchers found that a significant relationship existed only for lung cancer. After adjusting for multiple variables, individuals with the highest hs-CRP level were more than twice as likely to die from lung cancer compared with those with the lowest hs-CRP level.
The association between hs-CRP levels and all-cause mortality and cancer mortality was stronger in lean individuals compared with those who were overweight.
"This was surprising," said Park. "Because obesity is a major risk factor for chronic diseases like cancer, physicians and the mass media often recommend eating less and exercising more. While an important public

health message, some people are too concerned with these recommendations and they eat fewer calories than their body actually needs. It is important that we eat enough to meet the metabolic demands of our body to make sure our organs function adequately for a healthy life."

http://www.sciencedaily.com/releases/2012/11/121106125554.htm

75 Percent of Patients Taking Popular Blood-Thinners On Wrong Dose: Millions at Risk for Uncontrolled Bleeding or Blood Clots

Researchers have found that approximately 75 percent of patients taking two common blood-thinning drugs may be receiving the wrong dosage levels

ScienceDaily - Cardiology researchers at the Intermountain Medical Center Heart Institute have found that approximately 75 percent of patients taking two common blood-thinning drugs may be receiving the wrong dosage levels, according to a new study.

This could put them at risk for serious problems like uncontrolled bleeding or developing blood clots.

Millions of Americans with coronary artery disease take one of the two drugs -- clopidogrel (Plavix) and prasugrel (Effient) -- to prevent harmful blood clots that can cause a stroke or heart attack. Current guidelines recommend that all patients take the same standardized dose. But in this new study of 521 patients, researchers at the Intermountain Medical Center Heart Institute found that dose is not effective for all patients.

"There's a sweet spot, an appropriate range for each patient. But we found that not many people are falling into that range," said cardiologist Brent Muhlestein, MD, a cardiac researcher at the Intermountain Medical Center Heart Institute. Dr. Muhlestein is presenting the group's findings on Nov. 6 at the American Heart Association Scientific Sessions 2012 in Los Angeles. "We showed that by performing a simple blood test to see whether or not the blood is clotting properly, we can determine whether patients are getting an appropriate, individualized dose of the medications," he says. "The test is easy to perform, but not widely used."

The Intermountain Medical Center Heart Institute study could help lead to personalized treatment and improved results for millions of people taking the drugs. It may also help cut pharmacy bills for many patients. The annual cost for one of the medications is more than $1,800. Finding the lowest effective dose for those patients could conceivably cut their bill in half.

Major findings of the study show that:

* Half of patients taking clopidogrel were getting too little of the drug to prevent clotting most effectively. A quarter were getting too much. Only a quarter were getting an accurate dose.
* Half of patients taking prasugrel are getting too much of the drug, which could lead to dangerous bleeding. A quarter were getting too little. Only a quarter are getting the appropriate dose.

The researchers also discovered that common indicators like age, gender, cholesterol levels, and history of heart problems were not good predictors for how a person would react to the drugs.

"That means there's not an easy way to predict how a person will react to these drugs. But the blood test is very effective," said Dr. Muhlestein. "In fact, a physician could have the test machine on his or her desk and perform the test right there in the office."

http://www.eurekalert.org/pub_releases/2012-11/hms-wpc110212.php

When parasites catch viruses

Researchers find a viral symbiont of a protozoan parasite increases virulence to the human host

When humans have parasites, the organisms live in our bodies, co-opt our resources and cause disease. However, it turns out that parasites themselves can have their own co-habitants.

Researchers from Harvard Medical School, Brigham and Women's Hospital and SUNY Upstate Medical University have found that the pathogenicity of the sexually transmitted protozoan parasite Trichomonas vaginalis—the cause of trichomoniasis—is fueled by a viral invader. Trichomoniasis infections are more common than all bacterial STDs combined. Annually, trichomoniasis affects nearly 250 million people, typically as vaginitis in women and urethritis in men.

"Trichomoniasis is associated with devastating consequences for women due to inflammation and related risks of reproductive disease," said Raina Fichorova, leader of the research team as well as associate professor of obstetrics, gynecology and reproductive biology at Brigham and Women's Hospital. "Our future goal is to determine how the viral symbiont and its inflammatory 'halo' affect the risk of preterm delivery and low birth weight."

"This is only one of two incidences that we know of for which the pathogenicity of a protozoan virus has been characterized," said Max Nibert, Harvard Medical School professor of microbiology and immunology and co-

author of the paper. "When found together, the result is an increase in virulence of the protozoan parasite to the human host, leading to exacerbated disease."
This study, which was initiated by a Harvard Catalyst Pilot grant, will be published online in Public Library of Science (PLOS) One.
Rather than invading human cells, Trichomonas vaginalis attaches to their surface and feeds on them, sometimes remaining asymptomatic for a period of time. The virus, called Trichomonasvirus, infects the protozoan and increases its pathogenic power by fueling virus-specific inflammatory responses.
Moreover, carrying the protozoan parasite predisposes women to acquire sexually transmitted viruses, particularly HIV and human papillomavirus, or HPV, both of which can lead to serious diseases such as AIDS and cervical cancer, respectively. Fichorova and Nibert have recently obtained funding from the Harvard University Center for AIDS Research to find out if the virus itself is directly responsible for increased HIV risk.
According to Nibert, the virus-parasite symbiosis is the norm rather than the exception with this particular protozoan. Upwards of 80 percent of Trichomonas vaginalis isolates carry the virus. "Unlike flu viruses, for example, this virus can't spread by jumping out of the cell into another one," said Nibert, who has pioneered molecular biology work on double-stranded RNA viruses, a category that includes Trichomonasvirus. "It just spreads between cells when they divide or mate."
According to the researchers, it is this double-stranded nature of the viral genome that contributes to increased virulence of the protozoan parasite. "The double-stranded RNA seems important to the signaling process," added Nibert.
Currently, trichomoniasis is treated with the antibiotic metronidazole. But this treatment is only effective on the protozoan. "When the medication is used, the dying or stressed protozoa release unharmed virions, which then signal to the human cells," explained Fichorova. As a result, the symptoms are aggravated, and this in turn might increase the danger it poses to pregnant women and their children.
"Ahead is more research to better understand the viral cycle and structural features that might be vulnerable to drugs, which will lead to opening new doors for better treatment of trichomoniasis and related diseases," said Fichorova. "Our complementary expertise, interdisciplinary team efforts and strong collaboration is the key to our future success."
Nibert added that basic research on Trichomonas vaginalis is not nearly as supported as he thinks it should be. "It is unfortunate that a human pathogen of such worldwide significance has been neglected to such a degree," he said.
The study was funded by NIH and NIAID grants (1RC1AI086788-01, 5R01AI079085, 1R56AI091889- 01A1), a Harvard Catalyst Pilot Grant (UL1-RR025758), the Harvard Clinical and Translational Science Center, and by the National Center of Research Resources.

http://phys.org/news/2012-11-pacific-tokelau-world-solar.html

Pacific's Tokelau in world first solar switch

Before the solar power grid was completed, Tokelau relied on diesel generators for electricity

The remote Pacific islands of Tokelau have become the first territory in the world to generate their electricity entirely from solar energy, in a project hailed as an environmental milestone.
Before the solar power grid was completed, the New Zealand-administered grouping of three coral atolls, with a population of just 1,500, relied on diesel generators for electricity.
Project coordinator Mike Bassett-Smith said the diesel was not only environmentally unfriendly, it also cost the islands, which lie about halfway between New Zealand and Hawaii, around NZ$1.0 million ($825,000) a year.
Bassett-Smith, from New Zealand firm PowerSmart Solar, said the change would allow Tokelau to switch money from fuel purchases to social welfare projects.
"For Tokelau, this milestone is of huge importance for their continued well-being," he said in a statement received Wednesday.
"Many Pacific nations struggle to provide a high proportion of their people access to electricity, and even when they do, access to affordable electricity is a significant additional challenge."
New Zealand Foreign Minister Murray McCully said the US$7.0 million project had achieved a world first and Wellington was working with other Pacific nations such as Tonga and the Cook Islands to develop renewable energy.
"Completed on time and on budget, the project is an excellent example of how small Pacific nations can lead the way on renewable energy," he said.

http://www.eurekalert.org/pub_releases/2012-11/plos-cfr110512.php

Coral files reveal time of first Polynesian settlements

High-precision techniques estimate first settlers arrived in Tonga almost 2,900 years ago

Polynesia was one of the last places on Earth to be settled by humans, and new techniques reveal that this settlement first occurred within a 16 year window nearly 3000 years ago. The research, published November 7 in the open access journal PLOS ONE by David Burley and colleagues from Simon Fraser University, Canada, reveals that the first human settlers lived in a founder colony on the islands of Tonga between 2830 to 2846 years ago.

To arrive at this precise figure, the researchers used a high-precision technique to estimate the age of coral files that early settlers used to sculpt and smooth wood and shell surfaces. As Dr. Burley states, "This degree of precision is impossible using radiocarbon and other dating techniques. It provides significant new opportunities for our understanding of the exploration and settlement of the far distant islands spread across the South Pacific."

This shows pristine (upper) and used (lower) surfaces of an Acropora coral file used to sculpt and smooth wood and shell surfaces. **Credit: Citation: Burley D, Weisler MI, Zhao**

Citation: Burley D, Weisler MI, Zhao J-x (2012) High Precision U/Th Dating of First Polynesian Settlement. PLoS ONE 7(11): e48769. doi:10.1371/ journal.pone.0048769

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http://www.eurekalert.org/pub_releases/2012-11/csp-lft110512.php

Looking for the anti-Alzheimer's molecule - A new approach to treating a devastating disease

'In silico search for an endogenous anti-Alzheimer's molecule -- Screening amino acid metabolic pathways' published today in the Canadian Journal of Chemistry

Ottawa, Canada – Researchers at Dalhousie University have discovered a new technique using "computer-aided" drug design that may lead to an entirely new approach in the treatment of Alzheimer's disease (AD).

"Alzheimer's is a devastating disease for which no truly disease-modifying drugs are available. Our approach is completely novel. We explore how the human body attempts to protect itself from Alzheimer's, and then we exploit this to develop an entirely new approach to therapeutics," explained Dr. Weaver, a professor at Dalhousie University, clinical neurologist at Capital Health and IWK Health Centre, Canada Research Chair in Clinical Neuroscience, and the DMRF Irene MacDonald Sobey Chair in Curative Approaches to Alzheimer's Disease. "We are extremely excited about the results presented in this paper and believe that this may represent a new approach to the treatment of AD."

Weaver says that he and his fellow researchers have successfully identified molecules that are able to prevent the disease-producing aggregation of both beta-amyloid and tau – the two proteins whose misfolding is implicated in the causation of Alzheimer's.

"Using 'in silico' (i.e. computer-aided) drug design, we have discovered new lead molecules that may aid in the future development of disease-modifying drugs for Alzheimer's disease," said Dr. Autumn Meek whose research into Alzheimer's has been funded by the Dalhousie Medical Research Foundation's "Gunn Family Graduate Studentship in Alzheimer's Disease". She works with co-authors Dr. Weaver and Mr. Gordon Simms in the Department of Chemistry at Dalhousie.

According to the Alzheimer's Society publication "Rising Tide: The Impact of Dementia on Canadian Society", Alzheimer's disease is an ever-growing concern in Canadian society, and as the population trends toward the aged it will place an increased strain on healthcare and families alike. It is believed that within a generation, the numbers of Canadians with Alzheimer's disease will more than double, and the cost of caring for individuals afflicted with dementia will increase from $15 billion annually to $153 billion annually.

The paper "In silico search for an endogenous anti-Alzheimer's molecule – Screening amino acid metabolic pathways", published in the Canadian Journal of Chemistry.

http://www.eurekalert.org/pub_releases/2012-11/asu-slt110512.php

Small lethal tools have big implications for early modern human complexity

Scientists have found evidence for an advanced stone age technology dated to 71,000 years ago at Pinnacle Point

On the south coast of South Africa, scientists have found evidence for an advanced stone age technology dated to 71,000 years ago at Pinnacle Point near Mossel Bay. This technology, allowing projectiles to be thrown at greater distance and killing power, takes hold in other regions of Africa and Eurasia about 20,000 years ago. When combined with other findings of advanced technologies and evidence for early symbolic behavior from this region, the research documents a persistent pattern of behavioral complexity that might signal modern humans evolved in this coastal location. These findings were reported in the article "An Early and Enduring Advanced Technology Originating 71,000 Years Ago in South Africa" in the November 7 issue of the journal Nature.

"Every time we excavate a new site in coastal South Africa with advanced field techniques, we discover new and surprising results that push back in time the evidence for uniquely human behaviors," said co-author Curtis Marean, project director and Arizona State University professor in the Institute of Human Origins, a research center of the College of Liberal Arts and Sciences in the School of Human Evolution and Social Change.

The reported technology focused on the careful production of long, thin blades of stone that were then blunted (called "backing") on one edge so that they could be glued into slots carved in wood or bone. This created light armaments for use as projectiles, either as arrows in bow and arrow technology, or more likely as spear throwers (atlatls). These provide a significant advantage over hand cast spears, so when faced with a fierce buffalo (or competing human), having a projectile weapon of this type increases the killing reach of the hunter and lowers the risk of injury. The stone used to produce these special blades was carefully transformed for easier flaking by a complex process called "heat treatment," a technological advance also appearing early in coastal South Africa and reported by the same research team in 2009.

"Good things come in small packages," said Kyle Brown, a skilled stone tool replicator and co-author on the paper, who is an honorary research associate with the University of Cape Town, South Africa. "When we started to find these very small carefully made tools, we were glad that we had saved and sorted even the smallest of our sieved materials. At sites excavated less carefully, these microliths may have been discarded in the back dirt or never identified in the lab."

These microlith blades show a flat edge with a rounded "cutting" edge. **Simen Oestmo**

Prior work showed that this microlithic technology appear briefly between 65,000 and 60,000 years ago during a worldwide glacial phase, and then it was thought to vanish, thus showing what many scientists have come to accept as a "flickering" pattern of advanced technologies in Africa. The so-called flickering nature of the pattern was thought to result from small populations struggling during harsh climate phases, inventing technologies, and then losing them due to chance occurrences wiping out the artisans with the special knowledge.

"Eleven thousand years of continuity is, in reality, an almost unimaginable time span for people to consistently make tools the same way," said Marean. "This is certainly not a flickering pattern."

The appearance and disappearance is more likely a function of the small sample of well-excavated sites in Africa. Because of this small sample, each new site has a high probability of adding a novel observation. The African sample is a tiny fraction of the known European sample from the same time period.

"This is why continued and well-funded fieldwork in Africa is of the highest scientific priority if we want to learn about what it means to be human, and where and when it happened," said Marean.

The site where this technology was discovered is called Pinnacle Point 5-6 (PP5-6). This spectacular site preserves about 14 meters of archaeological sediment dating from approximately 90,000 to 50,000 years ago. The documentation of the age and span of the technology was made possible by an unprecedented fieldwork commitment of nine, two-month seasons (funded by the National Science Foundation and Hyde Family Foundation) where every observed item related to human behavior was plotted directly to a computer using a "total station." A total station is a surveying instrument that digitally captures points where items are found to create a 3D model of the excavation. Almost 200,000 finds have been plotted to date, and excavations continue. This was joined to over 75 optically stimulated luminescence dates by project geochronologist Zenobia Jacobs at the University of Wollongong (Australia), creating the highest resolution stone-age sequence from this time span.

"As an archaeologist and scientist, it is a privilege to work on a site that preserves a near perfect layered sequence capturing almost 50,000 years of human prehistory," said Brown, who codirected excavations at PP5-6. "Our team has done a remarkable job of identifying some of the subtle but important clues to just how innovative these early humans on the south coast were." Research on stone tools and Neanderthal anatomy strongly suggests that Neanderthals lacked true projectile weapons.
"When Africans left Africa and entered Neanderthal territory they had projectiles with greater killing reach, and these early moderns probably also had higher levels of pro-social (hyper-cooperative) behavior. These two traits were a knockout punch. Combine them, as modern humans did and still do, and no prey or competitor is safe," said Marean. "This probably laid the foundation for the expansion out of Africa of modern humans and the extinction of many prey as well as our sister species such as Neanderthals."

http://www.eurekalert.org/pub_releases/2012-11/lu-prd110712.php

Protein reveals diabetes risk many years in advance

Researchers have now identified a promising candidate for a test that indicates who is at risk for diabetes

When a patient is diagnosed with type 2 diabetes, the disease has usually already progressed over several years and damage to areas such as blood vessels and eyes has already taken place. To find a test that indicates who is at risk at an early stage would be valuable, as it would enable preventive treatment to be put in place. Researchers at Lund University have now identified a promising candidate for a test of this kind. The findings have been published in the journal Cell Metabolism.
"We have shown that individuals who have above-average levels of a protein called SFRP4 in the blood are five times more likely to develop diabetes in the next few years than those with below-average levels", says Anders Rosengren, a researcher at the Lund University Diabetes Centre (LUDC), who has led the work on the risk marker.

Higher levels in diabetes patients

It is the first time a link has been established between the protein SFRP4, which plays a role in inflammatory processes in the body, and the risk of type 2 diabetes. Studies at LUDC, in which donated insulin-producing beta cells from diabetic individuals and non-diabetic individuals have been compared, show that cells from diabetics have significantly higher levels of the protein.

Link between inflammation and diabetes explained

It is also the first time the link between inflammation in beta cells and diabetes has been proven.
"The theory has been that low-grade chronic inflammation weakens the beta cells so that they are no longer able to secrete sufficient insulin. There are no doubt multiple reasons for the weakness, but the SFRP4 protein is one of them", says Taman Mahdi, main author of the study and one of the researchers in Anders Rosengren's group.

Fivefold risk increase

The level of the protein SFRP4 in the blood of non-diabetics was measured three times at intervals of three years. Thirty-seven per cent of those who had higher than average levels developed diabetes during the period of the study.
Among those with a lower than average level, only nine per cent developed the condition.
"This makes it a strong risk marker that is present several years before diagnosis. We have also identified the mechanism for how SFRP4 impairs the secretion of insulin. The marker therefore reflects not only an increased risk, but also an ongoing disease process", says Anders Rosengren.
The marker works independently of other known risk factors for type 2 diabetes, for example obesity and age.

Motivation for lifestyle changes

"If we can point to an increased risk of diabetes in a middle-aged individual of normal weight using a simple blood test, up to ten years before the disease develops, this could provide strong motivation to them to improve their lifestyle to reduce the risk", says Anders Rosengren, adding:
"In the long term, our findings could also lead to new methods of treating type 2 diabetes by developing ways of blocking the protein SFRP4 in the insulin-producing beta cells and reducing inflammation, thereby protecting the cells."
The research results have been published in the journal Cell Metabolism: 'Secreted Frizzled-Related Protein 4 Reduces Insulin Secretion and is Overexpressed in Type 2 Diabetes' *http://www.sciencedirect.com/science/article/pii/S1550413112004093*

http://www.sciencenews.org/view/generic/id/346280/title/A_little_radiation_is_good_for_mice

A little radiation is good for mice

Low doses of radioactivity led to healthier pups

By Tina Hesman Saey

X-rays may not heal broken bones, but low doses of ionizing radiation may spark other health benefits, a new study of mice suggests.

Radiation in high doses has well-known harmful effects. Scientists had thought low doses would do less extensive damage but could add up to big problems later. But radiation acts differently at low doses, producing health benefits for mice with an unusual genetic makeup, Randy Jirtle of the University of Wisconsin–Madison and colleagues report online November 1 in the FASEB Journal. Antioxidant vitamins, such as vitamins C and E, erased those health gains.

"What goes on at high doses is not very predictive of what happens at low doses," says Edward Calabrese, a toxicologist at the University of Massachusetts-Amherst. Chemicals that are poisons at high doses may be growth or health promoters at low concentrations. "It's a major observation that is still to be appreciated," he says.

Jirtle's group studies mice known as viable yellow agouti mice. Scientists use them to gauge how diet, chemicals and other environmental conditions affect gene activity in animals, probably including humans. Agouti mice have a genetic quirk that causes the agouti gene to be turned on in all their body tissues. This results in yellow coats, obesity, diabetes and more cancer than normal. But attaching chemical tags to the DNA, a process called DNA methylation, around the agouti gene shuts the gene's activity down, leading to lean, brown, healthy mice. Chemicals, stress or other factors that interfere with methylation shift the coat color and health status of the mice.

The scientists irradiated pregnant mice so that developing fetuses received doses between 0.4 centigrays and 7.6 centigrays. (A human dental X-ray delivers about 0.4 to 0.8 centigrays.) Some mice were put in the scanner but not irradiated. Mother mice that got radiation doses between 0.7 and 3 centigrays had more pups with browner coats than did sham-irradiated mice. Browner coat colors among mice exposed to low-dose radiation were associated with higher levels of DNA methylation on the agouti gene, indicating that radiation does something to alter the chemical tagging.

Giving mother mice antioxidants blocked the tagging. That finding could mean that radiation is creating oxidants, chemicals that are hungry to interact with other molecules. Too many hungry molecules in a cell can tear apart proteins, DNA and other components, but small numbers of oxidants serve as chemical messengers for cells. In this case, low-level radiation may have signaled cells to shut down agouti activity, thus making the mice healthier. Vitamins and other antioxidants that intercept that message would promote the unhealthy state.

Jirtle wasn't exactly excited about the result at first. "Nobody wants to think that low dose radiation could be advantageous and the stuff you put in your vitamin pill would be bad," he says.

Although the mice in Jirtle's experiments have a specific genetic quirk that may make low levels of radiation helpful to them, people may also get some benefits from such exposure, Calabrese says. Before antibiotics became widespread, some doctors treated ear and sinus infections and gangrene with low dose X-rays. Low doses of radiation are also sometimes used to treat arthritis in people who can't take anti-inflammatory drugs. Radiation may help modulate the immune system by altering epigenetic tags on DNA in immune cells, he says.

A.J. Bernal et al. Adaptive radiation-induced epigenetic alterations mitigated by antioxidants. FASEB Journal. doi: 10.1096/fj.12-220350. [Go to]

http://www.bbc.co.uk/news/health-20217737

Concern over 'souped up' human race

A race of humans who can work without tiring and recall every conversation they've ever had may sound like science fiction, but experts say the research field of human enhancement is moving so fast that such concepts are a tangible reality that we must prepare for.

By Michelle Roberts Health editor, BBC News online

People already have access to potent drugs, originally made for dementia patients and hyperactive children, that boost mental performance and wakefulness. Within 15 years, experts predict that we will have small devices capable of recording our entire life experience as a continuous video feed - a life log that we can reference when our own memory fails.

Advances in bionics and engineering will mean we could all boast enhanced night vision allowing us to see clearly in the dark.

While it may be easy to count the potential gains, experts are warning that these advances will come at a significant cost - and one which is not just financial.

Potential harm

Four professional bodies - the Academy of Medical Sciences, the British Academy, the Royal Academy of Engineering and the Royal Society - say that while human enhancement technologies might improve our performance and aid society, their use raise serious ethical, philosophical, regulatory and economic issues.
In a joint report, they warn that there is an "immediate need" for debate around the potential harms.

'Smart' pills
Improve memory and mental performance One commonly used "smart" drug is modafinil (brand name Provigil), which is normally prescribed for sleep disordersAnother is the drug methylphenidate (brand name Ritalin), which is given to people with ADHD

Chairwoman of the report's steering committee Prof Genevra Richardson said: "There are a range of technologies in development and in some cases already in use that have the potential to transform our workplaces - for better or for worse." There may be an argument for lorry drivers, surgeons and airline pilots to use enhancing drugs to avoid tiredness, for example. But, in the future, is there a danger that employers and insurers will make this use mandatory, the committee asks.

Coercion

As our population ages, it is accepted that we will all be expected to work further into old age. Human enhancement could enable older workers to keep pace with younger colleagues. But there is also the risk that those who fail to join the technological elite would be sidelined as dinosaurs, says Prof Jackie Leach Scully, professor of social ethics at Newcastle University's Policy, Ethics & Life Sciences Research Centre.
Several surveys reveal that many students now use brain-enhancing "smart" pills to help boost their exam grades, which raises the question about whether colleges and universities should insist candidates are "clean" in the same way that Olympic athletes have to prove they are drug-free to compete.
Many people buy them over the internet, which is risky because they don't know what they're getting.
And we know little about their long-term effects on healthy, young brains.
Dr Robin Lovell-Badge, of the Medical Research Council and who chaired one of the workshop sessions that formulated the report, said: "It was clear from discussions that cognitive-enhancing drugs present the greatest immediate challenge for regulators and other policymakers. "They are simple to take, already available without prescription, and are increasingly being used by healthy individuals.
"However, other forms of enhancement, including physical methods, will follow. Some were on show at the Paralympics, some are being explored by the military and others may become a serious option in the clinic in the not too distant future.
"It is good to see and to be excited by many of these developments, but there must be an equally watchful eye and care taken to ensure that the workforce can capitalise on the benefits, but not suffer the harms that could come about by their inappropriate use."

http://www.eurekalert.org/pub_releases/2012-11/giot-cab110212.php

Corals attacked by toxic seaweed use chemical 911 signals to summon help

Bodyguard fish

Corals under attack by toxic seaweed do what anyone might do when threatened – they call for help. A study reported this week in the journal Science shows that threatened corals send signals to fish "bodyguards" that quickly respond to trim back the noxious alga – which can kill the coral if not promptly removed.
Scientists at the Georgia Institute of Technology have found evidence that these "mutualistic" fish respond to chemical signals from the coral like a 911 emergency call – in a matter of minutes. The inch-long fish – known as gobies – spend their entire lives in the crevices of specific corals, receiving protection from their own predators while removing threats to the corals.
This symbiotic relationship between the fish and the coral on which they live is the first known example of one species chemically signaling a consumer species to remove competitors. It is similar to the symbiotic relationship between Acacia trees and mutualist ants in which the ants receive food and shelter while protecting the trees from both competitors and consumers.

A juvenile Gobidon fish is shown on an Acropora coral. These fish spend their entire lives with the same coral, and protect the coral from encroaching seaweed. **Georgia Tech Photo: Joao Paulo Krajewski**

"This species of coral is recruiting inch-long bodyguards," said Mark Hay, a professor in the School of Biology at Georgia Tech. "There is a careful and nuanced dance of the odors that makes all this happen. The fish have evolved to cue on the odor released into the water by the coral, and they very quickly take care of the problem."

The research, supported the National Science Foundation, the National Institutes of Health and the Teasley Endowment at Georgia Tech, was reported November 8 in the journal Science. The research was done as part of a long-term study of chemical signaling on Fiji Island coral reefs aimed at understanding these threatened ecosystems and discovering chemicals that may be useful as pharmaceuticals.

Because they control the growth of seaweeds that damage coral, the importance of large herbivorous fish to maintaining the health of coral reefs has been known for some time. But Georgia Tech postdoctoral fellow Danielle Dixson suspected that the role of the gobies might be more complicated. To study that relationship, she and Hay set up a series of experiments to observe how the fish would respond when the coral that shelters them was threatened.

They studied Acropora nasuta, a species in a genus of coral important to reef ecosystems because it grows rapidly and provides much of the structure for reefs. To threaten the coral, the researchers moved filaments of Chlorodesmis fastigiata, a species of seaweed that is particularly chemically toxic to corals, into contact with the coral. Within a few minutes of the seaweed contacting the coral, two species of gobies – Gobidon histrio and Paragobidon enchinocephalus – moved toward the site of contact and began neatly trimming away the offending seaweed.

"These little fish would come out and mow the seaweed off so it didn't touch the coral," said Hay, who holds the Harry and Linda Teasley Chair in Environmental Biology at Georgia Tech. "This takes place very rapidly, which means it must be very important to both the coral and the fish. The coral releases a chemical and the fish respond right away."

In corals occupied by the gobies, the amount of offending seaweed declined 30 percent over a three-day period, and the amount of damage to the coral declined by 70 to 80 percent. Control corals that had no gobies living with them had no change in the amount of toxic seaweed and were badly damaged by the seaweed.

To determine what was attracting the fish, Dixson and Hay collected samples of water from locations (1) near the seaweed by itself, (2) where the seaweed was contacting the coral, and (3) from coral that had been in contact with the seaweed – 20 minutes after the seaweed had been removed. They released the samples near other corals that hosted gobies, which were attracted to the samples taken from the seaweed-coral contact area and the damaged coral – but not the seaweed by itself.

"We demonstrated that the coral is emitting some signal or cue that attracts the fish to remove the encroaching seaweed," Hay said. "The fish are not responding to the seaweed itself."

Similar waters collected from a different species of coral placed in contact with the seaweed did not attract the fish, suggesting they were only interested in removing seaweed from their host coral.

Finally, the researchers obtained the chemical extract of the toxic seaweed and placed it onto nylon filaments designed to stimulate the mechanical effects of seaweed. They also created simulated seaweed samples without the toxic extract. When placed in contact with the coral, the fish were attracted to areas in which the chemical-containing mimic contacted the coral, but not to the area contacting the mimic without the chemical.

By studying the contents of the fish digestive systems, the researchers learned that one species – Gobidon histrio – actually eats the noxious seaweed, while the other fish apparently bites it off without eating it. In the former, consuming the toxic seaweed makes the fish less attractive to predators.

The two species of fish also eat mucus from the coral, as well as algae from the coral base and zooplankton from the water column. By defending the corals, the gobies are thus defending the home in which they shelter and feed.

"The fish are getting protection in a safe place to live and food from the coral," Hay noted. "The coral gets a bodyguard in exchange for a small amount of food. It's kind of like paying taxes in exchange for police protection."

As a next step, Hay and Dixson would like to determine if other species of coral and fish have similar symbiotic relationships. And they'd like to understand more about how the chemical signaling and symbiotic relationship came into being.

"These kinds of positive interactions needs to be better understood because they tell us something about the pressures that have gone on through time on these corals," said Hay. "If they have evolved to signal these gobies when a competitor shows up, then competition has been important throughout evolutionary time."

CITATION: Danielle L. Dixson and Mark E. Hay, Corals chemically signal mutualistic fishes to remove competing seaweeds, Science (2012).

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http://www.eurekalert.org/pub_releases/2012-11/uoc--ccw110612.php

Chernobyl cleanup workers had significantly increased risk of leukemia

Findings may help estimate cancer risk from low-dose exposures like CT scans

A 20-year study following 110,645 workers who helped clean up after the 1986 Chernobyl nuclear power plant accident in the former Soviet territory of Ukraine shows that the workers share a significant increased risk of developing leukemia. The results may help scientists better define cancer risk associated with low doses of radiation from medical diagnostic radiation procedures such as computed tomography scans and other sources.

In the journal Environmental Health Perspectives this week, an international team led by scientists at the University of California, San Francisco (UCSF) and the Chernobyl Research Unit at the Radiation Epidemiology Branch of the National Cancer Institute describes the increased risks of leukemia among these workers between 1986 and 2006. The risk included a greater-than-expected number of cases of chronic lymphocytic leukemia, which many experts did not consider to be associated with radiation exposure in the past.

The new work is the largest and longest study to date involving Chernobyl cleanup workers who worked at or near the nuclear complex in the aftermath of the accident.

Overall, there were 137 cases of leukemia among the workers over the 20-year span of the study, and 16 percent of those cancers were attributable to the Chernobyl radiation exposure, the team found.

The findings shed light on the thorny issue of estimating cancer risk from low doses of radiation – an issue of importance to miners, nuclear workers and anyone who is chronically exposed to low levels of radiation at work or patients who receive sizeable radiation doses when undergoing medical diagnostic tests.

"Low doses of radiation are important," said the lead researcher Lydia Zablotska, MD, PhD, an associate professor of epidemiology and biostatistics at UCSF. "We want to raise awareness of that."

Worst Nuclear Accident of All Time

The nearly 111,000 Ukrainian workers in the study were among the more than 500,000 former Soviets who worked directly on the front lines in the aftermath of Chernobyl disaster, which was the worst nuclear accident of the 20th century followed by the 2011 Fukushima disaster in Japan.

It began in the early morning hours of April 26, 1986 when a planned test of a backup system for operating cooling pumps went awry. A combination of human error and unsafe reactor design led to the runaway production of heat in Chernobyl's Reactor No. 4, which quickly caused two massive explosions, ruptured the reactor, crumbled the building, exposed the nuclear core, rained radioactive debris around the compound and spread fallout through the atmosphere over the Soviet Union and Europe.

Many of the Ukrainian workers were exposed to high levels of radiation because they were part of the teams that helped sweep up contaminated debris from the immediate area – much of which was highly radioactive. Some of them, in fact, reached lifetime limits of radiation exposure within a matter of a few hours.

Although an elevated radiation-related risk of leukemia was not surprising, given the level of exposure among many of these workers, what did surprise Zablotska and her colleagues was the elevated risk of chronic lymphocytic leukemia (CLL), which was similar in size to the risk estimated for non-CLL leukemia.

Leukemia and Low-Dose Radiation

For many years, doctors have known that ionizing radiation from an X-ray source or produced by the decay of radioactive elements can cause leukemia, because it can penetrate the body, expose bone marrow to the radiation and damage DNA. But while scientists have understood this basic mechanism for decades, the question of how much leukemia risk is associated with moderate or low doses of radiation has been hard to answer.

For many years, the best estimates came from long-term studies involving survivors of the 1945 atomic bomb detonations over Hiroshima and Nagasaki, Japan during World War II. People in the immediate vicinity of the blasts were exposed to various levels of radiation, and in the decades afterward, their health was monitored and the increase in cancer tracked.

From those assessments of cancer risk, scientists estimated risks from lower doses by extrapolating the data down. But there have always been problems with this approach, said Zablotska. Atomic bomb survivors were bathed in gamma or neutron rays, while someone who undergoes a CT scan in the U.S. is exposed to X-rays, a different type of radiation. Moreover, extrapolating risks for Japanese population to Western population is further confounded by differences in genetics, lifestyle and diet between the two.

The new work helps to bridge this gap because the doses received by the Ukrainian cleanup workers falls somewhere in between the high level received by the Japanese atomic bomb victims and the lower levels received by people who undergo extensive medical scans.

It also challenges the idea that chronic lymphocytic leukemia is not linked to radiation exposure – something that earlier studies of atomic bomb survivors had seemed to support.
The genetic makeup of the Japanese population may have hidden any increased risk, Zablotska said, because they are much less likely to develop this type of cancer anyway. Chronic lymphocytic leukemia accounts for only 3 percent of all cases of leukemia in Japan – as opposed to about one-third of all leukemia cases in the U.S. and 40 percent of all cases of leukemia in Ukraine.
The article, "Radiation and the Risk of Chronic Lymphocytic and Other Leukemias among Chernobyl Cleanup Workers" by Lydia B. Zablotska, Dimitry Bazyka, Jay H. Lubin, Nataliya Gudzenko, Mark P. Little, Maureen Hatch, Stuart Finch, Irina Dyagil, Robert F. Reiss, Vadim V. Chumak, Andre Bouville, Vladimir Drozdovitch, Victor P. Kryuchkov, Ivan Golovanov, Elena Bakhanova, Nataliya Babkina, Tatiana Lubarets, Volodymyr Bebeshko, Anatoly Romanenko and Kiyohiko Mabuchi will be published online by the journal Environmental Health Perspectives on November 8th, 2012. See: http://ehp03.niehs.nih.gov/
In addition to UCSF, authors on this study are associated with the National Research Center for Radiation Medicine in Kyiv, Ukraine; the National Cancer Institute in Bethesda, Md.; Robert Wood Johnson Medical School in Camden, N.J.; Columbia University in New York City; and Burnasyan Federal Medical Biophysical Centre in Moscow.
This study was funded by the National Cancer Institute (NCI) through grant #CA132918 and contract #NO1-CP-21178 and by the Intra-Agency Agreement between the NCI and the National Institute of Allergy and Infectious Diseases (NIAID) through agreement #Y2-Al-5077 and #Y3-CO-5117. Both NCI and NIAID are part of the National Institutes of Health (NIH).
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http://www.sciencedaily.com/releases/2012/11/121107132742.htm

Looking Through an Opaque Material: Sharp Pictures Taken of Objects Hidden Behind an Opaque Screen

A team of researchers from the Netherlands and Italy has succeeded in making sharp pictures of objects hidden behind an opaque screen.

ScienceDaily - Materials such as skin, paper and ground glass appear opaque because they scatter light. In such materials light does not move in a straight line, but travels along an unpredictable and erratic path. As a result, it is impossible to get a clear view of objects hidden behind such materials. Powerful methods have been developed to retrieve images through materials in which a small fraction of the light follows a straight path. To date, however, it has not been possible to resolve an image from light that has been completely scattered. This breakthrough in research has been published in the research journal Nature.
A team from the MESA+ Institute for nanotechnology at the University of Twente in the Netherlands has now succeeded in doing just this. The researchers, led by Dr. Allard Mosk, scanned the angle of a laser beam that illuminated an opaque diffuser. At the same time, a computer recorded the amount of fluorescent light that was returned by a tiny object hidden behind the diffuser. Dr. Mosk point out that: "While the measured intensity of the light cannot be used to form an image of the object directly, the information needed to do so is in there, but in a scrambled form. The two young scientists who are the first authors of this paper had the brilliant idea to find out whether that scrambled information is sufficient to reconstruct the image -- and they found a way to do so." Their method involves a computer program that initially guesses the missing information, and then tests and refines the guess. They succeeded in making an image of a hidden fluorescent object just 50 micrometers across -- the size of a typical cell.
The researchers expect their work to lead to new microscopy methods capable of forming razor sharp images in a strongly scattering environment. Allard Mosk notes that: "This will be very useful in nanotechnology. We would like to bring structures to light that are hidden inside a complex environments like computer chips." They also dream of extending their method to examine objects under the human skin. "But for the moment," says Dr. Mosk, "our method is too slow for that."
This study was supported by the Netherlands Organization for Scientific Research NWO, the Foundation for Fundamental Research on Matter FOM, the Technology Foundation STW, the European Research Council (ERC) and the Italian Ministry of Education, Universities and Research.
Jacopo Bertolotti, Elbert G. van Putten, Christian Blum, Ad Lagendijk, Willem L. Vos, Allard P. Mosk. Non-invasive imaging through opaque scattering layers. Nature, 2012; 491 (7423): 232 DOI: 10.1038/nature11578

http://nyti.ms/SN7wss

Chasing Clues to Detect Outbreak

The e-mail Dr. Marion A. Kainer received on Sept. 18 suggested an investigation of a case of fungal meningitis and stroke in a man whose immune system was normal and whose only risk for the infection was a spinal injection of a steroid.

By LAWRENCE K. ALTMAN, M.D.

"Alarm bells went off" because of its rarity, Dr. Kainer, an epidemiologist at the Tennessee health department, said in an interview.

She immediately began what became a national investigation that has now identified 409 cases, including 30 deaths, from a fungus so unusual that it is not in medical textbooks. The fungus was transmitted through injections of a contaminated steroid drug prepared by the New England Compounding Center in Framingham, Mass.

Dr. Kainer's investigation led Tennessee to take extraordinary measures to track down 1,009 people at risk of the fungal infection. The state is credited as the driving force in discovering one of the most shocking outbreaks in the annals of American medicine.

The discovery came in large part because of Dr. Kainer's diligence and expertise in infectious diseases, neurology and public health. It came, too, from the clinical acumen of Dr. April C. Pettit, an infectious disease specialist at Vanderbilt University who sent the e-mail to the health department.

The still-evolving findings also illustrate the strengths of the government's response to a public health crisis. Dr. Kainer, like other physicians in hospitals and clinics, often detect the initial cases. But usually only health departments and other government agencies have the ability and authority to track down additional cases to document disease outbreaks and warn those at risk. It is work that private groups seldom can do, in part for lack of funds and the authority to examine patient records.

The national surveillance system for outbreaks of infectious and other communicable diseases relies on reports that physicians are required to send to local and state health departments and that are then relayed to the Centers for Disease Control and Prevention. At the federal agency in Atlanta, epidemiologists identify outbreaks by studying trends.

At the same time, the fungal meningitis cases have exposed weaknesses in government. A dispute surrounds the Food and Drug Administration's failure to act earlier to prevent the outbreak. The federal agency has been attacked for failing to use its authority to protect the public from the dangerous practice of large-scale drug compounding that led to the outbreak. But the agency, whose top officials have remained relatively silent, says Congress has not given it the clear authority needed to have taken action.

Dr. Kainer's investigation progressed in steps similar to peeling the layers of an onion.

Within two days of receiving Dr. Pettit's e-mail, Dr. Kainer learned that the steroid had come from the New England Compounding Center.

"That got me very concerned," Dr. Kainer said, because she had taken part in epidemiologic investigations involving different infections linked to compounding centers. Inquiries determined that the New England center had received no reports of infections linked to its steroid, and the C.D.C. knew of no additional recent cases of fungal meningitis and stroke.

An inspection by Dr. Kainer's staff and from the clinic that administered the injection showed no obvious source of local fungal contamination, like recent construction or water leaks.

Then Dr. Kainer learned of three additional suspect cases of meningitis and stroke linked to the clinic. But fungi had not yet been identified in those patients' spinal fluid. Also, her team could find no correlations in factors like time of day or week when the patients received the injections. One patient had a particular kind of stroke known as posterior circulation, which attracted Dr. Kainer's attention because she had learned in neurology that fungal infections can cause such strokes.

"What didn't make sense was that two patients appeared to be improving without antifungal treatment, and that didn't fit the clinical picture," Dr. Kainer said.

So she and her team took additional steps. One was to issue a statewide alert to identify similar cases; none were reported.

"We tell doctors and health workers we would rather have 15 false alarms than miss one case," Dr. Kainer said.

Then she learned that the two patients who had been improving had taken a turn for the worse.

Fungi in spinal fluid grow slowly in the laboratory, and there had not been enough time for any to appear in cultures from the suspect cases. Though the small case count was rising, Dr. Kainer was convinced that fungal meningitis was the one diagnosis that explained their illness. She reminded laboratories of the most appropriate way to look for fungi in spinal fluid and not to discard any from the lumbar punctures on suspect cases.

On Sept. 26, the Tennessee cases led the New England Compounding Center to stop producing and shipping the steroid and to recall vials already distributed. Dr. Kainer's team received a list of clinics that had received the steroid in Tennessee. From it, health workers identified 1,009 people who were possibly exposed to contaminated steroid. Under the order of the Tennessee health commissioner, they sought out each one.
There was a sense that the first crop of patients appeared in emergency rooms for symptoms linked to conditions like urinary tract infections. That did not suggest meningitis, and there were not the stiff necks and fever typical of bacterial and viral meningitis.
The purpose of the search was to warn patients to pay attention to mild symptoms and to alert physicians to consider fungal meningitis in such cases. A hope was that starting antibiotic treatment in the earliest stages of the infection would be more effective. The effort involved nurses and extended to national park tour guides, military personnel and law enforcement officials to find patients who were scattered in remote places like Yellowstone Park and even abroad. Additional cases were detected.
Dr. William Schaffner, the head of preventive medicine at Vanderbilt, and other experts said they could not recall searches for potential victims that were so persistent and extensive.
"It was a gutsy move," Dr. Schaffner said admiringly, adding that he was uncertain he would have taken the same bold action if he were the health commissioner.
Dr. Kainer said her suspicions were confirmed on Oct. 4 when the F.D.A. announced that it had found fungal contamination in an unopened vial of steroid from the New England Compounding Center.
Dr. Schaffner credits the close relationship that Vanderbilt and the Tennessee health department have cultivated over the last 30 years, much of it linked to the training that he and other Tennessee epidemiologists received at the Centers for Disease Control and Prevention. (I was part of the same program.) Similar relationships have developed in other parts of the country, like California, Connecticut, Georgia, Minnesota and Washington State.
As a result of their actions, they determined that the first case in the outbreak apparently had occurred in July in Florida. But a perplexing aspect of the outbreak is why the fungus Aspergillus was identified in Dr. Pettit's case but a different one, Exserohilum, in an overwhelming majority of the remaining cases. "I just don't understand it," Dr. Kainer said.
The near-miss discovery of the fungal meningitis outbreak raises questions about other outbreaks that possibly were not detected. "Surely things have gone by, but I don't know how often, and as good as our surveillance system is, it is not as good as it could be," Dr. Kainer said.

http://www.eurekalert.org/pub_releases/2012-11/uoc--eym110712.php

Even yeast mothers sacrifice all for their babies

UCSF discovery shows evolution at work in the laboratory

A mother's willingness to sacrifice her own health and safety for the sake of her children is a common narrative across cultures – and by no means unique to humans alone. Female polar bears starve, dolphin mothers stop sleeping and some spider moms give themselves as lunch for their crawly babies' first meal.
Now an unexpected discovery at the University of California, San Francisco (UCSF) shows that even yeast "mothers" do it, giving all to their offspring – even at the cost of their own lives.
As described this week in the journal Science, the UCSF scientists found that the yeast Saccharomyces cerevisiae ensures the health of its budding offspring by pushing essential internal structures known as mitochondria into them.
Mitochondria are the mini powerhouses of living cells, supplying the chemical energy all yeast and higher life forms need to survive. Like all cellular life, yeast need these structures to survive. In the new paper, the UCSF team describes how yeast cells ferry just the right amount of mitochondria along a network of protein tracks and molecular motors into the young yeastlings, which bud off their mother like mini-me's.
But what surprised the researchers, led by Wallace Marshall, PhD, UCSF associate professor of biochemistry and biophysics and UCSF postdoc Susanne Rafelski, PhD, was how yeast mothers continued to give generous amounts of their mitochondria to their offspring even when it meant hastening their own death.
"The mom will pump in as many as [the bud] needs," said Marshall. "The bud gets more and more as it grows, and mom doesn't get any more."
UCSF, which includes a top-ranked medical center providing patient care and many ongoing clinical studies, also is one of the world's leading institutions pursuing fundamental research in basic biomedical fields, including molecular biology, biochemistry, physiology, biophysics and genetics – work that offers insight into the ways normal cells function and what sometimes goes wrong in diseases such as cancer, AIDS, diabetes, multiple sclerosis and Alzheimer's.

How Cells Divide

The classic picture of cell division – a process known as mitosis – is an even splitting whereby one cell gives birth to two identical copies. Scientists have always reasoned that during this classic division, the mitochondria were likewise evenly split – the same way that both sides of a pepperoni pizza cut in two would have half the toppings.

But not all cells divide evenly. Human stem cells, for instance, often divide into two cells that look and behave very differently. Some cancer cells do this as well. There is a growing sense in the biomedical field, Marshall said, that understanding how a cell moves its mitochondria around during such uneven divisions may hold some of the clues to understanding aspects of stem cell or cancer biology.

Working with yeast, the UCSF team developed sophisticated microscope and computer techniques that allowed them to track the movement of mitochondria within cells. If these structures had divided randomly, they would expect to find fewer in the bud than in the mother (since the buds are smaller than the mother).

What they found instead was that the yeast mothers gave a consistent amount of mitochondria to their offspring at each generation, and so over time they had fewer and fewer of the organelles themselves. The price they paid to ensure their offspring was healthy was steep: The yeast mothers would eventually give away too many of the mitochondria to survive and begin to die off after 10 generations. By 20 generations, most of the mothers had died.

Mutant forms of yeast, which were much more stingy in giving up their mitochondria, lived much longer.

The article, Mitochondrial Network Size Scaling in Budding Yeast" by Susanne M. Rafelski, Matheus P. Viana, Yi Zhang, Yee-Hung M. Chan, Kurt S. Thorn, Phoebe Yam, Jennifer C. Fung, Hao Li, Luciano da F. Costa, and Wallace F. Marshall appears in the November 9, 2012 issue of Science. See: http://www.sciencemag.org

In addition to UCSF, authors on this study were associated with the Universidade de São Paulo in Brazil and Peking University in Bejing, China.

This work was supported by the National Institutes of Health through grants #R01GM070808, #R01GM097017, #R01GM026259, #P50Gm081879, and #5RO1GM097213-02. Additional support was provided through the Sandler and Boyer Postdoctoral Fellowships; the Herbert Boyer Junior Faculty Endowed Chair Award, a Packard Fellowship, an NIH NRSA fellowship, and a China Scholarship Council scholarship.

http://www.eurekalert.org/pub_releases/2012-11/uoa-dsc110812.php

Dream symbols could help in psychotherapy

Dream images could provide insights into people's mental health problems and may help with their treatment, according to a psychology researcher from the University of Adelaide.

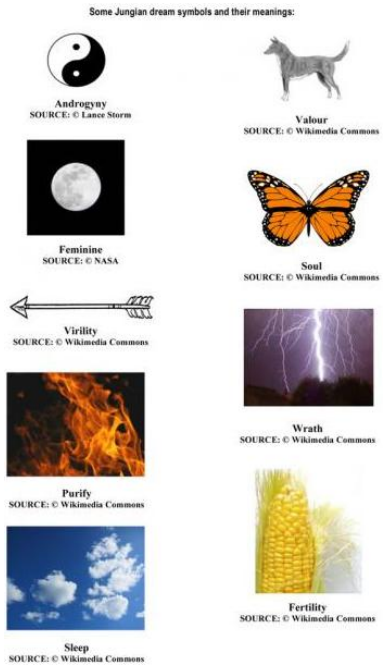
Dr Lance Storm, a Visiting Research Fellow with the University of Adelaide's School of Psychology, has been studying dream symbols (or "archetypes") and their meanings, as described by the famous psychologist and psychiatrist, Carl Jung.

In the early 1900s, Jung proposed that these archetypes were ancient images stemming from humans' collective unconscious. He believed that dream symbols carried meaning about a patient's emotional state which could improve understanding of the patient and also aid in their treatment.

In a paper about one of Dr Storm's non-clinical studies - to be published next year in the International Journal of Jungian Studies, and currently published online - he supports Jung's theories and recommends that dream analysis be explored further for potential clinical use.

"Jung was extremely interested in recurring imagery across a wide range of human civilizations, in art, religion, myth and dreams," says Dr Storm.

"He described the most common archetypal images as the Hero, in pursuit of goals; the Shadow, often classed as negative aspects of personality; the Anima, representing an element of femininity in the male; the Animus, representing masculinity in the female; the Wise Old Man; and the Great Mother.



These are some examples of Jungian dream images and their meanings. **Dr Lance Storm, University of Adelaide, from multiple sources including Wikimedia Commons.**

"There are many hundreds of other images and symbols that arise in dreams, many of which have meanings associated with them - such as the image of a beating heart (meaning 'charity'), or the ouroboros, which is a snake eating its own tail ('eternity'). There are symbols associated with fear, or virility, a sense of power, the need for salvation, and so on.

"In Jungian theory, these symbols are manifestations of the unconscious mind; they are a glimpse into the brain's 'unconscious code', which we believe can be decrypted," he says.
Dr Storm argues that Jung's theories have practical significance and could broaden the range of options available to patients undergoing treatment for mental health problems. "Our research suggests that instead of randomly interpreting dream symbols with educated guesswork, archetypal symbols and their related meanings can be objectively validated. This could prove useful in clinical practice," he says.
"We believe, for example, that dream analysis could help in the treatment of depression. This is a rapidly growing area of mental health concern, because depressive people are known to experience prolonged periods of rapid eye movement (REM) sleep, which is directly linked with emotional processing and dreaming."

http://bit.ly/RtVlBK

Vampire Skeleton Rediscovered in Britain

A new archaeological report details the long forgotten discovery of a skeleton found buried with metal spikes through shoulders, heart area and ankles

Analysis by Rossella Lorenzi

Details of one of the few "vampire" burials in Britain have emerged as a new archaeological report details the long forgotten discovery of a skeleton found buried with metal spikes through shoulders, heart area and ankles.
Dating from 550-700 A.D., the skeleton was unearthed in 1959 in the minster town of Southwell, Nottinghamshire, during excavations in preparation for a new school. The dig also turned up Roman remains.
Archaeologist Charles Daniels immediately recognized the skeletal remains as being out of the ordinary, but no further investigation was carried out at that time.

The Southwell deviant burial (left) as it was found in 1959 alongside further disarticulated human remains. **Credit: Charles Daniels. Copyright University of Nottingham Archaeology Museum.**

"Daniels did jokingly comment he had 'checked the eye teeth,' clearly associating the skeleton with the vampire being," Matthew Beresford, of Southwell Archaeology told Discovery News.
"However, the skeleton had largely been forgotten about since then," Beresford said.
The author of a detailed report on the Southwell skeleton, as well as other two books on the subject of the "vampire" being, Beresford looked at the wider context for the burial, including excavations that occurred in the past decades near the "deviant" burial.
He learned 225 skeletons were discovered in the area in 1971.
"We can only ponder as to whether any of those skeletons had a similar practice bestowed upon them," he said.
Only a handful of deviant burials have been recognized in the UK. "Dangerous dead" such as vampires were interred with particular rituals to prevent them rising from their graves and attacking the living.
"Throughout the Anglo-Saxon period the 'punishment' of being buried in water-logged ground, face down, decapitated, staked or otherwise was reserved for thieves, murderers or traitors," Beresford wrote.
The treatment was later extended to all those who did not conform to society's rules.
"These were adulterers, disrupters of the peace, the unpious or oath-breaker. Which of these the Southwell skeleton was we will never know," Beresford said.
The archaeologist believes the remains of the skeleton may still be buried on the site where they originally lay as Daniels admitted he was unable to retrieve the body completely from the ground.
"There is a final twist in the tale of the Southwell vampire. It seems he was not the last person to be buried in the town who the locals feared might return to plague the living," Beresford wrote on his website.
Historical accounts report that in 1822 one Henry Standley was found guilty of the murder of a hawker named John Dale. Arrested, Standley was found then dead in his cell.
"He had committed suicide by hanging," Beresford said.
A local newspaper report dated Feb. 15, 1822 reveals that Standley was buried near the crossroads and a stake was driven through his body, suggesting that fear for the dead rising from the grave did exist in British society in the 1820s.
"Burial at crossroads is quite common for suspected vampires, the theory being if they were to reanimate they would not know the way back to the village. And within folklore, suicides are at great risk of becoming vampires in death," Beresford said

http://www.eurekalert.org/pub_releases/2012-11/ci-n110812.php

New habitable zone super-Earth found in exosolar system

Astronomers have discovered a new super-Earth in the habitable zone, where liquid water and a stable atmosphere could reside, around the nearby star HD 40307

Washington, D.C.-. It is one of three new super-Earths found around the star that has three other low-mass planets orbiting it. HD 40307 is a dwarf star that is somewhat smaller and less luminous than the Sun that is about 42 light years away (12.88 parsecs). The previously discovered planets around it are called hot super-Earths because they orbit too close to the star to support life.

The international team, including Carnegie co-author Paul Butler, was led by Mikko Tuomi of the University of Hertfordshire and Guillem Anglada-Escudé of the University of Göttingen. The researchers used newly developed software that is able to process the signals more thoroughly and thereby reveal the presence of the three additional planets. The team reanalyzed spectra taken with the HARPS spectrograph through the European Southern Observatory public archive.

Butler explained: "With Guillem Anglada-Escudé's new velocity reduction package, we are able to extract more information from the HARPS spectra, and thus make a more precise measurement. This coupled with the innovative Bayesian orbital searching algorithm, primarily written by Mikko Tuomi, allows us to search deeper into the data and to find smaller Earth-sized planets around the nearest stars. This, of course, increases our chances of finding more in that orbital sweet spot that we call the habitable zone—the zone where it is not too cold, nor too hot for liquid water to exist." Anglada-Escudé wrote the velocity reduction package while he was a postdoctoral fellow at Carnegie.

The most interesting of the new planets is in the outermost orbit from the star, a distance that is similar to the distance between the Earth and our Sun. Its mass is at least seven times the mass of the Earth. The team said the planet is likely to be rotating on its axis while in orbit, possibly creating a day/night cycle and an Earth-like environment. "The star HD 40307 is a perfectly quiet old dwarf star, so there is no reason why such a planet could not sustain an Earth-like climate," said Anglada-Escudé. The research will be published in Astronomy & Astrophysics and posted online at arxiv.org/archive/astro-ph.

The coauthors of the paper include R. Paul Butler of the Carnegie Institution for Science, Tuomi, Anglada-Escudé, and Vogt, as well as Eugenio Rivera of UC Santa Cruz, Hugh Jones of the University of Hertfordshire, Enrico Gerlach of the Technical University of Dresden, and Ansgar Reiners of the University of Göttingen. This research was funded in part by RoPACS (Rocky Planets Around Cool Stars), a Marie Curie Initial Training Network funded by the European Commission; the German Ministry of Education and Research; the German Research Foundation (DFG); and the U.S. National Science Foundation (NSF grant AST-0307493). The researchers acknowledged the significant efforts of the HARPS-ESO team in improving the instrument and its data reduction pipelines and obtaining the observations that made this work possible.

http://www.eurekalert.org/pub_releases/2012-11/miot-mdp110812.php

Medical devices powered by the ear itself

For the first time a battery could power implantable electronic devices without impairing hearing

Written by Larry Hardesty, MIT News Office

Deep in the inner ear of mammals is a natural battery — a chamber filled with ions that produces an electrical potential to drive neural signals. In today's issue of the journal Nature Biotechnology, a team of researchers from MIT, the Massachusetts Eye and Ear Infirmary (MEEI) and the Harvard-MIT Division of Health Sciences and Technology (HST) demonstrate for the first time that this battery could power implantable electronic devices without impairing hearing.

The devices could monitor biological activity in the ears of people with hearing or balance impairments, or responses to therapies. Eventually, they might even deliver therapies themselves.

In experiments, Konstantina Stankovic, an otologic surgeon at MEEI, and HST graduate student Andrew Lysaght implanted electrodes in the biological batteries in guinea pigs' ears. Attached to the electrodes were low-power electronic devices developed by MIT's Microsystems Technology Laboratories (MTL). After the implantation, the guinea pigs responded normally to hearing tests, and the devices were able to wirelessly transmit data about the chemical conditions of the ear to an external receiver.

"In the past, people have thought that the space where the high potential is located is inaccessible for implantable devices, because potentially it's very dangerous if you encroach on it," Stankovic says. "We have known for 60 years that this battery exists and that it's really important for normal hearing, but nobody has attempted to use this battery to power useful electronics."

The ear converts a mechanical force — the vibration of the eardrum — into an electrochemical signal that can be processed by the brain; the biological battery is the source of that signal's current. Located in the part of the ear called the cochlea, the battery chamber is divided by a membrane, some of whose cells are specialized to

pump ions. An imbalance of potassium and sodium ions on opposite sides of the membrane, together with the particular arrangement of the pumps, creates an electrical voltage.
Although the voltage is the highest in the body (outside of individual cells, at least), it's still very low. Moreover, in order not to disrupt hearing, a device powered by the biological battery can harvest only a small fraction of its power. Low-power chips, however, are precisely the area of expertise of Anantha Chandrakasan's group at MTL.
The MTL researchers — Chandrakasan, who heads MIT's Department of Electrical Engineering and Computer Science; his former graduate student Patrick Mercier, who's now an assistant professor at the University of California at San Diego; and Saurav Bandyopadhyay, a graduate student in Chandrakasan's group — equipped their chip with an ultralow-power radio transmitter: After all, an implantable medical monitor wouldn't be much use if there were no way to retrieve its measurements.
But while the radio is much more efficient than those found in cellphones, it still couldn't run directly on the biological battery. So the MTL chip also includes power-conversion circuitry — like that in the boxy converters at the ends of many electronic devices' power cables — that gradually builds up charge in a capacitor. The voltage of the biological battery fluctuates, but it would take the control circuit somewhere between 40 seconds and four minutes to amass enough charge to power the radio. The frequency of the signal was thus itself an indication of the electrochemical properties of the inner ear.
To reduce its power consumption, the control circuit had to be drastically simplified, but like the radio, it still required a higher voltage than the biological battery could provide. Once the control circuit was up and running, it could drive itself; the problem was getting it up and running.
The MTL researchers solve that problem with a one-time burst of radio waves. "In the very beginning, we need to kick-start it," Chandrakasan says. "Once we do that, we can be self-sustaining. The control runs off the output."
Stankovic, who still maintains an affiliation with HST, and Lysaght implanted electrodes attached to the MTL chip on both sides of the membrane in the biological battery of each guinea pig's ear. In the experiments, the chip itself remained outside the guinea pig's body, but it's small enough to nestle in the cavity of the middle ear.
The work was funded in part by the Focus Center Research Program, the National Institute on Deafness and Other Communication Disorders, and the Bertarelli Foundation.

http://www.eurekalert.org/pub_releases/2012-11/uoc--cce110812.php

Comet collisions every 6 seconds explain 17-year-old stellar mystery

Every six seconds, for millions of years, comets have been colliding with one another near a star in the constellation Cetus called 49 CETI, which is visible to the naked eye.

Over the past three decades, astronomers have discovered hundreds of dusty disks around stars, but only two — 49 CETI is one — have been found that also have large amounts of gas orbiting them.
Young stars, about a million years old, have a disk of both dust and gas orbiting them, but the gas tends to dissipate within a few million years and almost always within about 10 million years. Yet 49 CETI, which is thought to be considerably older, is still being orbited by a tremendous quantity of gas in the form of carbon monoxide molecules, long after that gas should have dissipated.
"We now believe that 49 CETI is 40 million years old, and the mystery is how in the world can there be this much gas around an otherwise ordinary star that is this old," said Benjamin Zuckerman, a UCLA professor of physics and astronomy and co-author of the research, which was recently published in the Astrophysical Journal. "This is the oldest star we know of with so much gas."
Zuckerman and his co-author Inseok Song, a University of Georgia assistant professor of physics and astronomy, propose that the mysterious gas comes from a very massive disk-shaped region around 49 CETI that is similar to the sun's Kuiper Belt, which lies beyond the orbit of Neptune.
The total mass of the various objects that make up the Kuiper Belt, including the dwarf planet Pluto, is about one-tenth the mass of the Earth. But back when the Earth was forming, astronomers say, the Kuiper Belt likely had a mass that was approximately 40 times larger than the Earth's; most of that initial mass has been lost in the last 4.5 billion years. By contrast, the Kuiper Belt analogue that orbits around 49 CETI now has a mass of about 400 Earth masses — 4,000 times the current mass of the Kuiper Belt.
"Hundreds of trillions of comets orbit around 49 CETI and one other star whose age is about 30 million years. Imagine so many trillions of comets, each the size of the UCLA campus — approximately 1 mile in diameter — orbiting around 49 CETI and bashing into one another," Zuckerman said. "These young comets likely contain more carbon monoxide than typical comets in our solar system. When they collide, the carbon monoxide escapes as a gas. The gas seen around these two stars is the result of the incredible number of collisions among these comets.

"We calculate that comets collide around these two stars about every six seconds," he said. "I was absolutely amazed when we calculated this rapid rate. I would not have dreamt it in a million years. We think these collisions have been occurring for 10 million years or so."
Using a radio telescope in the Sierra Nevada mountains of southern Spain in 1995, Zuckerman and two colleagues discovered the gas that orbits 49 CETI, but the origin of the gas had remained unexplained for 17 years, until now.

http://www.bbc.co.uk/news/uk-wales-20238924

Majority 'back assisted suicide', says Bangor uni study

Two-thirds of people accept assisted suicide, according to international research by Bangor University.

The study of the views of over 62,000 people suggested support was around the same among people with terminal illnesses as for the general public. Researchers said the result contrasted with a recent review claiming doctors consistently opposed euthanasia. The main reason given for considering assisted death was unbearable suffering. Other factors such as loss of dignity, loneliness and being a burden were at least as significant as pain in motivating people to consider taking such action.
Researchers looked at available international literature published about assisted dying and brought together the views of ordinary people. There were no apparent differences in attitudes between countries, whether assisted dying was permitted by law or not. People wished to have control so they could choose the right time to die, suggested the study, which is published in the journal Palliative Medicine. "It remains to understand the discrepancy between the perspectives of doctors and their patients," the report concluded.
Assisted dying is legal in four European countries - Netherlands, Belgium, Switzerland and Luxembourg - and three American states - Oregon, Washington and Montana.

Celebrity campaigners

Researchers said it remained controversial elsewhere, particularly in more affluent or mainly Protestant countries. They also said headlines tended to feature professional arguments against celebrity campaigners, with ordinary people "less clearly represented".
Prof Clare Wilkinson, of the North Wales Centre for Primary Care Research, said: "Our work highlights the collective views of a huge number of people, including those from Britain. "The medical profession needs to recognise and have respect for this majority view even if we don't agree with it."
This summer, doctors at the British Medical Association's annual conference reiterated their opposition to assisted dying. Delegates debated the issue after a motion calling for the organisation to take a neutral stance was put forward. Medics voted to reject the proposal.
Prof Baroness Ilora Finlay, a cross-bench peer and professor of palliative medicine at Cardiff University, told the conference it was essential that doctors "never walk away from patients".

http://www.eurekalert.org/pub_releases/2012-11/acoa-aea110212.php

An egg a day to keep allergies away

New research finds half of children outgrow egg allergy, tolerant to baked eggs

ANAHEIM, CA. – Avoiding sweet treats like pumpkin bread and cookies this holiday season might not be necessary for children with egg allergies. New studies presented at the American College of Allergy, Asthma and Immunology (ACAAI) Annual Scientific Meeting found 56 percent of allergic children can tolerate baked hen's egg, while 55 percent outgrow their egg allergy entirely.
"More than half of egg allergic children can tolerate hen's eggs when they are baked at 350 degrees in products such as cakes and breads," said allergist Rushani Saltzman, M.D., lead study author and ACAAI member. "Dietary introduction of baked egg by an allergist can broaden a child's diet, improve quality of life and likely accelerate the development of an egg tolerance." The median dose tolerated was 2⁄5 baked hen's egg. The products tested were all baked at 350 degrees for a minimum of 30 minutes.
In a separate study also presented at the meeting, Ruchi Gupta, M.D., lead study author and pediatrician, found that out of the eight common food allergens, children most commonly outgrew egg allergy. "Food tolerance was observed in one in four children, with 55 percent outgrowing their egg allergy by age seven," said Dr. Gupta. "Developing an egg tolerance is the most common for children, followed by milk. A small proportion outgrew shellfish and tree nut allergies." If children have shown a severe reaction to eggs in the past they are less likely to outgrow the allergy, according to researchers. Severe symptoms include rapid swelling of the skin and tissue, difficulty breathing and life-threatening anaphylaxis.
"While these studies show many positive findings for children with egg allergy, parents must practice caution," said allergist Richard Weber, M.D., ACAAI president-elect. "Introducing an allergen back into a child's diet can have severe consequences, and only should be done under the care of a board-certified allergist."

Parents can find a board-certified allergist in their area at AllergyAndAsthmaRelief.org. More news and research from the annual meeting, being held Nov. 8-13, 2012 in Anaheim, Calif. can be followed via Twitter at #ACAAI.

http://www.bbc.co.uk/news/health-20253236

Patient treatment preferences 'often misdiagnosed'

Doctors are failing to really listen to patients' views on how they want to be treated, suggests a study in the British Medical Journal.

The Dartmouth College research says working out a patient's preferences is as important as an accurate medical diagnosis. Involving patients in discussions about treatment could cut the cost of healthcare around the world, they say. Doctors should follow a three-step approach to engaging patients.

The BMJ analysis, written by three healthcare experts from the Dartmouth Center for Health Care Delivery Science in New Hampshire, US, is based on a report written for the UK's King's Fund, a policy thinktank.

In it they argue that "preference misdiagnosis" - misinterpreting or ignoring the patient's wishes - is a significant problem which is damaging to both doctors and patients.

The researchers say it can lead to, what they call, "silent" misdiagnoses - when doctors choose the wrong treatments because they fail to assess their patients' preferences correctly.

These misdiagnoses are "silent" because they go largely unreported.

Priorities

While doctors are taught to concentrate on diagnosing the medical problem, the authors point to evidence which suggests doctors are not as good at setting out all the treatment options and finding out how the patient feels about them.

In one study they looked at, doctors believed that 71% of patients with breast cancer rate keeping their breast as a top priority, but the figure reported by patients was just 7%.

In another study of dementia, patients placed substantially less importance than doctors believed on the continuation of life with severely declining brain function.

Evidence also shows that patients often choose different treatments after they become better informed about the risks and benefits, say the authors. One study found that 40% fewer patients preferred surgery for benign prostate disease once they were informed about the risks of sexual dysfunction.

But ensuring patients' preferences are not misdiagnosed is not as simple as asking the patient what he or she wants, explain the authors.

They say it requires doctors to complete three steps when talking to a patient.

They should adopt a mindset of scientific detachment; use data to work out what the patient's preference is likely to be and involve the patient in shared decision-making regarding their treatment.

'Trade-offs'

Engaging the patient in discussion about treatment possibilities will help them become more informed about the options and make it less likely that their preferences will be misinterpreted or misdiagnosed.

Al Mulley, lead researcher and professor of medicine at the Geisel School of Medicine at Dartmouth, New Hampshire, said it had been estimated that the NHS could save up to £30 billion every year if people actively took ownership of their health. He also said it was a universal phenomenon. He added: "Most medical treatments involve choices and trade-offs. For example, screening programmes can bring real benefits but also serious harm, such as over-diagnosis.

"More than 100 years ago student doctors were told to 'listen to the patient, he is telling you the diagnosis'.

"Today, the rise in treatment options makes this even more critical, not only to reach a correct medical diagnosis but also to understand fully patients' preferences - and reduce the huge waste in time and money that comes from the delivery of services that patients often neither want nor need."

Anna Dixon, director of policy at the King's Fund, said the research supported the idea that patients should be helped to make decisions about their care. "Not only does it find that this results in more appropriate treatment than currently achieved but, rather counter-intuitively, it results in dramatically lower intervention rates."

Dr Vivienne Nathanson, head of science and ethics at the British Medical Association said good medicine was about doctors using their knowledge and expertise to help patients make informed choices.

"Good decisions about treatment reflect both a patient's preferences, and the relevant medical evidence. Doctors try to help patients express their preferences and are aware that these sometimes differ from those of the 'average' patient. "Exploring how the patient's preferences and values relate to the decision to be made requires a relationship of trust between patient and doctor."

http://www.eurekalert.org/pub_releases/2012-11/ehs-mil110612.php

Minimally invasive lymph node dissection in breast cancer has advantages over conventional surgery

Promising results reported in Mayo Clinic Proceedings

Rochester, MN, November 9, 2012 – Axillary lymph node dissection is done in conjunction with lumpectomy or mastectomy to determine if breast cancer has spread to the adjoining lymph nodes. The conventional surgical approach leaves a surgical scar that is unattractive and can restrict range of motion in the shoulder joint. Also, squeezing and pulling the tumor during the breast operation can stimulate tumor cell metastases. A new study in the December issue of Mayo Clinic Proceedings reports that an endoscopic technique, mastoscopic axillary lymph node dissection (MALND), can reduce these complications.

"Patients who undergo MALND experience improved operative outcomes, fewer complications, better functional conservation, and more attractive cosmetic results," says lead investigator Chengyu Luo, MD, of Fuxing Hospital, Capital Medical University, Beijing, China. "When performed by a well-trained surgeon, it is the treatment of choice."

1027 patients with operable breast cancer were randomly assigned to one of two study groups. The first group underwent a breast operation and axillary lymph node dissection by conventional surgical means (CALND). The second group first underwent MALND and then conventional breast surgery. Both groups were treated post-operatively with systemic therapy and radiation therapy. The patients were followed for 63 months.

The average blood loss in the MALND group was lower than that in the CALND group. There was no significant difference between the two groups with respect to operative time. The patients who underwent MALND had less axillary pain, numbness, paresthesias and arm swelling. The aesthetic appearance of the axilla was much better in the MALND group than in the CALND group.

No statistically significant difference in disease free survival or overall survival between the two groups was observed. However, there was a significant difference between the two groups in the distant metastasis rate in favor of the MALND group. "This is the most significant finding of the study," says Dr. Luo. "While there is not as yet any significant difference in survival, longer term follow-up (e.g., 10 years and 20 years) is still needed to make a definitive conclusion. This may suggest that the axillary operation should be done before the breast operation even in conventional surgery."

http://news.discovery.com/tech/hiv-vaccine-121108.html#mkcpgn=rssnws1

New HIV Vaccine Shows No Adverse Side Effects

The vaccine has promising results without symptoms or reactions to drug.

Content provided by George Dvorsky , iO9

Canadian researchers working to develop the world's first HIV vaccine announced on Tuesday that they have cleared a major hurdle. Initial results from a Phase I trial conducted by scientists at Western University has shown no adverse effects while significantly boosting immunity. The vaccine, which is based on a genetically modified, dead virus, can now progress to the next stage of testing. If all continues to go well, the vaccine could be commercially available in five years.

Since it first made its appearance in the early 1980s, HIV/AIDS has killed more than 28 million people worldwide, with more than 34 million people currently living with the virus infection. While there have been numerous attempts over the years to develop vaccines, nothing has worked to date. But if the early indications of this new vaccine is of any indication, that could soon change.

The vaccine, called SAV001-H, is being developed by Dr. Chil-Yong Kang and his team at Western's Schulich School of Medicine and Dentistry, with the support of Sumagen Canada. The now completed first-phase trial was a randomized, observer-blinded, placebo-controlled study involving infected men and women aged 18 to 50.

Results from the trials showed that patients experienced no adverse effects -- no local reactions from the injections, or any signs, symptoms, or reactions to potential toxicities. Given that the early results have shown safety and tolerability in humans, Sumagen and the Western researchers are now ready to embark upon the next phase of clinical trials to study the vaccine's immunity and effectiveness.

"We have proven that there is no safety concern of SAV001-H in human administration and we are now prepared to take the next steps towards Phase II and Phase III clinical trials," said Dr. Dong Joon Kim through the official release. "We are delighted to be one step closer to the first commercialized HIV vaccine."

Interestingly, the vaccine is unique in that it uses a killed whole HIV-a -- much like the killed whole virus vaccines that are used to treat polio, influenza, rabies and hepatitis A. A killed vaccine is a vaccine made from a previously virulent or infectious agent that has been inactivated or killed in some way, typically by radiation,

heat, or chemicals. In this case, the HIV-1 was genetically engineered so that it is non-pathogenic and can be produced in large quantities.
The phase 2 trial, which will begin next year, will see the vaccine tested on 600 HIV-negative volunteers at high risk for infection. This will allow the researchers to measure immune response. For phase 3, it's hoped that 6,000 HIV-negative volunteers can be recruited from different countries who are also at high risk for infection. In addition, Sumagen will be looking to collaborate with multi-national biopharmaceutical companies for globalizing clinical trials and commercialization. Sumagen Co. Ltd. is a Korean-based pharmaceutical venture company that was established to fund the development of the HIV vaccine.

http://www.bbc.co.uk/news/health-20251121

Hip replacement 'raises stroke risk' after operation

Having a total hip replacement increases the risk of a stroke in the year after the operation, according to records of patients in Denmark.

By James Gallagher Health and science reporter, BBC News

Data from more than 66,000 operations showed the odds of a stroke increased more than fourfold in the fortnight immediately after surgery. The research in the journal Stroke showed that taking drugs such as aspirin could reduce the risk. The Stroke Association said the results should be taken "very seriously".
Hip replacements are a very common operation, carried out on hundreds of thousands of people around the world each year. Researchers in the UK and the Netherlands said the probability of having a stroke in the year after surgery was 2%, compared with 0.4% if they did not have the operation. The risk peaked in the weeks after surgery before returning to normal over the course of a year. One of the researchers, Prof Cyrus Cooper from the University of Southampton, said the risk was twice as high as would be expected from general surgery.

'Traumatic'

Taking medication which reduced the risk of a blood clot, such as aspirin, appeared to lower the risk in the study. The report's authors called for more studies to investigate if patients should be given pills before going under the knife.
Prof Cooper said: "This research has demonstrated that there is a high risk of stroke to patients soon after having a total hip replacement and suggests that the use of soluble aspirin might be beneficial in reducing this risk. "Normally we would have reservations about people taking aspirin every day but our results suggest aspirin is a benefit and worthwhile to give to the patient before the surgery. "The data is of huge clinical importance."
Dr Peter Coleman, from the Stroke Association charity, said: "Hip replacement surgery is a significant operation and can be very traumatic for the body. Like with any major surgery there is always a risk of incurring further health problems. "This research suggests that hip replacement surgery could increase your risk of stroke and the results should be taken very seriously. "If you are due to undergo a hip operation, it is important that you speak to your GP or hospital consultant beforehand in order to discuss the potential risks."

http://www.scientificamerican.com/article.cfm?id=wrens-teach-eggs-to-sing

Wrens Teach Eggs to Sing

Parent wrens sing food passwords to unhatched chicks to avoid having to feed impostors

By Zoë Corbyn and Nature magazine

Fairy-wrens Baby fairy wrens won't get fed unless they sing the secret password they learned in the egg. Photo taken in the Northern Beaches of Sydney, Australia. Image: Wikimedia Commons/Nevil Lazarus
Mothers usually set about teaching their offspring the moment they're born. But the females of one Australian bird can't wait that long.
Superb fairy-wren (Malurus cyaneus) mothers sing to their unhatched eggs to teach the embryo inside a 'password' — a single unique note — which the nestlings must later incorporate into their begging calls if they want to get fed.
The trick allows fairy-wren parents to distinguish between their own offspring and those of the two cuckoo species that frequently invade their nests. The female birds also teach their mates the password.
Fairy-wrens were known to discriminate against cuckoo nestlings on the basis of their foreign begging calls, says Sonia Kleindorfer, an animal behaviorist at Flinders University in Adelaide, who led the work. But it wasn't known that wren nestlings learned the passwords before hatching.
“It has never been shown before that there is actually learning in the embryo stages,” says Kleindorfer. The finding, published today in Current Biology, has the potential to open up new lines of enquiry into prenatal learning in systems other than parasite-host relationships and in other animals — it could occur anywhere where it's a benefit, she adds.

Accidental discovery

The researchers stumbled across the embryonic learning quite by accident. They were recording inside the birds' domed nests in search of anti-predator calls when they noticed that female fairy-wrens were singing to their unhatched eggs.

When Kleindorfer and her team analyzed recordings made over the full nesting cycle, they found that the wren nestlings in a given nest all had the same begging call, which was unique to their nest. That call contained a signature element present in the call the mothers had made while incubating the eggs, and in the call she used to solicit food from the father. When the researchers broadcast a foreign nestling call at the nests, both the female and male adult birds refused to feed the chicks.

To test if the begging call was learned or genetic, Kleindorfer swapped around eggs across 22 nests. When the swapped eggs hatched, nestlings used the call taught by their foster mother, not their biological mother.

http://bit.ly/PNp76q

India's thorium-based nuclear dream inches closer

A reactor that will produce electricity from India's most convenient fuel for the first time

09 November 2012 by Hal Hodson

SINCE India began its nuclear programme in the 1950s, it has aimed to tap the ample thorium reserves that lie within its borders. Construction is finally set to begin on a reactor that will produce electricity from India's most convenient fuel for the first time. But with a checkered past on the subject, the country's promises of a new dawn for nuclear rest on shaky ground.

Last week, the Nuclear Power Corporation of India (NPCIL) put out statements to the Indian press touting the safety of its new Advanced Heavy Water Reactor (AHWR), which could break ground near one of the country's conventional reactors next year. Once operational, they claim it will fulfil the vision of India's 60-year-old blueprint for thorium-based nuclear energy production, generating 300 megawatts of power from thorium more safely than nuclear energy has ever done. NPCIL's technical director, Shiv Abhilash Bhardwaj, told the press that such reactors will be so safe they can be built right inside major cities like Mumbai.

The rhetoric is familiar: for decades, thorium has been repeatedly held up as a cheap, clean way forward for nuclear power. Compared with the uranium-based fuel cycles, thorium produces far smaller amounts of radioactive waste elements - including plutonium, which remains dangerous for tens of thousands of years.

But the reality is that there's nothing new about the AHWR, says Craig Smith, a nuclear engineer at the US Naval Postgraduate School in Monterey, California. Smith says Bhardwaj's claims that the reactor will be safe enough to build in urban areas simply do not stand up. The reactor will convert thorium to uranium-233, which then splits to produce heat and other elements with short half-lives. If an accident were to occur, this dangerous mix of chemicals could be released into the environment.

Ralph Moir, a nuclear physicist at the Lawrence Livermore Laboratory in California, suggests that India's devotion to thorium is driven more by ideology than science. India's nuclear road map was laid out by nuclear pioneer Homi Bhabha in 1954. His primary goal was not safe nuclear power but energy independence based on the sheer abundance of thorium in the country - as much as one-quarter of the world's supply.

Half a century later, however, the AHWR is the best thing India has to show for its thorium efforts - and it hasn't even been built yet. This reflects India's poor record on nuclear power projects: in 1969, the country's Atomic Energy Commission predicted that India would be producing a total of 43 gigawatts of power by the turn of the new millennium. Today, 4.8 gigawatts come from nuclear, good for just 2.3 per cent of the total output of electricity in the country.

Meanwhile, China has raced ahead. Not distracted by thorium, China built uranium reactors at a furious pace and its nuclear capacity now stands at three times India's, despite having only completed its first power plant in 1991.

In the wake of the Fukushima meltdown in Japan, world governments are waking up to the reality that nuclear power is not necessarily safe. The promise of thorium-fuelled reactors remains great. Decades of hype in India may have dampened the mood, but if the country can finally follow through on their claims, what has for so long been the "technology of the future" may at last arrive in the present.

http://phys.org/news/2012-11-greenland-evidence-earth-formation.html

Greenland rocks provide evidence of Earth formation process

Rocks from southwesr Greenland have yielded valuable information about the earliest structure of the Earth

Phys.org - Rocks dating back 3.4 billion years from south-west Greenland's Isua mountain range have yielded valuable information about the structure of the Earth during its earliest stages of development. In these rocks, which witnessed the first billion years of Earth's history, a French-Danish team led by researchers from the

'Magmas and Volcanoes' Laboratory (CNRS) have highlighted a lack of neodymium-142, an essential chemical element for the study of the Earth's formation. This deficit supports the hypothesis that between 100 and 200 million years after its formation, the Earth was made up of an ocean of molten magma, which gradually cooled. The work, which was carried out in collaboration with the Laboratoire de Géologie de Lyon (CNRS) and the University of Copenhagen, was published on 1 November 2012, in the journal Nature.
The Earth is believed to have formed 4.58 billion years ago, by accretion of material in the Solar System. The heat produced by the accretion process, as well as by the decay of radioactive elements, caused this material to melt. As a result, 100 to 200 million years after its formation, the Earth must have been made up of an ocean of molten magma, in the center of which a metallic core formed. The ocean gradually cooled. The Earth's crust then appeared, and the process of continental drift began. The crystallization of the molten magma is likely to have been accompanied by the chemical layering of the Earth: concentric layers with distinct chemical compositions became differentiated. It is the signature of these primordial inhomogeneities that the researchers found in the Isua rocks.
The scientists were interested in a key chemical element, the isotope neodymium-142, formed by the decay of a now vanished radioactive isotope called samarium-146. The abundance of neodymium-142 is almost identical in all terrestrial rocks. Only two exceptions have been discovered to date, in Canada and Greenland, in certain rocks dating back 3.7 billion years. The composition of these rocks shows evidence of the primordial inhomogeneities that formed as the magma ocean crystallized.
In 2003, for the first time, two groups of French researchers observed an excess of neodymium-142 in certain rocks in the same region. If such excess can be found in some layers of the primordial Earth, it means that other layers must be depleted in this isotope. However, until today's findings by the French-Danish team, such neodymium-142 deficits remained hypothetical for nine years. Using a sophisticated method, thermal ionization mass spectrometry, the researchers carried out a very detailed analysis of the concentration of neodymium-142 in Isua rock samples. They discovered a neodymium-142 deficit of 10.6 parts per million, which lends weight to the 'magma ocean' theory.
These findings should help to improve models of the internal dynamics of the Earth during its early stages of development. By discovering a neodymium-142 deficit in relatively young rocks, formed around a billion years after the crystallization of the magma ocean, the researchers have shown that the primordial inhomogeneities persisted longer than predicted before being eliminated by convective motion in the Earth's mantle. In order to obtain more comprehensive data, the scientists now intend to study the composition of other rocks of similar age outcropping for example in Canada, South Africa and China.
More information: Rizo, H. et al., The elusive Hadean enriched reservoir revealed by 142Nd deficits in Isua Archean rocks. Nature, November 1, 2012.

http://www.eurekalert.org/pub_releases/2012-11/osu-lfb110912.php

Link found between child prodigies and autism

A new study of eight child prodigies suggests a possible link between these children's special skills and autism.

COLUMBUS, Ohio - Of the eight prodigies studied, three had a diagnosis of autism spectrum disorders. As a group, the prodigies also tended to have slightly elevated scores on a test of autistic traits, when compared to a control group. In addition, half of the prodigies had a family member or a first- or second-degree relative with an autism diagnosis. The fact that half of the families and three of the prodigies themselves were affected by autism is surprising because autism occurs in only one of 120 individuals, said Joanne Ruthsatz, lead author of the study and assistant professor of psychology at Ohio State University's Mansfield campus.
"The link between child prodigies and autism is strong in our study," Ruthsatz said. "Our findings suggest child prodigies have traits in common with autistic children, but something is preventing them from displaying the deficits we associate with the disorder."
The study also found that while child prodigies had elevated general intelligence scores, where they really excelled was in working memory - all of them scored above the 99th percentile on this trait.
Ruthsatz conducted the study with Jourdan Urbach of Yale University. Their results were published in a recent issue of the journal Intelligence. For the study, the researchers identified eight child prodigies through the internet and television specials and by referral. The group included one art prodigy, one math prodigy, four musical prodigies and two who switched domains (one from music to gourmet cooking, and one from music to art). The study included six males and two females.
The researchers met with each prodigy individually over the course of two or three days. During that time, the prodigies completed the Stanford-Binet intelligence test, which included sub-tests on fluid reasoning, knowledge, quantitative reasoning, visual spatial abilities and working memory.

In addition, the researchers administered the Autism-Spectrum Quotient assessment, which scores the level of autistic traits. The prodigies' scores on the test were compared to a control group of 174 adults who were contacted randomly by mail.
Ruthsatz said the most striking data was that which identified autistic traits among the prodigies.
The prodigies showed a general elevation in autistic traits compared to the control group, but this elevation was on average even smaller than that seen in high-functioning autistic people diagnosed with Asperger's syndrome. Autism is a developmental disability characterized by problems with communicating and socializing and a strong resistance to change. People with Asperger's are more likely than those with autism to have normal intelligence, but tend to have difficulties with social interaction.
The prodigies did score higher than the control group and the Asperger's group on one subsection of the autism assessment: attention to detail. "These prodigies had an absolutely amazing memory for detail," she said. "They don't miss anything, which certainly helps them achieve the successes they have."
Ruthsatz said it was not the three prodigies who were diagnosed with autism who were driving this particular finding. In fact, the three autistic prodigies scored an average of 8 on attention to detail, compared to 8.5 for the entire group of prodigies.
On the intelligence test, the prodigies scored in the gifted range, but were not uniformly exceptional. While five of the eight prodigies scored in the 90th percentile or above on the IQ test, one scored at the 70th percentile and another at the 79th percentile. But just as they did in the autism assessment, the prodigies stood out in one of the sub-tests of the intelligence test. In this case, the prodigies showed an exceptional working memory, with all of them scoring above the 99th percentile. Working memory is the system in the brain that allows people to hold multiple pieces of information in mind for a short time in order to complete a task.
The findings paint a picture of what it takes to create a prodigy, Ruthsatz said. "Overall, what we found is that prodigies have an elevated general intelligence and exceptional working memory, along with an elevated autism score, with exceptional attention to detail," Ruthsatz said.
These results suggest that prodigies share some striking similarities with autistic savants - people who have the developmental disabilities associated with autism combined with an extraordinary talent or knowledge that is well beyond average. "But while autistic savants display many of the deficits commonly associated with autism, the child prodigies do not," Ruthsatz said. "The question is why."
The answer may be some genetic mutation that allows prodigies to have the extreme talent found in savants, but without the deficits seen in autism. But the answer will require more study, Ruthsatz said. "Our findings suggest that prodigies may have some moderated form of autism that actually enables their extraordinary talent."

http://www.eurekalert.org/pub_releases/2012-11/wsu-wss110912.php

Weber State Scientists discover possible building blocks of ancient genetic systems

Scientists believe that prior to the advent of DNA as the earth's primary genetic material, early forms of life used RNA to encode genetic instructions.

What sort of genetic molecules did life rely on before RNA?
The answer may be AEG, a small molecule when linked into chains form a hypothetical backbone for Peptide Nucleic Acids, which have been hypothesized as the first genetic molecules. Synthetic AEG has been studied by the pharmaceutical industry as a possible genesilencer to stop or slow certain genetic diseases. The only problem with the theory is that up to now, AEG has been unknown from nature.
A team of scientists from the USA and Sweden announced that they have discovered AEG within cyanobacteria which are believed to be some of the most primitive organisms on earth. Cyanobacteria sometimes appear as mats or scums on the surface of reservoirs and lakes during hot summer months. Their tolerance for extreme habitats is remarkable, ranging from the hot springs of Yellowstone to the tundra of the Arctic.
"Our discovery of AEG in cyanobacteria was unexpected," explains Dr. Paul Alan Cox, coauthor on the paper that appeared today in the journal PLOS ONE. The American team, is based at the Institute for Ethnomedicine in Jackson Hole, and serve as adjunct faculty at Weber State University in Ogden, Utah.
"While we were writing our manuscript," Cox says, "we learned that our colleagues at the Stockholm University Department of Analytical Chemistry had made a similar discovery, so we asked them to join us on the paper."
To determine how widespread AEG production is among cyanobacteria, the scientists analyzed pristine cyanobacterial cultures from the Pasteur Culture Collection of Paris, France. They also collected samples of cyanobacteria from Guam, Japan, Qatar, as well as in the Gobi desert of Mongolia, the latter sample being collected by famed Wyoming naturalist Derek Craighead. All were found to produce AEG.

Professor Leopold Ilag and his student Liying Jiang at Stockholm University's Department of Analytical Chemistry analyzed the same samples and came up with identical results: cyanobacteria produce AEG. While the analysis is certain, its significance for studies of the earliest forms of life on earth remains unclear. Does the production of AEG by cyanobacteria represent an echo of the earliest life on earth?
"We just don't have enough data yet to draw that sort of conclusion," reports Cox. "However the pharmaceutical industry has been exploring synthetic AEG polymers for potential use in gene silencing, so I suspect we have much more to learn." *http://www.plosone.org/article/info:doi/10.1371/journal.pone.0049043*

http://bit.ly/SNGKA9

Hints of More Dangerous West Nile Virus: DNews Nugget

The virus may have mutated into a more dangerous form that is more likely to cause brain damage.

Analysis by Amanda Onion

Two doctors on the front lines of treating patients with the West Nile virus in Mississippi and Michigan, tell the Washington Post that they're seeing signs that the virus may have mutated into a more dangerous form that is more likely to cause brain damage.
The doctors report they have had cases where the virus damaged the speech, language and thinking centers of the brain -- symptoms that had never been detected before for the disease.
The Centers for Disease Control says it's too early to know for sure if there is, in fact, a new, nastier version of the virus out there. CDC doctors say it could just be that there are simply more reported cases this past year and so there are a wider variety of symptoms.
But Elizabeth Angus of of Detroit's Henry Ford Hospital told the Washington Post, "I've been struck this year that I'm seeing more patients where the brain dysfunction has been very much worse."
Angus also said that patients with severe symptoms are no longer limited to the elderly and those with compromised immune symptoms. This summer she treated severe cases of the disease in a woman in her 20s and a man in his 40s. Dr. Art Leis in Jackson, Miss. told the Washington Post that four of his patients had lost their ability to talk and write, another was paralyzed on one side. "It is clearly much more neuroinvasive, neurovirulent," he said. *via Washington Post*

http://www.sciencedaily.com/releases/2012/11/121109132313.htm

Precision-Guided Needle Used to Glue Shut Dangerous and Disfiguring Blood Vessel Growth

Specialists and surgeons have successfully used precision, image-guided technology to glue shut a tangle of abnormal blood vessel growth

ScienceDaily - Using a technique performed at Johns Hopkins but rarely elsewhere, imaging specialists and surgeons have successfully used precision, image-guided technology to glue shut a tangle of abnormal blood vessel growths in a 43-year-old woman's upper lip, face and nose. Surgery had earlier been ruled out because traditional approaches were considered too risky.
Susan Adams, an accountant from Owings, Md., says her arteriovenous malformation (AVM) had caused a decade of spontaneous nose and lip bleeds that were difficult to control, and that more than a half dozen previous operations had failed to stop the bleeding or facial disfigurement.
Adams' condition is rare and notoriously difficult to treat. Her AVM had grown -for no known reason -- between her upper lip and base of her nose. As it grew, her upper lip and skin above it had bulged out, causing the lower-left side of her face to droop. If left untreated, the condition can lead to life-threatening blood loss from a burst vessel.
For her May 14 procedure, which took about two hours at The Johns Hopkins Hospital, interventional neuroradiologist Monica Pearl, M.D., used an ultrathin needle, precisely guided from the outside in by real-time ultrasound scanning and angiography, to puncture Adams' facial skin and several of the outermost and largest tangled blood vessels. Once the needle was inside the abnormal blood vessels, which are no more than 1 to 2 millimeters wide, Pearl injected a glue-like substance to block each vessel and cut off the blood supply to any smaller, abnormal branching blood vessels. Pearl says this effectively destroyed the blood vessels making up the AVM.
Pearl was able to select which blood vessels to block using a contrasting dye injected into the tangle immediately prior to the glue-sealing embolization treatment. Using digital subtraction angiography (DSA) -- in which computer software removes the images of bones and other organs, showing only the blood vessels -- Pearl was able to track reduced blood flow through the AVM after every individual embolization. After three major blood vessels were sealed, blood flow through the tangle became nearly invisible on the DSA images.

Pearl cautioned that the procedure she and her team used is riskier than traditional AVM therapies. Typically, says Pearl, an assistant professor at the Johns Hopkins University School of Medicine who sees an AVM patient about once a week, interventional neuroradiologists and surgeons use the glue sealant to destroy -- from the inside -- the larger, misshapen arteries, using catheters through major blood vessels elsewhere in the body. This "inside-in" approach usually lowers the risk of any life-threatening bleeding from burst arteries. However, scarring and postsurgical infections from Adams' earlier procedures led Pearl and plastic and reconstructive surgeon Amir Dorafshar, M.D., to decide in favor of an "outside-in" approach. Although, other surgeons had ruled Adams situation too risky for further surgery, Pearl and Dorafshar thought success was still possible if Adams AVM could be sealed.

Once the tangle was glued shut, Dorafshar threaded a protective line of sutures around Adam's facial outgrowth, as protection against any sudden blood loss during Adams' reconstructive surgery, performed immediately after embolization. In that operation, lasting almost four hours, he cut out the destroyed AVM tangle and put Adams' upper lip back together, repairing the mucosa, muscle and skin, and re-aligning her nose.

"Our success with this alternative outside-in approach shows our ability to look at medical problems from a different perspective and the potential capabilities for treating what was once considered untreatable," says Pearl. "People with complex vascular malformations require individualized treatment plans that rely on close collaborations across physician specialties and disciplines."

According to Pearl and Dorafshar, Adams will need three months to fully recover and will require at least one more operation to repair facial scarring.

http://www.japantimes.co.jp/text/nn20121111a3.html

Geoelectric changes may help 'predict' quakes: researchers

Correlation found between the occurrence of earthquakes in the Izu Island chain and subtle changes in subterranean geoelectricity

Researchers claim to have found a correlation between the occurrence of earthquakes in the Izu Island chain and subtle changes in subterranean geoelectricity, a finding that one day might help develop techniques for predicting temblors.

The team, consisting of researchers from institutions including Tokai University and Tokyo Gakugei University, analyzed the relation between small changes in geoelectricity around Kozu Island, located 170 km southwest of Tokyo, and quakes in the vicinity with a magnitude of at least 3.0, based on data gathered between May 1997 and June 2000.

The geoelectric data were collected during this period through about 20 electrodes buried at intervals of between 100 and as much as 3,000 meters around Kozu. The team studied temblors that struck within 20 km of the island, according to a study published online by a prestigious U.S. science journal.

The researchers observed 19 anomalous changes in the strength and movement of geoelectric currents, 11 of which were proceeded by 3.0-magnitude or stronger quakes within 30 days — a 58 percent rate of occurrence, they reported in the Proceedings of the National Academy of Sciences of the United States of America.

"This rate of probability is statistically significant," said Toshiyasu Nagao, a Tokai University professor who coauthored the study. "There is debate over the existence of precursors to earthquakes, but (this study) indicates that some may exist."

The researchers said they excluded geoelectric anomalies caused by factors such as lightning strikes and the sun when determining this rate of occurrence, and reported that a total of 23 temblors with a minimum magnitude of 3.0 struck during the period they examined. They selected Kozu because of its remoteness and distance from any urban environments, which generate a variety of noises that can effect geoelectricity levels.

Their technique is similar to the so-called VAN method, which was developed in Greece to predict earthquakes based on seismic electric signals. However, scientists have mixed views on the VAN method's effectiveness and purported 60 percent success rate for forecasting temblors.

http://www.eurekalert.org/pub_releases/2012-11/haog-3io110812.php

36 in one fell swoop -- researchers observe 'impossible' ionization

World's most powerful X-ray laser kicks record number of electrons out of an atom

Using the world's most powerful X-ray laser in California, an international research team discovered a surprising behaviour of atoms: with a single X-ray flash, the group led by Daniel Rolles from the Center for Free-Electron Laser Science (CFEL) in Hamburg (Germany) was able to kick a record number of 36 electrons at once out of a xenon atom. According to theoretical calculations, these are significantly more than should be possible at this energy of the X-ray radiation. The team present their unexpected observations in the journal "Nature Photonics". CFEL is a collaboration of DESY, the Max Planck Society and the University of Hamburg.

When an atom loses electrons, it acquires a positive electric charge – it becomes ionized. This ionization is stronger the more electrons are torn from the atom. The researchers led by Rolles, who is working in the Max Planck Advanced Study Group at CFEL, had fired intense X-ray laser flashes from the Linac Coherent Light Source (LCLS) at the US National Accelerator Laboratory SLAC in California at atoms of the noble gas xenon. With 1.5 kiloelectronvolts (1.5 keV), the particles of light (photons) of the X-ray radiation had around a thousand times more energy than visible light. When such a high-energy photon hits an electron in the xenon atomic shell, its energy is transferred to the electron. Through this collision, the electron can be ejected from the atomic shell – depending on how strongly it is bound.

According to calculations, up to 26 of the 54 electrons of the noble gas could be kicked out at the energy employed, the remaining are too strongly bound. In fact, however, the researchers found that up to 36 electrons flew from the atoms. "To our knowledge, this is the highest ionization that has ever been achieved in an atom using a single electromagnetic pulse," says Rolles, who will lead a Helmholtz Young Investigators group at DESY in the future. "Our observation shows that the existing theoretical approaches have to be modified."

What causes the "impossible" ionization is a so-called resonance: in the energy range used, xenon electrons can absorb a lot of X-ray radiation. Some are thus directly ejected from the atom, while others go into an excited, i.e. more energetic, state, but are still bound to the atom. When one of the excited electrons returns to its initial state, in turn energy is released, which can give another excited electron the necessary extra nudge to kick it out of the atom. In rare cases, the already excited electron is hit by a second photon from the X-ray flash, and so ejected from the atomic shell.

"The LCLS experiment produced an unexpected and unprecedented charge state by ejecting dozens of electrons from an atom," says graduate student and co-author Benedikt Rudek from the Max Planck Advanced Study Group and the Max Planck institute for nuclear physics in Heidelberg, who analysed the data. "The absorbed energy per atom was more than twice as high as expected." This resonance effect is particularly strong for xenon at an energy of 1.5 keV. Consequently, even at a higher energy of 2 keV, the researchers observed only less strongly ionized atoms. Based on the measurements, the CFEL researchers refined a computational model that allows them to calculate such resonances in heavy atoms. In subsequent experiments, scientists used the LCLS to examine, among others, krypton and molecules that contain heavy atoms, as co-author Artem Rudenko from Kansas State University says, who headed one of these follow-up experiments.

The observations also have practical significance for research: "Our results give a recipe for maximizing the loss of electrons in a sample," says Rolles. This can be desirable or undesirable. "For instance, researchers can use our results if they're interested in creating a very highly charged plasma." When investigating biological samples, however, most researchers should avoid the resonance regions of such heavy atoms. "Most biological samples have some heavy atoms embedded," says Rolles. In the resonance region, such samples can be damaged very quickly in these places, which may affect the image quality.

For their precision measurements the team used a special experimental station that was built by the Max Planck Advanced Study Group (ASG) at CFEL together with the Max Planck institutes for nuclear physics, for medical research and semiconductor laboratory. The CFEL-ASG Multi-Purpose chamber (CAMP) was shipped to SLAC in 40 crates weighing a total of 11 tons and was installed at the LCLS for three years. It was used in more than 20 experiments.

Along with researchers from the Center for Free-Electron Laser Science, several Max Planck institutes, DESY and the US National Accelerator Laboratory SLAC, the study involved scientists from about a dozen institutions in Germany, France, Japan and the USA.

Ultra-efficient ionization of heavy atoms by intense X-ray free-electron laser pulses; Daniel Rolles et al.; Nature Photonics, 2012 (advance online publication); DOI: 10.1038/NPHOTON.2012.261

http://www.eurekalert.org/pub_releases/2012-11/uab-nfo110912.php

New form of brain plasticity: Study shows how social isolation disrupts myelin production

Research may prompt new investigations into white matter's role in psychiatric disorders as well as connections between mood and myelin diseases, like MS

BUFFALO, N.Y. -- Animals that are socially isolated for prolonged periods make less myelin in the region of the brain responsible for complex emotional and cognitive behavior, researchers at the University at Buffalo and Mt. Sinai School of Medicine report in Nature Neuroscience online.

The research sheds new light on brain plasticity, the brain's ability to adapt to environmental changes. It reveals that neurons aren't the only brain structures that undergo changes in response to an individual's environment and experience, according to one of the paper's lead authors, Karen Dietz, PhD, research scientist in the Department of Pharmacology and Toxicology in the UB School of Medicine and Biomedical Sciences.

Dietz did the work while a postdoctoral researcher at Mt. Sinai School of Medicine; Jia Liu, PhD, a Mt. Sinai postdoctoral researcher, is the other lead author.
The paper notes that changes in the brain's white matter, or myelin, have been seen before in psychiatric disorders, and demyelinating disorders have also had an association with depression. Recently, myelin changes were also seen in very young animals or adolescents responding to environmental changes.
"This research reveals for the first time a role for myelin in adult psychiatric disorders," Dietz says. "It demonstrates that plasticity in the brain is not restricted to neurons, but actively occurs in glial cells, such as the oligodendrocytes, which produce myelin." Myelin is the crucial fatty material that wraps the axons of neurons and allows them to signal effectively. Normal nerve function is lost in demyelinating disorders, such as MS and the rare, fatal, childhood disease, Krabbe's disease. T
his paper reveals that the stress of social isolation disrupts the sequence in which the myelin-making cells, the oligodendrocytes, are formed. In the experiment, adult mice, normally social animals, were isolated for eight weeks to induce a depressive-like state. They were then introduced to a "novel" mouse, one they hadn't seen before; while mice are normally highly motivated to be social, those who had been socially isolated did not show any interest in interacting with the new mouse, a model of social avoidance and withdrawal.
Brain tissue analysis of the socially isolated animals revealed significantly lower than normal levels of gene transcription for oligodendrocyte cells in the prefrontal cortex, a brain region responsible for emotional and cognitive behavior. "This research provides the first explanation of the mechanism behind how this brain plasticity occurs," says Dietz, "showing how this change in the level of social interaction of the adult animal resulted in changes in oligodendrocytes."
The key change was that cellular nuclei in the prefrontal cortex contained less heterochromatin, a tightly packed form of DNA material, which is unavailable for gene expression.
"This process of DNA compaction is what signifies that the oligodendrocytes have matured, allowing them to produce normal amounts of myelin," says Dietz. "We have observed in socially isolated animals that there isn't as much compaction, and the oligodendrocytes look more immature. As adults age, normally, you would see more compaction, but when social isolation interferes, there's less compaction and therefore, less myelin being made." She adds, however, that the research also showed that myelin production went back to normal after a period of social integration, suggesting that environmental intervention was sufficient to reverse the negative consequences of adult social isolation.
The new paper, together with a report published earlier this year by another group showing myelin changes triggered by social isolation early in life will broaden investigations into brain plasticity, says David Dietz, PhD, one of the paper's co-authors, an assistant professor of pharmacology and toxicology at UB.
In addition, adds Karen Dietz, the work has implications for future questions regarding MS and other myelin disorders. "This research suggests that maybe recovery from an MS episode might be enhanced by social interaction," she says. "This opens another avenue of investigation of how mood and myelin disorders may interact with one another." *Major funding for the research came from the National Institutes of Health.*

http://www.eurekalert.org/pub_releases/2012-11/ssoe-tps110812.php

Touch-sensitive plastic skin heals itself

Chemists and engineers have created the first synthetic material that is both sensitive to touch and capable of healing itself quickly and repeatedly at room temperature.

Written by Kelly Servick

Nobody knows the remarkable properties of human skin like the researchers struggling to emulate it. Not only is our skin sensitive, sending the brain precise information about pressure and temperature, but it also heals efficiently to preserve a protective barrier against the world. Combining these two features in a single synthetic material presented an exciting challenge for Stanford Chemical Engineering Professor Zhenan Bao and her team.
Now, they have succeeded in making the first material that can both sense subtle pressure and heal itself when torn or cut.
Their findings will be published on November 11 in the journal Nature Nanotechnology.
In the last decade, there have been major advances in synthetic skin, said Bao, the study's principal investigator, but even the most effective self-healing materials had major drawbacks.
Some had to be exposed to high temperatures, making them impractical for day-to-day use. Others could heal at room temperature, but repairing a cut changed their mechanical or chemical structure, so they could only heal themselves once.
Most importantly, no self-healing material was a good bulk conductor of electricity, a crucial property.

"To interface this kind of material with the digital world, ideally you want them to be conductive," said Benjamin Chee-Keong Tee, first author of the paper.

A NEW RECIPE

The researchers succeeded by combining two ingredients to get what Bao calls "the best of both worlds" – the self-healing ability of a plastic polymer and the conductivity of a metal.

They started with a plastic consisting of long chains of molecules joined by hydrogen bonds – the relatively weak attractions between the positively charged region of one atom and the negatively charged region of the next.

"These dynamic bonds allow the material to self-heal," said Chao Wang, a co-first author of the research. The molecules easily break apart, but then when they reconnect, the bonds reorganize themselves and restore the structure of the material after it gets damaged, he said. The result is a bendable material, which even at room temperature feels a bit like saltwater taffy left in the fridge.

To this resilient polymer, the researchers added tiny particles of nickel, which increased its mechanical strength. The nanoscale surfaces of the nickel particles are rough, which proved important in making the material conductive.

Tee compared these surface features to "mini-machetes," with each jutting edge concentrating an electrical field and making it easier for current to flow from one particle to the next.

The result was a polymer with uncommon characteristics. "Most plastics are good insulators, but this is an excellent conductor," Bao said.

BOUNCING BACK

The next step was to see how well the material could restore both its mechanical strength and its electrical conductivity after damage.

The researchers took a thin strip of the material and cut it in half with a scalpel. After gently pressing the pieces together for a few seconds, they found the material gained back 75 percent of its original strength and electrical conductivity. The material was restored close to 100 percent in about 30 minutes. "Even human skin takes days to heal. So I think this is quite cool," said Tee.

What's more, the same sample could be cut repeatedly in the same place. After 50 cuts and repairs, a sample withstood bending and stretching just like the original.

The composite nature of the material created a new engineering challenge for the team. Bao and her co-authors found that although nickel was key to making the material strong and conductive, it also got in the way of the healing process, preventing the hydrogen bonds from reconnecting as well as they should.

For future generations of the material, Bao said the team might adjust the size and shape of the nanoparticles, or even the chemical properties of the polymer, to get around this trade-off.

Nonetheless, Wang said the extent of these self-healing properties was truly surprising: "Before our work, it was very hard to imagine that this kind of flexible, conductive material could also be self-healing."

SENSITIVE TO THE TOUCH

The team also explored how to use the material as a sensor. For the electrons that make up an electrical current, trying to pass through this material is like trying to cross a stream by hopping from stone to stone. The stones in this analogy are the nickel particles, and the distance separating them determines how much energy an electron will need to free itself from one stone and move to another.

Twisting or putting pressure on the synthetic skin changes the distance between the nickel particles and, therefore, the ease with which electrons can move. These subtle changes in electrical resistance can be translated into information about pressure and tension on the skin.

Tee says that the material is sensitive enough to detect the pressure of a handshake. It might, therefore, be ideal for use in prosthetics, Bao added. The material is sensitive not only to downward pressure but also to flexion, so a prosthetic limb might someday be able to register the degree of bend in a joint.

Tee pointed out other commercial possibilities. Electrical devices and wires coated in this material could repair themselves and get electricity flowing again without costly and difficult maintenance, particularly in hard-to-reach places, such as inside building walls or vehicles.

Next up, Bao said the team's goal is to make the material stretchy and transparent, so that it might be suitable for wrapping and overlaying electronic devices or display screens.

Ranulfo Allen, a graduate chemical engineering student, also contributed to this research.

The research was supported by the Air Force Office of Scientific Research (AFOSR).

http://www.sciencedaily.com/releases/2012/11/121111152944.htm

Newborn Neurons -- Even in the Adult Aging Brain -- Are Critical for Memory

Newly generated, or newborn neurons in the adult hippocampus are critical for memory retrieval

ScienceDaily - Newly generated, or newborn neurons in the adult hippocampus are critical for memory retrieval, according to a study led by Stony Brook University researchers to be published in the November 11 advanced online edition of Nature Neuroscience. The functional role of newborn neurons in the brain is controversial, but in "Optical controlling reveals time-dependent roles for adult-born dentate granule cells," the researchers detail that by 'silencing' newborn neurons, memory retrieval was impaired. The findings support the idea that the generation of new neurons in the brain may be crucial to normal learning and memory processes.

Previous research by the study's lead investigator Shaoyu Ge, PhD, Assistant Professor in the Department of Neurobiology & Behavior at Stony Brook University, and others have demonstrated that newborn neurons form connections with existing neurons in the adult brain. To help determine the role of newborn neurons, Dr. Ge and colleagues devised a new optogenetic technique to control newborn neurons and test their function in the hippocampus, one of the regions of the brain that generates new neurons, even in the adult aging brain.

"Significant controversy has surrounded the functional role of newborn neurons in the adult brain," said Dr. Ge. "We believe that our study results provide strong support to the idea that new neurons are important for contextual fear memory and spatial navigation memory, two essential aspects of memory and learning that are modified by experience.

"Our findings could also shed light on the diagnosis and treatment of conditions common to the adult aging brain, such as dementia and Alzheimer's disease," he said.

Dr. Ge explained that their findings may help specifically to advance research on cell-replacement therapies being investigated for neurological diseases of the brain affecting memory.

In the study, Dr. Ge and colleagues used a retroviral tool to deliver optogenes: genes that are engineered to express proteins that form channels responsive to light stimulation. Using their created opto-retrovirus, the research team labeled a cohort of newborn neurons that they could control with light illumination. By doing this, the team conducted an in-depth exploration of the circuit and behavioral functions of newborn neurons in the adult mouse brain.

The researchers first determined when the neurons were "ready" in the hippocampus, which is an important addition to their findings published earlier this year in Nature. Then they 'silenced' the activity of neurons of different ages. They found that by silencing four-week-old neurons, an age known to be more responsive to change than existing neurons, but not older or younger neurons, memory retrieval was impaired in tasks known to depend on the functions of the hippocampus.

Regarding the newborn neuron controlling method, Dr. Ge and colleagues said that the novel tool and approach used in the study can be applied to other circuit and behavioral studies to access the functional contributions of newborn neurons in the adult brain.

Co-authors of the study include: Yan Gu, Jia Wang, and Stephen Janoschka of the Department of Neurobiology and Behavior at Stony Brook University School of Medicine; and Maithe Arruda-Carvalho, Sheena Josselyn, and Paul Frankland of the University of Toronto in Canada.

Yan Gu, Maithe Arruda-Carvalho, Jia Wang, Stephen R Janoschka, Sheena A Josselyn, Paul W Frankland, Shaoyu Ge. Optical controlling reveals time-dependent roles for adult-born dentate granule cells. Nature Neuroscience, 2012; DOI: 10.1038/nn.3260