

## **Easter Island drug raises cognition throughout life span**

### ***Rapamycin made young mice learn better and negated decline in old mice***

SAN ANTONIO, Texas - Cognitive skills such as learning and memory diminish with age in everyone, and the drop-off is steepest in Alzheimer's disease.

Texas scientists seeking a way to prevent this decline reported exciting results this week with a drug that has Polynesian roots.

The researchers, appointed in the School of Medicine at The University of Texas Health Science Center San Antonio, added rapamycin to the diet of healthy mice throughout the rodents' life span.

Rapamycin, a bacterial product first isolated from soil on Easter Island, enhanced learning and memory in young mice and improved these faculties in old mice, the study showed.

"We made the young ones learn, and remember what they learned, better than what is normal," said Veronica Galvan, Ph.D., assistant professor of physiology at the Barshop Institute for Longevity and Aging Studies, part of the UT Health Science Center.

"Among the older mice, the ones fed with a diet including rapamycin actually showed an improvement, negating the normal decline that you see in these functions with age."

The drug also lowered anxiety and depressive-like behavior in the mice, Dr. Galvan said. Anxiety and depression are factors that impair human cognitive performance.

Lead author Jonathan Halloran conducted scientifically reliable tests to accurately measure these cognitive components in the rodents.

#### **Venturing into the open**

Mice are burrowers that prefer tunnels with walls. To observe behavior, Halloran used an elevated maze of tunnels that led to a catwalk. "All of a sudden the mice are in open space," Halloran said. "It's pretty far from the floor for their size, sort of like if a person is hiking and suddenly the trail gets steep. It's pretty far down and not so comfortable."

Mice with less anxiety were more curious to explore the catwalk. "We observed that the mice fed with a diet containing rapamycin spent significantly more time out in the open arms of the catwalk than the animals fed with a regular diet," Halloran said.

The second test measured depressive-like behavior in the rodents. Mice do not like to be held by their tails, which is the way they are moved from cage to cage. Inevitably they struggle to find a way out. "So we can measure how much and how often they struggle as a measure of the motivation they have to get out of an uncomfortable situation," Dr. Galvan said.

#### **Rapamycin acts like an antidepressant**

Some mice barely struggle to get free, but if an antidepressant is administered they struggle a lot more. This behavior is very sensitive to the action of antidepressants and is a reliable measure of whether a drug is acting like an antidepressant, Dr. Galvan said.

"We found rapamycin acts like an antidepressant - it increases the time the mice are trying to get out of the situation," she said. "They don't give up; they struggle more."

The reductions of anxiety and depressive-like behavior in rapamycin-treated mice held true for all ages tested, from 4 months of age (college age in human years) to 12 months old (the equivalent of middle age) to 25 months old (advanced age).

#### **Feel-good chemicals elevated**

The researchers measured levels of three "happy, feel-good" neurotransmitters: serotonin, dopamine and norepinephrine. All were significantly augmented in the midbrains of mice treated with rapamycin.

"This is super-interesting, something we are going to pursue in the lab," Dr. Galvan said.

Dr. Galvan and her team published research in 2010 showing that rapamycin rescues learning and memory in mice with Alzheimer's-like deficits.

The elevation of the three neurotransmitters, which are chemical messengers in the brain, may explain how rapamycin accomplished this, Dr. Galvan said.

Rapamycin is an antifungal agent administered to transplant patients to prevent organ rejection. The drug is named for Rapa Nui, the Polynesian title for Easter Island. This island, 2,000 miles from any population centers, is the famed site of nearly 900 mysterious monolithic statues.

*This study, funded by the National Institutes of Health, the Alzheimer's Association and the Ellison Medical Foundation, became available online June 28 as a manuscript in press in the journal Neuroscience.*

<http://www.sciencedirect.com/science/article/pii/S0306452212006720?v=s5>

<http://bit.ly/N8CY3r>

**Pharma giant failed to report 80,000 drug files**  
***80,000 reports of patient reactions to drugs were not passed on to regulatory authorities by Roche and Genentech.***

**18:00 29 June 2012 by Andy Coghlan**

An investigation is under way after the discovery that 80,000 reports of patient reactions to drugs were not passed on to regulatory authorities by the Swiss-based pharmaceutical giant Roche and its US affiliate, Genentech.

The focus of the probe, by the European Medicines Agency, is to find out whether patient safety has been compromised by the unreported information, which includes 15,000 reports of patients who ultimately died of their illnesses – although there is no evidence that their deaths were a result of the drugs they took.

"We need to determine what's going on, and have asked the companies to submit an updated corrective action plan," said a spokeswoman for the EMA. She said that companies are legally obliged to notify regulatory authorities of any adverse drug reactions (ADRs) that come to light, but stressed that until the investigation is complete, it's not clear how many of the 80,000 reports were of adverse reactions. "They are not necessarily ADRs," she told New Scientist.

The cache of buried reports was discovered last month when officials from the UK Medicines and Healthcare products Regulatory Agency visited Roche's facilities in Welwyn, UK. The EMA revealed the lapse on 21 June. On 27 June, Roche sent the EMA a comprehensive action plan aimed at rectifying the situation and ensuring that all future reports will be properly submitted.

Roche and Genentech stress that their failure to report was not intentional. "We are taking steps to enhance our systems and controls for detecting and analysing safety data, and are evaluating further actions to prevent this from happening again," said Nadine Pinell of Genentech.

She said that no potential dangers to patients had yet been identified during an initial examination of the 80,000 buried reports. "Based on our assessments to date, no impact on the safety profiles of any of Roche's products has been found." Roche's initial response to the exposé appears on [this Pharmalot news report](#).

<http://www.sciencedaily.com/releases/2012/06/120629211854.htm>

**Moderate Doses of Alcohol Increase Social Bonding in Groups**

***A new study led by University of Pittsburgh researchers reveals that moderate amounts of alcohol - consumed in a social setting - can enhance positive emotions and social bonding and relieve negative emotions among those drinking.***

ScienceDaily - While it is usually taken for granted that people drink to reduce stress and enhance positive feelings, many studies have shown that alcohol consumption has an opposite effect. In a new paper titled "Alcohol and Group Formation: A Multimodal Investigation of the Effects of Alcohol on Emotion and Social Bonding," research shows that moderate doses of alcohol have a powerful effect on both male and female social drinkers when they are in a group. The paper is published online in Psychological Science.

According to the researchers, previous alcohol studies testing the impact of alcohol on emotions involved social drinkers consuming alcohol in isolation rather than in groups. "Those studies may have failed to create realistic conditions for studying this highly social drug," said Michael A. Sayette, lead author and professor of psychology in Pitt's Kenneth P. Dietrich School of Arts and Sciences. "We felt that many of the most significant effects of alcohol would more likely be revealed in an experiment using a social setting." Sayette and his colleagues assembled various small groups using 720 male and female participants, a larger sample than in previous alcohol studies. Researchers assessed individual and group interactions using the Facial Action Coding System (FACS) and the Grouptalk model for speech behavior.

They concluded that alcohol stimulates social bonding, increases the amount of time people spend talking to one another, and reduces displays of negative emotions. According to Sayette, the paper introduces into the alcohol literature new measures of facial expression and speech behavior that offer a sensitive and comprehensive assessment of social bonding.

Sayette and eight colleagues took special care in the methods they employed to form the groups. Each participant was randomly assigned to a group of three unacquainted "strangers." Each group was instructed to drink an alcoholic beverage, a placebo, or a nonalcoholic control beverage. Twenty groups representing each gender composition (three males; one female and two males; two males and one female; and three females) were assigned to the three different beverage scenarios. Group members sat around a circular table and consumed three drinks over a 36-minute time span. Each session was video recorded, and the duration and sequence of the participants' facial and speech behaviors were systematically coded frame by frame.

Results showed that alcohol not only increased the frequency of "true" smiles, but also enhanced the coordination of these smiles. In other words, alcohol enhanced the likelihood of "golden moments," with groups provided alcohol being more likely than those offered nonalcoholic beverages to have all three group members smile simultaneously. Participants in alcohol-drinking groups also likely reported greater social bonding than did the nonalcohol-drinking groups and were more likely to have all three members stay involved in the discussion.

"By demonstrating the sensitivity of our group formation paradigm for studying the rewarding effects of alcohol," said Sayette, "we can begin to ask questions of great interest to alcohol researchers -- Why does alcohol make us feel better in group settings? Is there evidence to suggest a particular participant may be vulnerable to developing a problem with alcohol?"

The new research sets the stage for evaluation of potential associations between socioemotional responses to alcohol and individual differences in personality, family history of alcoholism, and genetic vulnerability. Additional Pitt researchers on the project were Pitt graduate students in psychology Kasey Creswell, John Dimoff, and Catharine Fairbairn and professors of psychology Jeffrey Cohn, John Levine, and Richard Moreland. Other researchers included Bryan Heckman, a graduate student in psychology at the University of South Florida, and Thomas Kirchner, a research investigator at the Schroeder Institute for Tobacco Research and Policy Studies. *The study was funded by a grant from the National Institute on Alcohol Abuse and Alcoholism.*

[http://www.eurekalert.org/pub\\_releases/2012-07/bc-cii062912.php](http://www.eurekalert.org/pub_releases/2012-07/bc-cii062912.php)

### **Chronic inflammation in the brain leads the way to Alzheimer's disease**

***Research published today in Biomed Central's open access journal Journal of Neuroinflammation suggests that chronic inflammation can predispose the brain to develop Alzheimer's disease.***

To date it has been difficult to pin down the role of inflammation in Alzheimer's disease (AD), especially because trials of NSAIDs appeared to have conflicting results. Although the ADAPT (The Alzheimer's Disease Anti-inflammatory Prevention Trial) trial was stopped early, recent results suggest that NSAIDs can help people with early stages of AD but that prolonged treatment is necessary to see benefit.

Researchers from the University of Zurich, in collaboration with colleagues from the ETH Zurich and University of Bern investigated what impact immune system challenges (similar to having a severe viral infection) would have on the development of AD in mice. Results showed that a single infection before birth (during late gestation) was enough to induce long-term neurological changes and significant memory problems at old age.

These mice had a persistent increase in inflammatory cytokines, increased levels of amyloid precursor protein (APP), and altered cellular localization of Tau. If this immune system challenge was repeated during adulthood the effect was strongly exacerbated, resulting in changes similar to those seen for pathological aging.

Dr Irene Knuesel who led this research explained, "The AD-like changes within the brain of these mice occurred without an increase in amyloid  $\beta$  ( $A\beta$ ). However, in mice genetically modified to produce the human version of  $A\beta$ , the viral-like challenge drastically increased the amount of  $A\beta$  at precisely the sites of inflammation-induced APP deposits. Based on the similarity between these APP/A aggregates in mice and those found in human AD, it seems likely that chronic inflammation due to infection could be an early event in the development of AD.

*Systemic immune challenges trigger and drive Alzheimer-like neuropathology in mice* Dimitrije Krstic, Amrita Madhusudan, Jana Doehner, Prisca Vogel, Tina Notter, Claudine Imhof, Abigail Manalastas, Martina Hilfiker, Sandra Pfister, Cornelia Schwerdel, Carsten Riether, Urs Meyer and Irene Knuesel *Journal of Neuroinflammation* (in press)

<http://www.bbc.co.uk/news/health-18649582>

### **Five millionth 'test tube baby'**

***Five million "test tube babies" have now been born around the world, according to research presented at a conference of fertility experts.***

**By James Gallagher Health and science reporter, BBC News, Istanbul**

Delegates hailed it as a "remarkable milestone" for fertility treatments.

The first test tube baby, Louise Brown, was born in the UK in July 1978. Her mother Leslie Brown died last month. However, delegates at the conference in Turkey warned couples not to use fertility treatment as an "insurance policy" if they delayed parenthood.

The International Committee for Monitoring Assisted Reproductive Technologies (Icmt) presented its latest data on children born to infertile parents at the European Society of Human Reproduction and Embryology conference. It said official figures up to 2008, plus three years of estimates, put the total number of test tube babies born at five million.

## Milestone

Icmart chairman Dr David Adamson said: "This technology has been highly successful in treating infertile patients. Millions of families with children have been created, thereby reducing the burden of infertility. "The technology has improved greatly over the years to increase pregnancy rates."

About 1.5 million cycles of IVF, and similar techniques, are performed every year, resulting in 350,000 babies, Icmart said.

Stuart Lavery, a consultant gynaecologist and director of IVF at Hammersmith Hospital, said: "IVF is now part of the mainstream, it is no longer something couples are ashamed of."

However, he cautioned that the great success of assisted reproduction techniques should not lull people into thinking they could wait to have children. "The subtext is that if people delay childbirth they may view IVF as an insurance policy that they can access at any stage.

"Unfortunately the facts still suggest that IVF success rates in women as they get older are not fantastic."

Dr Allan Pacey, senior lecturer in andrology at the University of Sheffield, said: "I think it's significant that we've got to five million. It's far more socially acceptable than it has been over the last 10 or 20 years.

"One word of warning, we should make sure that couples understand that IVF isn't a guaranteed solution and if they're in a position to have their children earlier in life then they should try and do that.

"IVF really is something that should be preserved for those people who really need it."

IVF success rates (based on figures for 2008)
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33.1% for women under 35
27.2% for women aged 35-37
19.3% for women aged 38-39
12.5% for women aged 40-42

[http://www.eurekalert.org/pub\\_releases/2012-07/uomm-swi062912.php](http://www.eurekalert.org/pub_releases/2012-07/uomm-swi062912.php)

### **Study: Women infected with common parasite have increased risk of attempting suicide University of Maryland senior author urges further study of possible link between *Toxoplasma gondii* and suicidal behavior**

BALTIMORE - Women infected with the *Toxoplasma gondii* (*T. gondii*) parasite, which is spread through contact with cat feces or eating undercooked meat or unwashed vegetables, are at increased risk of attempting suicide, according to a new study of more than 45,000 women in Denmark. A University of Maryland School of Medicine psychiatrist with expertise in suicide neuroimmunology is the senior author of the study, which is being published online today in the Archives of General Psychiatry.

"We can't say with certainty that *T. gondii* caused the women to try to kill themselves, but we did find a predictive association between the infection and suicide attempts later in life that warrants additional studies. We plan to continue our research into this possible connection," says Teodor T. Postolache, M.D., the senior author and an associate professor of psychiatry and director of the Mood and Anxiety Program at the University of Maryland School of Medicine. He also serves as research faculty at the University of Maryland Child and Adolescent Mental Health Innovations Center and is a senior consultant on suicide prevention for the Baltimore VA Medical Center.

About one-third of the world's population is infected with the parasite, which hides in cells in the brain and muscles, often without producing symptoms. The infection, which is called toxoplasmosis, has been linked to mental illness, such as schizophrenia, and changes in behavior.

E. Albert Reece, M.D., Ph.D., M.B.A., vice president of medical affairs at the University of Maryland and John Z. and Akiko K. Bowers Distinguished Professor and dean of the University of Maryland School of Medicine, says, "*T. gondii* infection is a major public health problem around the world, and many people don't realize they're infected. Dr. Postolache is a leading expert on suicide neuroimmunology. Suicide is a critically important mental health issue. About 1 million people commit suicide and another 10 million attempt suicide worldwide each year. We hope that this type of research will one day help us find ways to save many lives that now end prematurely in suicide."

The research is the result of Dr. Postolache's ongoing collaboration with Preben Mortensen, Dr. Med. Sc., professor and head of the National Centre for Register-based Research at the University of Aarhus in Denmark. Marianne Giørtz Pedersen, M.Sc., of the National Centre for Register-based Research, is the study's lead author. It is the largest study of *T. gondii* and attempted suicide and the first prospective study to document suicide attempts that occurred after the infection was discovered. Dr. Postolache's research team at the University of Maryland was the first to report a connection between *T. gondii* and suicidal behavior in 2009. He is collaborating with researchers in Denmark, Germany and Sweden to confirm and investigate the mechanism leading to this association.

The *T. gondii* parasite thrives in the intestines of cats, and it is spread through oocysts passed in their feces. All warm-blooded animals can become infected through ingestion of these oocysts. The organism spreads to their

brain and muscles, hiding from the immune system within "cysts" inside cells. Humans can become infected by changing their infected cats' litter boxes, eating unwashed vegetables, drinking water from a contaminated source, or more commonly, by eating undercooked or raw meat that is infested with cysts. Not washing kitchen knives after preparing raw meat before handling another food item also can lead to infection. Pregnant women can pass the parasite directly to their fetuses and are therefore advised not to change cat litter boxes to avoid possible infection.

In this study, researchers analyzed data from 45,788 women in Denmark, who gave birth between May 15, 1992 and Jan. 15, 1995 and whose babies were screened for *T. gondii* immunoglobulin G (IgG) antibodies. Babies don't produce antibodies to *T. gondii* for three months after they are born, so the antibodies present in their blood represented infection in the mothers. The scientists scoured Danish health registries to determine if any of these women later attempted suicide, including cases of violent suicide attempts which may have involved guns, sharp instruments and jumping from high places. The researchers also cross-checked records in the Danish Psychiatric Central Register to determine if the women had been diagnosed previously with mental illness.

The study found that women infected with *T. gondii* were one and a half times more likely to attempt suicide compared to those who were not infected, and the risk seemed to rise with increasing levels of the *T. gondii* antibodies. Previous mental illness did not appear to significantly alter these findings. The relative risk was even higher for violent suicide attempts. In contrast to the number of women who attempted suicide using any method (517) or violent methods (78), the number of fatalities through suicides in the cohort (18, with eight in *Toxoplasma*-positive mothers) was still too small to be conclusively analyzed statistically.

Dr. Postolache stresses that further research is needed to learn more about the connection between *T. gondii* and suicide. Although studies looking at aggregate data by countries have suggested a link, "there are no studies on individuals confirming the association of *T. gondii* with suicide fatalities," he says. "Because suicides and attempts differ based on individual experience and demographics – for example, women attempt suicide more frequently and men have a higher incidence of suicide – the next step is to repeat this study with a sufficient sample aimed at analyzing suicide mortality, the most important target variable in suicide prevention."

He notes that one of the strengths of this study was that researchers were able to adjust for various factors, such as prior history of mental illness (e.g. mood disorders, schizophrenia, borderline personality disorders) not only in the subjects, but also in their parents. They also had access to a tremendous amount of information as a result of Denmark's multiple registries and health care system, which provides free medical care for residents. "We had a unique population-based cohort with almost complete follow-up data for up to 14 years. Women were included in the study irrespective of socioeconomic status, and information about *T. gondii* antibodies was collected prospectively and independently of this study," Dr. Postolache says.

But, he also notes limitations to the study, such as the inability to determine the cause of the suicidal behavior. "*T. gondii* infection is likely not a random event and it is conceivable that the results could be alternatively explained by people with psychiatric disturbances having a higher risk of becoming *T. gondii* infected prior to contact with the health system," Dr. Postolache says.

The study also did not include men and women who didn't have children, and did also not capture many episodes of attempted suicide, especially those that were interrupted or aborted and therefore may not have been recorded. It was also not always possible to determine if a self-inflicted injury was an intended suicide, Dr. Postolache says.

"Is the suicide attempt a direct effect of the parasite on the function of the brain or an exaggerated immune response induced by the parasite affecting the brain? We do not know. In fact, we have not excluded reverse causality as there might be risk factors for suicidal behavior that also make people more susceptible to infection with *T. gondii*," Dr. Postolache says. "If we can identify a causal relationship, we may be able to predict those at increased risk for attempting suicide and find ways to intervene and offer treatment." He proposes future research focusing on molecular and behavioral intermediate mechanisms potentially mediating the relationship between *T. gondii*, suicide risk factors and suicidal behavior.

J. John Mann, M.D., of Columbia University, an international expert on suicide, says that evidence is accumulating on immune factors being associated with suicidal behavior. "Identifying neurotropic latent infections potentially triggering or perpetuating a heightened immune response in patients at risk could lead to new ways of thinking of risk, prevention and risk reduction for suicide, one of the major contributors to premature death worldwide," he says.

*The research was funded by the Stanley Medical Research Institute (Mortensen) and the American Foundation for Suicide Prevention (Postolache).*

## **Common factors suggested in study of autism spectrum disorders, schizophrenia, bipolar disorder**

### ***Schizophrenia or bipolar disorder in first-degree relatives, such as parents or siblings, may be associated with increased risk of autism spectrum disorder***

CHICAGO – Schizophrenia or bipolar disorder in first-degree relatives, such as parents or siblings, may be associated with increased risk of autism spectrum disorder (ASD), according to a report published Online First by Archives of General Psychiatry, a JAMA Network publication.

Patrick F. Sullivan, M.D., F.R.A.N.Z.C.P., of the University of North Carolina at Chapel Hill, and colleagues used population registers in Sweden and Israel to examine whether a family history of schizophrenia, bipolar disorder, or both were risk factors for ASD, a group of developmental brain disorders.

The clinical and etiologic (cause or contributing factor) relationship between ASDs and schizophrenia is unknown, and bipolar disorder was included given its overlap with schizophrenia, according to the study background.

Researchers conducted a case-control evaluation of histories of schizophrenia or bipolar disorder in first-degree relatives of probands (the patients who met the criteria for ASD) from three group samples: two in Sweden and a third of conscripts (recruits to military service) in Israel.

The presence of schizophrenia in parents was associated with an increased risk for ASD in a Swedish national group sample (odds ratio [OR], 2.9) and a Stockholm County, Sweden, group (OR, 2.9), study results show. Schizophrenia in a sibling also was associated with an increased risk for ASD in the Swedish national group (OR, 2.6) and the Israeli conscription group (OR, 12.1). Bipolar disorder showed a similar pattern of association but of a lesser magnitude, the results indicate. "Our findings indicate that ASD, schizophrenia and bipolar disorders share etiologic risk factors. We suggest that future research could usefully attempt to discern risk factors common to these disorders," the authors comment.

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## **Moffitt researchers find cutaneous human papillomavirus infection a risk factor for skin cancer**

### ***5 genera of HPV studied for skin cancer association***

Researchers at Moffitt Cancer Center and colleagues at the University of South Florida, the German Cancer Research Center in Heidelberg, and the International Agency for Research on Cancer in Lyon, France, conducted a case control study and found associations between having antibodies to certain types of cutaneous human papillomavirus (HPV) and a kind of skin cancer called squamous cell carcinoma (SCC).

Their study, the first case-control study to investigate the association between SCC and cutaneous HPV types belonging to five different genera, appeared in a recent issue of *Cancer Epidemiology, Biomarkers & Prevention*, a journal published by the American Association for Cancer Research. The research was supported by a grant from the James and Esther King New Investigator grant through the Florida Department of Health and by the Miles for Moffitt Foundation Funds.

"Squamous cell carcinoma of the skin is the second most frequently occurring cancer among Caucasians in the United States, and the numbers of cases continue to rise," said study lead author Dana E. Rollison, Ph.D., Moffitt associate member, vice president and chief health information officer. "Risk factors for SCC include ultraviolet radiation exposure via the sun, older age, light skin and suppressed immune system."

According to the researchers, evidence has been emerging that cutaneous human papillomavirus infection (not the mucosal HPV infection that is associated with cervical cancers) may be an additional risk factor for SCC.

Their study investigated antibodies to cutaneous HPV types in five different genera - alpha, beta, gamma, mu and nu - in blood samples from patients with SCC and a control group that did not have SCC.

The study was conducted using 173 SCC cases from a university dermatology clinic and 300 controls who screened negative for skin cancer. Tumor tissue from 159 SCC cases was tested for the presence of cutaneous HPV infection.

The researchers found that SCC was significantly associated with antibodies to HPV 10 in genus alpha and HPV types 8 and 17 in genus beta. Additional associations were found between antibodies to beta HPV types 5 and 24 when SCC cases with those same HPV types in their tumors were compared to controls.

"While our current study provides evidence for an association between genus-beta HPV and SCC, the exact mechanism by which the association exists is still unclear," explained Rollison.

Some researchers hypothesize that infection with the genus-beta HPV has an effect on the repair of DNA in sun-damaged skin, an effect that subsequently leads to an accumulation of mutations that could predispose people to SCC formation.

The study, Rollison said, was unique in that it measured cutaneous HPV types in five different genera and investigated correlations between cutaneous HPV antibodies in the blood and HPV infection in the tumor.

"We hope that this study, aimed at identifying the role of cutaneous HPV infection in SCC, will lead to improved knowledge about who is at risk for SCC and the development of new means of prevention," concluded Rollison and the researchers.

[http://www.eurekalert.org/pub\\_releases/2012-07/uoca-rrs070212.php](http://www.eurekalert.org/pub_releases/2012-07/uoca-rrs070212.php)

### **Researchers report success in treating autism spectrum disorder**

***Using a mouse model of autism, researchers at the University of Cincinnati (UC) and Cincinnati Children's Hospital Medical Center have successfully treated an autism spectrum disorder characterized by severe cognitive impairment.***

CINCINNATI - The research team, led by Joe Clark, PhD, a professor of neurology at UC, reports its findings online July 2, 2012, in the Journal of Clinical Investigation, a publication of the American Society for Clinical Investigation.

The disorder, creatine transporter deficiency (CTD) is caused by a mutation in the creatine transporter protein that results in deficient energy metabolism in the brain. Linked to the X chromosome, CTD affects boys most severely; women are carriers and pass it on to their sons.

The brains of boys with CTD do not function normally, resulting in severe speech deficits, developmental delay, seizures and profound mental retardation. CTD is estimated to currently affect about 50,000 boys in the United States and is the second-most common cause of X-linked mental retardation after Fragile X syndrome.

Following CTD's discovery at UC in 2000, researchers at UC and Cincinnati Children's led by Clark discovered a method to treat it with cyclocreatine - also known as CincY, and pronouncedinci-why - a creatine analogue originally developed as an adjunct to cancer treatment. They then treated genetically engineered mice as an animal model of the human disease.

"CincY successfully entered the brain and reversed the mental retardation-like symptoms in the mice, with benefits seen in nine weeks of treatment," says Clark, adding that no harmful effects to the mice were observed in the study. "Treated mice exhibited a profound improvement in cognitive abilities, including recognition of novel objects, spatial learning and memory."

As a repurposed drug (originally developed for another therapy), CincY has already been through part of the U.S. Food and Drug Administration (FDA) approval process. It is taken orally as a pill or powder.

UC's Office of Entrepreneurial Affairs and Technology Commercialization has reached agreement with Lumos Pharma, a privately held Austin, Texas, startup company based on UC technology, to develop and commercialize CincY. Lumos Pharma was created with technology licensed from UC's Office of Entrepreneurial Affairs and Technology Commercialization. Its CEO is Rick Hawkins, a 30-year biotech industry veteran. Jon Saxe is its chairman.

"It has taken many years to get here and I am happy that our efforts have led to this translational effort to make a therapy available to those afflicted with CTD," says Clark. "We look forward with commitment and hope to the day when those patients will benefit from our work."

The collaboration gained momentum when Lumos Pharma submitted a proposal based on Clark's technology to the National Institutes of Health and was selected as a drug development project partner by the National Center for Advancing Translational Sciences' Therapeutics for Rare and Neglected Diseases (TRND) program. Under TRND's collaborative operational model, project partners form joint project teams with TRND and receive in-kind support from TRND drug development scientists, laboratory and contract resources.

Lumos Pharma plans to initiate a TRND-supported preclinical development plan, with TRND support continuing through the filing of an Investigational New Drug (IND) application with the FDA prior to beginning a clinical trial. Such a trial would be about three years away, Clark says.

*In addition to Clark, study team members are Yuko Kurosawa, PhD; Ton de Grauw, MD, PhD; Diana Lindquist, PhD; Victor Blanco, PhD; Gail Pyne-Geithman, DPhil; Takiko Daikoku, PhD; James Chambers, PhD; and Stephen Benoit, PhD.*

*The research by Clark's team was supported by funding from the National Institutes of Health. The study authors report no conflicts of interest.*

## **Newly discovered dinosaur implies greater prevalence of feathers** ***Megalosaur fossil represents 1st feathered dinosaur not closely related to birds***

A new species of feathered dinosaur discovered in southern Germany is further changing the perception of how predatory dinosaurs looked.

The fossil of *Sciurumimus albersdoerferi*, which lived about 150 million years ago, provides the first evidence of feathered theropod dinosaurs that are not closely related to birds.

The fossil is described in a paper published in the Proceedings of the National Academy of Sciences today.

"This is a surprising find from the cradle of feathered dinosaur work, the very formation where the first feathered dinosaur *Archaeopteryx* was collected over 150 years ago," said Mark Norell, chair of the Division of Palaeontology at the American Museum of Natural History and an author on the new paper along with researchers from Bayerische Staatssammlung für Paläontologie und Geologie and the Ludwig Maximilians University.

Theropods are bipedal, mostly carnivorous dinosaurs. In recent years, scientists have discovered that many extinct theropods had feathers. But this feathering has only been found in theropods that are classified as coelurosaurs, a diverse group including animals like *T. rex* and birds. *Sciurumimus* - identified as a megalosaur, not a coelurosaur - is the first exception to this rule. The new species also sits deep within the evolutionary tree of theropods, much more so than coelurosaurs, meaning that the species that stem from *Sciurumimus* are likely to have similar characteristics.



***Sciurumimus Hodari*** Nundu on deviantART

"All of the feathered predatory dinosaurs known so far represent close relatives of birds," said palaeontologist Oliver Rauhut, of the Bayerische Staatssammlung für Paläontologie und Geologie. "*Sciurumimus* is much more basal within the dinosaur family tree and thus indicates that all predatory dinosaurs had feathers."

The fossil, which is of a baby *Sciurumimus*, was found in the limestones of northern Bavaria and preserves remains of a filamentous plumage, indicating that the whole body was covered with feathers.

The genus name of *Sciurumimus albersdoerferi* refers to the scientific name of the tree squirrels, *Sciurus*, and means "squirrel-mimic" - referring to the especially bushy tail of the animal. The species name honors the private collector who made the specimen available for scientific study.

"Under ultraviolet light, remains of the skin and feathers show up as luminous patches around the skeleton," said co-author Helmut Tischlinger, from the Jura Museum Eichstatt.

*Sciurumimus* is not only remarkable for its feathers. The skeleton, which represents the most complete predatory dinosaur ever found in Europe, allows a rare glimpse at a young dinosaur. Apart from other known juvenile features, such as large eyes, the new find also confirmed other hypotheses.

"It has been suggested for some time that the lifestyle of predatory dinosaurs changed considerably during their growth," Rauhut said. "*Sciurumimus* shows a remarkable difference to adult megalosaurs in the dentition, which clearly indicates that it had a different diet."

Adult megalosaurs reached about 20 feet in length and often weighed more than a ton. They were active predators, which probably also hunted other large dinosaurs. The juvenile specimen of *Sciurumimus*, which was only about 28 inches in length, probably hunted insects and other small prey, as evidenced by the slender, pointed teeth in the tip of the jaws.

"Everything we find these days shows just how deep in the family tree many characteristics of modern birds go, and just how bird-like these animals were," Norell said. "At this point it will surprise no one if feather like structures were present in the ancestors of all dinosaurs."

*The study was financed by the Volkswagen Foundation and the American Museum of Natural History.*



## **Why Extramarital Sex Can Kill**

***Affairs increase the risk of sudden death, with distressing guilt potentially playing a role in cardiovascular disease***

**By Rebecca Coffey | July 2, 2012 | 23**

Physicians have known for a long time that, for most men, sex is safe and even life-prolonging. Yet evidence is growing that, at least for adulterers, the picture is different. In a review of the literature on infidelity published online in April in the *Journal of Sexual Medicine*, researchers presented intriguing evidence that extramarital sex can kill.

To be sure, death by copulation is rare. But the data suggest that when it happens, it usually happens to adulterers, and the cause is typically cardiovascular. In 1963 a Japanese pathologist reported that of 34 men who had died during intercourse, nearly 80 percent had died during extramarital sex, most of cardiac causes. In 2006 South Korean pathologists documented 14 cases of sudden coital death and found that only one had involved a man who had been having intercourse with a woman known to be his wife; all the other men had died of cardiovascular causes. In 2006 researchers at Goethe University Frankfurt in Germany published an analysis of sex-related autopsy reports for 68 men. Ten had died with a mistress and 39 with a prostitute. Why do unfaithful men, especially, die doing what they love to do? "Extramarital sex may have its own hazards," says Alessandra Fisher, the study's lead author and an expert on sexual disorders at the University of Florence. "The lover might be much younger. Sex might be particularly athletic or follow excessive drinking or eating".

Guilt may also play a role. The University of Florence team's 2011 statistical analysis of health outcomes for almost 1,700 male patients showed that those involved in stable extramarital relationships had about twice the cardiovascular disease as other patients in the study, particularly if the man reported that his wife was still sexually interested in him. "Deceiving a sexually available and involved mate could lead to a deeper sense of guilt," the researchers wrote. That type of psychological distress has been shown to up cardiovascular risk.

<http://www.sciencedaily.com/releases/2012/07/120702133246.htm>

## **Achieve Olympic Feet With Barefoot Running**

***Olympic runners could run more economically by just taking off their trainers***

ScienceDaily - Olympic runners could run more economically by just taking off their trainers, say researchers at Northumbria University.

In new research, Dr Michael Wilkinson found that when runners who always wear shoes run barefoot they immediately alter their gait to that characteristic of habitual barefoot runners, and also use less oxygen during barefoot running compared to running with shoes at the same speed. This indicates greater running economy which is an important determinant of distance running performance, especially in elite runners.

Habitual barefoot runners have a distinctive running gait -- using mid-foot landings, shorter stride lengths, faster stride rates, and less time in contact with the ground. They are also known to hit the ground with lower impact force and loading rates than runners who land on the rear foot in trainers. This cushions the force of landing, avoiding the discomfort associated with striking the ground heel-first common in runners who wear shoes.

In the study, a mix of 18 recreational and highly trained runners participated in a six-minute moderate running task both barefoot and in shoes on separate days. During the runs, oxygen uptake was measured to assess energy expenditure and gait was analyzed using digitalized video footage.

The runners reduced their stride length and ground contact time, increased their stride rate and, on average, used less oxygen during barefoot compared to shod running at the same speed, indicating greater economy. The 6% improvement in economy was the same as that previously reported after a nine-week training program for shoe-wearing runners, who also enjoyed a 3% improvement in running performance.

The results suggest that, by ditching their trainers, athletes new to barefoot running adopt a running style similar to experienced barefoot runners and enjoy an immediate and likely beneficial increase in running economy.

Dr Wilkinson is an expert in the physiology of exercise and a barefoot runner for more than six years, completing the Great North Run barefoot in 2011. He said: "There's a difference between shod and barefoot running gaits that comes about from feeling the ground. The sensory feedback when running barefoot encourages runners to put their feet down more gently in an attempt to avoid the impact forces that would cause discomfort and are also linked to injury.

"We saw a significant saving in energy from taking off running shoes. There were also mechanical differences in the foot strike pattern, with those who usually strike the ground with their heel first when they run with shoes, altering their pattern and striking the ground with the more cushioned mid-foot instead when barefoot." Previous studies have found that populations who habitually run barefoot report a low prevalence of lower-limb injury, suggesting that plantar-sensory feedback (being able to feel the nature of the terrain and adjust the force your feet apply to the ground) plays an important role in safe running.

Dr Wilkinson and his colleague Phil Hayes will disseminate their research and the science behind barefoot running benefits to athletic groups in the North East this month.

Dr Wilkinson added: "Running barefoot is a hot topic in both running and scientific communities at present. High profile scientific studies have been popularized by the media reporting potential benefits of running barefoot for injury reduction and performance improvement.

"However, there is much misinformation being broadcast on the internet and in running magazines about barefoot running, little of which is based on current evidence from scientific investigations.

<http://www.sciencedaily.com/releases/2012/07/120702152647.htm>

### **Got Kids? Then You're Less Likely to Catch a Cold**

#### ***Being a parent reduces your risk of catching a cold -- possibly because of unknown "psychological or behavioral differences between parents and nonparents"***

ScienceDaily - Being a parent reduces your risk of catching a cold -- possibly because of unknown "psychological or behavioral differences between parents and nonparents," according to a study in the July issue of Psychosomatic Medicine, the official journal of the American Psychosomatic Society.

The risk of becoming ill after exposure to cold viruses is reduced by about half in parents compared to nonparents, regardless of pre-existing immunity, according to research led by Rodlescia S. Sneed, MPH, and Sheldon Cohen, PhD of Carnegie Mellon University, Pittsburgh. The study suggests that other, yet unknown factors related to being a parent may affect susceptibility to illness.

#### **Being a Parent Protects Against Colds**

The researchers analyzed data on 795 adults from three previous studies of stress and social factors affecting susceptibility to the common cold. In those studies, healthy volunteers were given nose drops containing cold-causing rhinovirus or influenza viruses. After virus exposure, about one-third of volunteers developed clinical colds - typical symptoms of a cold plus confirmed infection with one of the study viruses. The analysis focused on whether being a parent affected the risk of developing a cold, with adjustment for other factors.

The results showed a lower rate of colds among parents, compared to volunteers who were not parents. In the adjusted analysis, the risk of developing a cold was 52 percent lower for parents.

That might be expected on the basis of immunity -- kids get colds, and parents may develop protective antibodies against the specific viruses causing those colds. However, the lower risk of colds in parents could not be explained by pre-existing immunity, based on levels of antibodies to the study viruses. Parents were less likely to develop colds whether or not they had protective levels of antibodies.

The protective effect of parenthood increased along with the number of children (although there were limited data on parents with three or more children). Parents were at reduced risk of colds even when they didn't live with any of their children. In fact, parents with no children at home had an even larger, 73 percent reduction in risk. The risk of colds was lower for parents in most age groups. The only exception was parents in the youngest age group -- 18 to 23 years -- for whom the risk of colds was no different than for nonparents. There was no difference in the risk of colds for parents who were married versus unmarried.

#### **Psychological or Behavioral Factors May Play a Role**

"We found parenthood predicted a decreased probability of colds among healthy individuals exposed to a cold virus," Sneed and coauthors write. The effect is independent of parental immunity, suggesting that psychological or behavioral factors could be involved.

However, the study permits no conclusions as to what those protective factors might be. One possibility is that being a parent improves regulation of immune factors (cytokines) triggered in response to infection. Previous studies have shown that cytokine responses explain the protective effects of psychological factors -- such as lower stress or a positive attitude -- against cold risk.

But more research will be needed to clarify just how being a parent could affect the body's response to cold viruses. Sneed and colleagues conclude, "Our results, while provocative, have left room for future studies to pursue how various aspects of parenthood (eg, frequency of contact with children, quality of parent/child relationships) might be related to physical health, and how parenthood could 'get under the skin' to influence physical health."

## **Premature Infants Do Feel Pain from Procedures: Physiological Markers for Neonate Pain Identified**

***There was a time when a belief was widely held that premature neonates did not perceive pain***

ScienceDaily - That, of course, has been refuted but measurements of neonate pain tend to rely on inexact measures, such as alertness and ability to react expressively to pain sensations. Researchers at Loma Linda University reported in *The Journal of Pain* that there is a significant relationship between procedural pain and detectable oxidative stress in neonates.

Previous studies have shown an approach involving measurement of systemic biochemical reactions to pain offers the benefit of providing an objective method for measuring pain in premature neonates. Exposure to painful procedures often results in reductions in oxygen saturations and tachycardia, but few studies have quantified the effects of increased pain oxygen consumption. No studies have examined the relationship between pain scores that reflect behavioral and physiological markers of pain and plasma markers of ATP utilization and oxidative stress.

In this study, 80 preterm neonates were evaluated. In about half, tape was taken off the skin following removal of catheters, and they were evaluated for oxidative stress by measuring uric acid and malondialdehyde (MDA) concentration in plasma before and after the procedure. These subjects were compared with a control group not experiencing tape removal. Pain scores were assessed using the Premature Infant Pain Profile. The data showed there was a significant relationship between procedural pain and MDA, which is a well accepted marker of oxidative stress.

There were increases in MDA in preterm neonates exposed to the single painful procedure and not in the control group. Since premature neonates undergo several painful procedures a day, the researchers concluded that if exposure to multiple painful procedures is shown to contribute to oxidative stress, biochemical markers might be useful in evaluating mechanism-based interventions that could decrease adverse effects of painful procedures.

<http://nyti.ms/Ry3VyS>

### **Second Time Around**

#### ***Q. Why does shingles cause far more pain than chickenpox?***

**By C. CLAIBORNE RAY**

A. Both chickenpox (formally varicella) and shingles (zoster) are caused by the varicella-zoster virus and affect the same set of nerves, said Dr. Lawrence R. Stanberry, chairman of pediatrics at New York-Presbyterian Morgan Stanley Children's Hospital.

In chickenpox, the virus enters through the nose, spreads to the bloodstream and the nervous system, and causes an itchy but rarely painful rash on most of the body. After recovery, the virus silently persists in the nervous system for life.

In an older person, the hibernating virus can be reactivated in a few nerve cells and can spread through the nerves to patches of skin, causing a rash that looks similar to chickenpox but can be extremely painful. The pain, a type called neuropathy, is not well controlled by prescription painkillers.

"It is generally believed that with chickenpox there is less inflammation of nerve cells and little or no cell death," Dr. Stanberry said, "while reactivation of the latent virus triggers an exuberant immune response, causing inflammation and cell death."

Chickenpox, he said, occurs in people who are "immunologically naïve." But in shingles, the person has already made immune responses to the virus. When reactivated, it seems to provoke a "recall response," stimulating the immune system's T-cells to attack the infected nerve cells.

<http://www.scientificamerican.com/article.cfm?id=foreign-language-improve-decisions>

### **How Knowing a Foreign Language Can Improve Your Decisions**

#### ***Thinking in another language changes how people weigh their options***

**By Catherine Caldwell-Harris | Tuesday, July 3, 2012 | 6**

The study of how people process foreign languages has traditionally focused on the topics we wrestled with in high school French or Spanish classes -- botched grammar, misunderstood vocabulary, and mangled phonemes. But in recent years psychologists have gone to the laboratory with a phenomenon that historically was only discussed in memoirs by bilingual writers like Vladimir Nabokov and Eva Hoffman: a foreign language feels less emotional than the mother tongue. Consider the case of taboo words. For many multilinguals, swearing in a foreign language doesn't evoke the same anxiety (or bring the same emotional release) as using a native language. Decreased emotionality in a foreign language spans the gamut of emotions, from saying "I love you,"

to hearing childhood reprimands, to uttering morally grave lies, or being influenced by persuasive messages in advertising.

Researchers have sought to understand the range and limits of these emotional language effects. Lower proficiency and/or late acquisition of the foreign language seems to be a crucial constraint. For people who grew up bilingual, skin conductance responses and self-reports were similar when listening to emotional phrases in either language. One method for finding new types of emotional-language effects is to examine areas where cognitive neuroscience reports that people can switch between analytical processing and emotional processing. Gut, automatic or instinctive reasoning is grounded in an emotional good-bad response.

Alternatively, reasoning can be the result of a deliberative process that involves careful, logical analysis. Would bilinguals be more analytical and less emotional when making decisions in a foreign language?

Boaz Keysar, Sayuri Hayakawa, and Sun Gyu An of University of Chicago asked this question in a paper recently published in *Psychological Science*. They studied framing effects, a phenomenon investigated by Daniel Kahneman and others. When a decision is verbally framed as involving a gain, humans prefer a sure outcome over a probabilistic outcome. When the same situation is framed as involving losses, people sometimes prefer to gamble. For example, given a scenario involving 600 sick individuals and two types of medicines to administer, research participants prefer the medicine which will save 200 people for sure, rather than the medicine which has a 1/3 chance of saving all 600 sick people and a 2/3 chance of saving no one. If the formally identical illness scenario is provided, but framed in terms of how many people will die, then research participants are more likely to choose the probabilistic option. Framing effects are one of the classic examples of how humans deviate from logical reasoning, and indeed, individuals with a propensity for logical reasoning, such as those with Asperger Syndrome, are less influenced by the verbal frame when making these types of decisions.

The Chicago researchers randomly assigned bilinguals to read and respond to decision-making scenarios using either their native or foreign language. Similar versions of the study were conducted in the U. S, France and Korea. This was important because a foreign language may feel more emotional when it is the language of daily life, as happens when studying at a foreign university. English was the first language for the U. S. participants and the foreign language for Korean participants. In France, English was the native language and the French was the foreign language but also language of immersion. Data from all three locations were consistent: the standard framing effects were found for the native language and were absent in the foreign language. The implication is that people were less influenced by emotional aspects of the scenarios when reading scenarios in their foreign language. This is an impressive finding since one might have supposed that the stress of using a less proficient language would diminish the cognitive resources needed for deliberative reasoning, thus pushing people to make gut, instinctive or emotional responses.

The authors ran additional experiments using a paradigm called loss aversion, another case where emotion can influence decision making. People are reluctant to accept bets that involve a chance of losing money, even if the odds are in the favor of winning, such as a 50 percent chance of winning \$12 vs. losing \$10. Keysar and colleagues found that, regardless of whether the bilinguals played with hypothetical money or real cash that could be kept after the experiment ended, bilinguals accepted the positive bets more often when they played using their foreign language and more often resisted betting when using their native language. This confirmed the finding of being reasoning more logically when using a foreign language.

Language has been traditionally viewed as a vehicle for communicating information (indeed, Chomsky famously characterized language as a mental algebra). Researchers have assumed that, as long as people are proficient enough, then how they respond will not be affected by the language they are using. It is now becoming better appreciated that people answer surveys differently depending on the language. For example, Chinese international students studying in North America agreed with traditional Chinese values more when answering a survey in Chinese; they had higher self-esteem scores when completing a self-esteem questionnaire in English. The full extent of these effects of languages on responses are still being investigated.

Like the other emotional-language effects discussed above, Keysar's study on how language influences decision making are laboratory effects. Is this what happens outside the lab? Psychologists are increasingly advising foreigners in the US to seek psychotherapy with a bilingual counselor, and, to minimize missing nuances or emotional implications, to avoid conducting life-or-death conversations in a foreign language, such as a serious talk with a doctor, taking a polygraph test, or undergoing police interrogation. But in the decision making case studied by the Chicago team, use of a foreign language led to more logical and better decisions. Does this imply that bilinguals should routinely seek to use their foreign languages when making decisions? Should they buy a house or plan their retirement using a foreign language? An ethnographic approach could analyze cases where

individuals end up using their native or a foreign language to conduct business. A wide range of laboratory and/or field experiments should be conducted in order to determine if the elimination of framing effects is a cute laboratory finding or something that may influence real life.

[http://www.eurekalert.org/pub\\_releases/2012-07/cmaj-sdd062612.php](http://www.eurekalert.org/pub_releases/2012-07/cmaj-sdd062612.php)

### **Some diabetes drugs may increase risk of bladder cancer**

***An increased risk of bladder cancer is linked to the use of pioglitazone, a medication commonly used to treat type 2 diabetes***

An increased risk of bladder cancer is linked to the use of pioglitazone, a medication commonly used to treat type 2 diabetes, according to a new study published in CMAJ (Canadian Medical Association Journal) ([pre-embargo link only](#)). People with type 2 diabetes are at risk of several types of cancer, including a 40% increased risk of bladder cancer, compared to people without diabetes. Previous studies have shown a higher incidence of bladder cancer in people taking pioglitazone, a type of thiazolidinedione.

To determine whether there is a link between pioglitazone use and bladder cancer, researchers conducted a systematic review and meta-analysis of randomized controlled trials and observational studies involving over 2.6 million patients. "We observed an increased risk of bladder cancer associated with the use of thiazolidinediones," writes Dr. Jeffrey Johnson, School of Public Health, University of Alberta, with coauthors. "In particular, use of pioglitazone was associated with an increased risk of bladder cancer based on a pooled estimate from three cohort studies involving more than 1.7 million individuals."

The researchers also looked at a possible association with rosiglitazone, another type of thiazolidinedione, but did not see an effect. "Although the absolute risk of bladder cancer associated with pioglitazone was small, other evidence-based treatments for type 2 diabetes may be equally effective and do not carry a risk of cancer," conclude the authors. "This study quantifies the association between pioglitazone use and bladder cancer and may help inform decisions around safer use of pioglitazone in individuals with type 2 diabetes."

[http://www.eurekalert.org/pub\\_releases/2012-07/iop-pes070212.ph](http://www.eurekalert.org/pub_releases/2012-07/iop-pes070212.ph)

### **Pre-industrial emissions still causing temperatures to rise**

***A climate model accounting for the carbon dioxide (CO<sub>2</sub>) released into our atmosphere before the industrial revolution has been used to show the detrimental effect of carbon emissions on global temperature in the long-term.***

In a study published today, 4 July, in IOP Publishing's journal Environmental Research Letters, researchers from the Carnegie Institution for Science have shown that pre-industrial emissions from land use changes are responsible for about nine per cent of the increase in today's global mean temperature since that era.

"The relatively small amounts of carbon dioxide emitted many centuries ago continue to affect atmospheric carbon dioxide concentrations and our climate today, though only to a relatively small extent," said co-author of the study Julia Pongratz. "But looking into the past illustrates that the relatively large amount of carbon dioxide that we are emitting today will continue to have relatively large impacts on the atmosphere and climate for many centuries into the future."

Having modelled pre-industrial emissions from around the world, the researchers calculated the effect on emissions of the five-fold population increase between 850 and 1850 AD.

This pre-industrial millennium of population growth was dominated by South and East Asia: China and India alone account for half of the population growth which led to the world's first living billion by 1850.

The researchers' model suggests that between 20 and 40 per cent of China and India's entire history of CO<sub>2</sub> emissions comprises pre-industrial emissions related to this population growth and demonstrates that these emissions are still having a detrimental effect on our climate today.

Land use changes – the change in vegetation cover due to agriculture and forestry – were the main causes of carbon emissions before the industrial revolution and still have an effect on today's temperature because the uptake of the excess CO<sub>2</sub> in the atmosphere by the oceans and vegetation happens at a very slow pace.

On top of that, when land was cleared for farming, part of the carbon was released immediately into the atmosphere by being burned; however, the rest, including that from roots and wood products, decays over years and centuries, meaning it is still being emitted into the atmosphere today.

The consequences of pre-industrial emissions for today's climate may be relevant for political discussions on how to distribute the burden-sharing of greenhouse gas reduction commitments, which are based on attributing today's climate change to different countries.

Questions still remain over whether countries should be held responsible for past emissions at a time when their effect was not known, or if present generations should be held responsible for historical activity; however, the

researchers' results show that accounting for pre-industrial emissions shifts the attribution of global temperature increase from the industrialised to less-industrialised countries by two to three per cent.

The researchers note, however, that their work is not designed to blame people in the developing world for today's climate problems, particularly considering the much larger climate impact being made by modern industrialized nations on a daily basis.

Co-author of the study, Ken Caldeira, said: "Accounting systems are not natural facts, but human inventions. Once an accounting system is defined, it becomes a matter of scientific investigation to determine what numbers should go in the ledger, but broader questions of who is responsible for what and who owes what to whom are judgments that lie outside the scope of science."

From Wednesday 4 July, this paper can be downloaded from <http://iopscience.iop.org/1748-9326/7/3/034001/article>

[http://www.eurekalert.org/pub\\_releases/2012-07/uoc--olw070312.php](http://www.eurekalert.org/pub_releases/2012-07/uoc--olw070312.php)

**Obesity, larger waist size associated with better outcomes in heart failure patients**  
***A slim waist and normal weight are usually associated with better health outcomes, but that's not always the case with heart failure patients, according to a new UCLA study.***

Researchers found that in both men and women with advanced heart failure, obesity - as indicated by a high body mass index (BMI) - and a higher waist circumference were factors that put them at significantly less risk for adverse outcomes. The study findings are published in the July 1 online issue of the American Journal of Cardiology.

Heart failure affects 5.8 million people, including 2.5 million women. Approximately one-half to two-thirds of heart failure patients are overweight or obese. Women and men are known to have differences in body composition and body-fat distribution, and this study is one of the first to specifically assess the impact of BMI and waist circumference on women and compare it with men.

The findings also offer further insight into an observed phenomenon in chronic heart failure known as the "obesity paradox": Obesity is a known risk factor for developing heart disease and heart failure, but once heart failure has manifested, being overweight may provide some protective benefits.

"The study provides us with more insight about how both genders of heart failure patients may be impacted by the obesity paradox," said senior author Dr. Tamara Horwich, an assistant professor of cardiology at the David Geffen School of Medicine at UCLA. "Heart failure may prove to be one of the few health conditions where extra weight may prove to be protective."

For the study, researchers analyzed data on advanced heart failure patients treated at UCLA Medical Center from 1983 to 2011. The team assessed 2,718 patients who had their BMI measured at the beginning of heart failure treatment and 469 patients who had their waist circumference measured at the beginning of treatment. Using standardized measures, the researchers identified men or women as having a high BMI if they were greater or equal to 25 kg/m<sup>2</sup> - this included both overweight patients (25 to 29.9 kg/m<sup>2</sup>) and obese patients (30 kg/m<sup>2</sup> or greater).

For men, a high waist circumference was considered 40 inches (102 cm) or greater, and for women, 37 inches (88 cm) or greater. This assessment also included patients who were either overweight or obese.

At the two-year follow-up, researchers used statistical analysis and found that in men, a high waist circumference and high BMI were associated with event-free survival from adverse outcomes like death, the need for a heart transplant, or the need for ventricular assist device placement.

Women with a higher BMI also had better outcomes than their normal-weight counterparts, and women with a high waist circumference also trended toward improved outcomes.

Both men and women with a normal BMI and waist circumference were at a substantially higher risk for these adverse outcomes. In fact, a normal BMI was associated with significantly worse outcomes - a 34 percent higher risk in men and a 38 percent higher risk in women - than a high BMI.

Normal waist circumference was also associated with an increased risk of adverse outcomes in both genders, with men's risk doubling and women's risk tripling.

"We knew that obesity might provide a protective benefit for heart failure patients, but we didn't know whether this obesity paradox applied specifically to women with heart failure, as well as men - and it does," Horwich said.

BMI measurement has been used for years as a surrogate measure of body fat. Since it measures all mass - including lean muscle, which weighs more than fat - the measurement may not be specific for total body fat. Waist circumference is a newer addition that may provide a more direct connection to body fat, since it measures the fat accumulated around the belly.

"The study also demonstrates how BMI and waist circumference can be used together to provide a more accurate measure of fat in the body to help determine obesity and assess risk," said the study's first author, Adrienne L. Clark, a resident in the department of medicine at the Geffen School of Medicine. According to Horwich, no one knows exactly why the obesity paradox exists for heart failure patients, but there are several possible explanations.

Being underweight is traditionally associated with a poorer prognosis in heart failure patients. Obesity may be at the other end of the spectrum, and patients may thereby benefit from increased muscle mass, as well as metabolic reserves in the form of fatty tissue. In addition, increased levels of serum lipoproteins that are associated with increased body fat may play an anti-inflammatory role, neutralizing circulating toxins and inflammation-related proteins. Obese patients also present at an earlier stage of heart failure due to increased symptoms and functional impairment caused by excess body weight, so they may be getting help sooner, which also could improve outcomes, the researchers said.

The next steps in research will include larger studies with longer follow-up times, as well as a closer look at the physiology behind the obesity paradox.

*The study was funded by the National Heart, Lung and Blood Institute, part of the National Institutes of Health (grant 1K23HL085097).*

*Jennifer Chyu of the UCLA Department of Molecular, Cell and Developmental Biology, was also a study author.*

<http://phys.org/news/2012-07-feel-good-glass-windows.html>

### **Feel-good glass for windows**

#### ***Daylight acts on our body clock and stimulates the brain.***

German researchers have made use of this knowledge and worked with industry partners to develop a coating for panes of glass that lets through more light. Above all, it promotes the passage through the glass of those wavelengths of light that govern our hormonal balance.

Most people prefer to live in homes that are airy and flooded with light. Nobody likes to spend much time in a dark and dingy room. That's no surprise, since daylight gives us energy and has a major impact on our sense of wellbeing. It is a real mood lifter. But not everyone is lucky enough to live in a generously glazed home, and office spaces – where we spend many hours of each day – are often not exactly bright and breezy. Modern heat-insulating, sun-protection glazing for offices and housing doesn't make things any better, since it isn't optimized to allow the light that governs our hormonal balance to pass through: instead, a distinctly noticeable percentage of incident sunlight in this effective part of the spectrum is reflected away.

Anti-reflective glass that is more transmissive overall to daylight is reserved for certain special applications, such as in glass covers for photovoltaic modules or in glazing for shop windows. The aim with this kind of glass is to avoid nuisance reflections and to achieve maximum light transmission at the peak emission wavelength of sunlight. This is the wavelength at which the human retina is also most sensitive to light.

"However, our biorhythms are not affected by the wavelengths that brighten a room the most, but rather by blue light," explains graduate engineer Walther Glaubitt, a researcher at the Fraunhofer Institute for Silicate Research ISC in Würzburg. That is why he and his team have developed glass that is designed to be particularly transmissive to light in the blue part of the spectrum. The secret is a special, long-lasting and barely perceptible inorganic coating that is only 0.1 micrometers thick. "Nobody's ever made glass like this before. It makes you feel as if the window is permanently open," says Glaubitt. One reason the glass gives this impression is that it exhibits maximum transmission at wavelengths between 450 and 500 nanometers – which is exactly where the effects of blue light are at their strongest.

Lack of light gives rise to sleep disorders

Why is it that the blue part of the light spectrum has such an impact on our sense of wellbeing? "There is a nerve connecting the human retina to the hypothalamus, which is the control center for the autonomic nervous system," explains Glaubitt's team colleague Dr. Jörn Probst. Special receptors sit at the end of the nerve connection which are sensitive to blue light, converting it into light-and-dark signals and sending these to the area of the brain that functions as our biological clock. There, one of the things these nerve impulses do is regulate melatonin levels. A lack of light leads to high levels of melatonin, which can result in problems sleeping and concentrating, as well as depression and other psychological impairments. Seasonal affective disorder, also known as winter depression, is one possible outcome of unusually high melatonin levels. "The coating we've developed helps people to feel they can perform better and makes it less likely they will fall ill," says Probst.

Industrial partner Centrosolar Glas GmbH & Co. KG is responsible for applying the coating to the glass while UNIGLAS GmbH & Co. KG, the company that brought the product to market maturity, handles the remaining

finishing work as well as sales. It is about to launch a triple-glazing product featuring this innovative glass, for which a patent is pending, under the name UNIGLAS | VITAL® feel-good glass. Fitting triple glazing to a room does not make it seem appreciably darker, but it does affect the light that enters the room in a way that is detrimental to our biorhythms. This is especially true for people who have little opportunity to spend time outdoors and are obliged to spend most of their time in rooms with only small windows. "Thanks to the special ISC coating, this is not the case with our UNIGLAS | VITAL® feel-good glass. Instead, the light quality achieved is very close to that of single glazing," says Thomas Fiedler, the Technical Director of UNIGLAS. Its transmissivity to light is increased across the entire range from 380 to 580 nanometers, which is to say in the portion of the spectrum that is responsible for promoting wellbeing. At 460 nanometers, the light transmissivity of UNIGLAS | VITAL® is 79 percent. Comparable triple glazing only lets through 66 percent of light at this wavelength. Meanwhile, the coating has no impact on the window's heat-insulating properties. But the ISC researchers haven't quite reached their ultimate goal: "Up to now we've only applied our special coating to the side of the glass facing into the cavity between panes," says Glaubitt. "In future we will also be coating the glazing's exposed surfaces – in other words, the outside and the inside of the window. That will allow us to achieve around 95 percent light transmissivity at 460 nanometers."

<http://www.sciencedaily.com/releases/2012/07/120703134100.htm>

**Ibuprofen Improves Bone Repair After Surgery or a Fracture, Study Suggests**  
***A study has demonstrated that ibuprofen has beneficial effects on bone repair after a fracture or following bone surgery***

ScienceDaily - A study conducted at the University of Granada has demonstrated that ibuprofen --a non-steroidal anti-inflammatory drug (NSAID)-- has beneficial effects on bone repair after a fracture or following bone surgery. In vitro tests demonstrated that -unlike other NSAIDs- when a therapeutic dose of ibuprofen is administered, it has no negative effects on the proliferation and synthesis of osteoblast osteocalcin, a cell which is directly involved in the formation and regeneration of bones. Osteoblast cells are bone cells that synthesize the bone matrix. Consequently, osteoblasts play a major role in bone development, growth, maintenance and repair.

**Positive Results**

In an article recently published in the Journal of Bone and Mineral Metabolism, the University of Granada researchers report the positive effects of ibuprofen on bone repair. The researchers are members of the research group BIO277, which studies the effects of different pharmacological and non-pharmacological therapies on osteoblast cells.

The primary author of this article, Concepción Ruiz Rodríguez, a professor at the University of Granada Nursing Department states that "up to date, we had little information on the effects of ibuprofen on osteoblast cells." The University of Granada study demonstrates that a therapeutic dose of ibuprofen (5-25 µm.) does not inhibit the proliferation and synthesis of osteocalcin in the MG-63 cell line. However, when higher doses are administered (>25 µm.) they may activate other cells, which might explain the expression of membrane markers and the decrease in the phagocytic capacity.

*Lourdes Díaz-Rodríguez, Olga García-Martínez, Elvira Luna-Bertos, Javier Ramos-Torrecillas, Concepción Ruiz. Effect of ibuprofen on proliferation, differentiation, antigenic expression, and phagocytic capacity of osteoblasts. Journal of Bone and Mineral Metabolism, 2012; DOI: 10.1007/s00774-012-0356-2*

<http://www.bbc.co.uk/news/health-18686179>

**Seaweed toothpaste 'to stop tooth decay'**  
***Adding enzymes from seaweed microbes to toothpaste and mouthwash could provide better protection against tooth decay, a team of UK scientists have said.***

**By Michelle Roberts Health editor, BBC News online**

Researchers at Newcastle University had been studying Bacillus licheniformis to see if it could clean ships' hulls.

But the scientists now believe it could protect the areas between teeth where plaque can gather despite brushing. Their lab tests suggest the microbe's enzyme cuts through plaque, stripping it of bacteria that cause tooth decay. Dr Nick Jakubovics, of the university's school of dental sciences, said: "Plaque on your teeth is made up of bacteria which join together to colonise an area in a bid to push out any potential competitors.

"Traditional toothpastes work by scrubbing off the plaque containing the bacteria - but that's not always effective - which is why people who religiously clean their teeth can still develop cavities.

"We found this enzyme can remove some of these undesirable bacteria from plaque."

Plaque is made up of lots of different decaying bacteria.



When bacterial cells die, the DNA inside them leaks out and makes a biofilm that sticks to the teeth. Instead of removing the plaque entirely, Dr Jakubovics believes the treatment could strip away the harmful bacteria, like *Streptococcus mutans*, that cause tooth decay. "Ultimately we hope to harness this power into a paste, mouthwash or denture-cleaning solution." He said more studies are needed to show the technique works and is safe before any products could be brought to market. He is presenting the latest findings to a meeting of the Society for Applied Microbiology, the organisation that is funding the research along with the Newcastle Healthcare Charity.

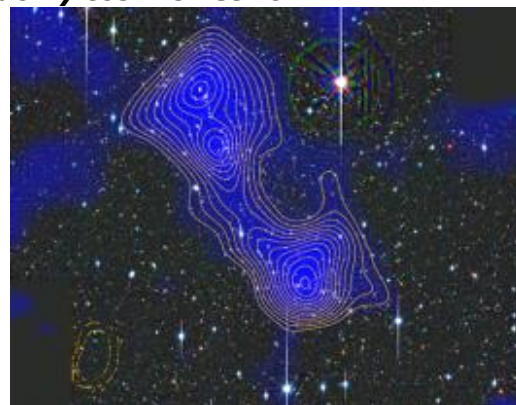
[http://www.sciencenews.org/view/generic/id/341985/title/Dark\\_matter\\_filament\\_illuminated](http://www.sciencenews.org/view/generic/id/341985/title/Dark_matter_filament_illuminated)

## **Dark matter filament illuminated**

### ***Astronomers visualize one connection in a shadowy cosmic network***

**By Devin Powell**

An invisible web thought to span the cosmos has now revealed one of its strands. That thread is spun of dark matter and connects two titanic clusters of galaxies, some of the most massive objects in the universe. Its discovery supports the idea that galaxy clusters grow at the intersections of such filaments, and its heft backs the claim that filaments hide more than half of all matter. "Filaments of dark matter have never been seen before," says Jörg Dietrich, an astronomer at the University Observatory Munich in Germany, whose team reports the finding online July 4 in *Nature*. "For the first time, we successfully mapped one."



*Contour lines outline an invisible dark matter filament connecting the galaxy clusters Abell 222 (bottom) and Abell 223 (top) in the night sky. The cosmic thread revealed itself by distorting light coming from distant galaxies. Credit: J. Dietrich/University Observatory Munich*

As the name suggests, dark matter is difficult to detect because it gives off no light or other radiation. The material's presence is typically inferred by measuring how its gravitational pull changes the motions of stars and galaxies. But look closely, and the shy matter can provide more direct evidence of its presence. Its gravity warps the fabric of spacetime and bends light passing nearby, so that more distant galaxies beyond the intervening dark matter appear distorted.

This lensing has already revealed dense clouds of dark matter kicked out of colliding galaxies. (SN Online: 3/06/12; SN: 8/26/06, p. 131) Filaments should likewise produce the fun house-like distortion. But since the dark matter in such structures isn't as dense as the clouds ejected by galactic smashups, the effect is much weaker. "With current telescopes ... it's very difficult to detect a filament," says Lindsay King, an astrophysicist at the University of Texas at Dallas.

To improve the odds of seeing one, Dietrich and colleagues focused on Abell 222/223, a pair of galaxy clusters that are close together and thus should be connected by a relatively massive filament. X-ray observations had already revealed a ribbon of hot gas between the clusters - the first hint of a dark matter link. Using the Subaru telescope in Hawaii, the researchers looked at light from distant galaxies passing through the space between the clusters. Sure enough, the distorted shapes of the galaxies revealed a thick cord of matter with a mass comparable to that of a small galaxy cluster. Gas can account for only about 9 percent of that mass. Dark matter seems to make up the rest.

The new study won't resolve the ongoing debate over the composition of dark matter; several candidate ingredients have been proposed. But understanding the structure of filaments could help to reveal their role in building galaxy clusters by funneling in gas or whole galaxies. "We're starting to connect the dots," says Meghan Gray, an astronomer at the University of Nottingham in England who wasn't involved in the study. "In the future I expect we will extend this and see more of these filaments."

<http://www.sciencedaily.com/releases/2012/07/120704182543.htm>

## **Printable, Electrically Conductive Gel With Unprecedented Electrical Performance Synthesized**

***Stanford researchers have invented an electrically conductive gel that is quick and easy to make, can be patterned onto surfaces with an inkjet printer and demonstrates unprecedented electrical performance.***

ScienceDaily - The material, created by Stanford chemical engineering Associate Professor Zhenan Bao, materials science and engineering Associate Professor Yi Cui and members of their labs, is a kind of conducting hydrogel -- a jelly that feels and behaves like biological tissues, but conducts electricity like a metal

or semiconductor. That combination of characteristics holds enormous promise for biological sensors and futuristic energy storage devices, but has proven difficult to manufacture until now.

The research recently appeared in the journal Proceedings of the National Academy of Sciences.

### **Printing Jell-O**

Bao and Cui made the gel by binding long chains of the organic compound aniline together with phytic acid, found naturally in plant tissues. The acid is able to grab up to six polymer chains at once, making for an extensively cross-linked network. "There are already commercially available conducting polymers," said Bao, "but they all form a uniform film without any nanostructures."

In contrast, the new gel's cross-linking makes for a complex, sponge-like structure. The hydrogel is marked with innumerable tiny pores that expand the gel's surface area, increasing the amount of charge it can hold, its ability to sense chemicals, and the rapidity of its electrical response.

Still, the gel can be easily manipulated. Because the material doesn't solidify until the last step of its synthesis, it can be printed or sprayed as a liquid and turned into a gel after it's already in place -- meaning that manufacturers should be able to construct intricately patterned electrodes at low cost.

"You can't print Jell-O," said Cui. "But with this technique, we can print it and make it Jell-O later."

### **Soft electrodes**

The material's unusual structure also gives the gel what Cui referred to as "remarkable electronic properties." Most hydrogels are tied together by a large number of insulating molecules, reducing the material's overall ability to pass electrical current. But phytic acid is a "small-molecule dopant" -- meaning that when it links polymer chains, it also lends them charge. This effect makes the hydrogel highly conductive.

The gel's conductance is "among the best you can get through this kind of process," said Cui. Its capacity to hold charge is very high, and its response to applied charge is unusually fast.

The substance's similarity to biological tissues, its large surface area and its electrical capabilities make it well suited for allowing biological systems to communicate with technological hardware.

The researchers envision it being used in everything from medical probes and laboratory biological sensors to biofuel cells and high-energy density capacitors. "And all it's made of are commercially available ingredients thrown into a water solution," said Bao.

The paper's first authors are Guihua Yu, a postdoctoral fellow in chemical engineering at Stanford, and Lijia Pan, a visiting scholar in chemical engineering from Nanjing University, China.

*Stanford's Precourt Institute for Energy funded the research.*

[http://www.eurekalert.org/pub\\_releases/2012-07/du-rfa070212.php](http://www.eurekalert.org/pub_releases/2012-07/du-rfa070212.php)

### **Researchers find a brain center for social choices**

***Although many areas of the human brain are devoted to social tasks like detecting another person nearby, a new study has found that one small region carries information only for decisions during social interactions.***

DURHAM, N.C. - Specifically, the area is active when we encounter a worthy opponent and decide whether to deceive them.

A brain imaging study conducted by researchers at the Duke Center for Interdisciplinary Decision Science (DCIDES) put human subjects through a functional MRI brain scan while playing a simplified game of poker against a computer and human opponents. Using computer algorithms to sort out what amount of information each area of the brain was processing, the team found only one brain region -- the temporal-parietal junction, or TPJ --- carried information that was unique to decisions against the human opponent.

Some of the time, the subjects were dealt an obviously weak hand. The researchers wanted to see whether they could watch the player calculate whether to bluff his opponent. The brain signals in the TPJ told the researchers whether the subject would soon bluff against a human opponent, especially if that opponent was judged to be skilled. But against a computer, signals in the TPJ did not predict the subject's decisions.

The TPJ is in a boundary area of the brain, and may be an intersection for two streams of information, said lead researcher McKell Carter, a postdoctoral fellow at Duke. It brings together a flow of attentional information and biological information, such as "is that another person?"

Carter observed that in general, participants paid more attention to their human opponent than their computer opponent while playing poker, which is consistent with humans' drive to be social.

Throughout the poker game experiment, regions of the brain that are typically thought to be social in nature did not carry information specific to a social context. "The fact that all of these brain regions that should be specifically social are used in other circumstances is a testament to the remarkable flexibility and efficiency of our brains," said Carter.

"There are fundamental neural differences between decisions in social and non-social situations," said D-CIDES Director Scott Huettel, the Hubbard professor of psychology & neuroscience at Duke and senior author of the study. "Social information may cause our brain to play by different rules than non-social information, and it will be important for both scientists and policymakers to understand what causes us to approach a decision in a social or a non-social manner.

"Understanding how the brain identifies important competitors and collaborators -- those people who are most relevant for our future behavior -- will lead to new insights into social phenomena like dehumanization and empathy," Huettel added.

*The study, supported by National Institutes of Health, appears in the July 6 Science.*

*CITATION: "A Distinct Role of the Temporal-parietal Junction in Predicting Socially Guided Decisions," R. McKell Carter, Daniel L. Bowling, Crystal Reeck, and Scott A. Huettel, Science, July 6, 2012. DOI 10.1126/science.1219681*

[http://www.eurekalert.org/pub\\_releases/2012-07/tum-fde070512.php](http://www.eurekalert.org/pub_releases/2012-07/tum-fde070512.php)

### **First direct evidence that elemental fluorine occurs in nature 200-year-long dispute over smelly mineral from Upper Palatinate resolved**

Fluorine is the most reactive chemical element. That is why it is not found in nature in its elemental form, but only in compounds, such as fluorite – that was the accepted scientific doctrine so far. A special fluorite, the "fetid fluorite" or "antozonite", has been the subject of many discussions for nearly 200 years. This mineral emits an intensive odor when crushed. Now, for the first time, scientists from the Technische Universitaet Muenchen (TUM) and the Ludwig-Maximilians-University Munich (LMU) have successfully identified natural elemental fluorine in this fluorspar. They report their results in the international edition of the scientific journal *Angewandte Chemie*.



*A special fluorite, the "fetid fluorite" or "antozonite," has been the subject of many discussions for nearly 200 years. This mineral emits an intensive odor when crushed. Now, for the first time, scientists from the Technische Universitaet Muenchen and the Ludwig-Maximilians-University Munich have successfully identified natural elemental fluorine in this fluorspar. They report their results in the international edition of the scientific journal Angewandte Chemie. Credit: Dr.*

*Rupert Hochleitner, Mineralogische Staatssammlung Muenchen*

Being the most reactive of all chemical elements fluorine calls for extremely careful handling. It is so aggressive that glass laboratory instruments cannot resist it and even bricks burn when exposed to fluorine gas. Yet elemental fluorine has numerous industrial applications including corrosion prevention or fuel tank diffusion barriers and it is used for the production of sulphur hexafluoride, which serves as insulating material in high voltage switches.

Because of its extreme properties, until now chemists were convinced that fluorine cannot occur in nature in its elemental form, but only as a fluoride ion, for instance in minerals such as fluorite ( $\text{CaF}_2$ ), also known as fluorspar. A certain variety of it, the so-called "fetid fluorite" or "antozonite" from the "Maria" mine in Woelsendorf in the Upper Palatinate (Germany), has been an object of contention in science for some 200 years. When crushed, it emits an unpleasant, pungent smell.

A number of eminent chemists, among them Friedrich Woehler (1800-1882) and Justus von Liebig (1803-1873), proposed various substances to explain the odor. Over the years, scientists resorted to olfactory tests, chemical analyses and complex mass spectrometer studies – coming to very different conclusions. Next to elemental fluorine, substances like iodine, ozone, phosphorus compounds, arsenic, sulphur, selenium, chlorine, hypochlorous acid and hydrofluorocarbons were made responsible for the smell. Direct evidence that this fluorspar has inclusions of fluorine and that the gas does not form during crushing was lacking hitherto. Now, finally, a scientific team led by Florian Kraus, head of the Fluorine Chemistry Work Group at the Department of Chemistry of the Technische Universitaet Muenchen, and by Joern Schmedt auf der Guenne, head of the Emmy-Noether Work Group for Solid State NMR at the Department of Chemistry of the Ludwig-Maximilians-University Munich, have succeeded in directly proving the presence of fluorine in "antozonite" beyond any doubt. Using  $^{19}\text{F}$ -NMR spectroscopy, they were able to identify the fluorine "in-situ", i.e. non-destructively in its natural environment, and thereby put an end to the long discussions about the cause for the odor of "stinking fluorspar".

"It is not surprising that chemists doubted the existence of elemental fluorine in fetid fluorite," explain the researchers. "The fact that elemental fluorine and calcium, which would normally react with each other at once, are found here side by side is indeed hard to believe." However, in the case of "antozonite" there are very

special conditions: The elemental fluorine is generated through minute uranium inclusions in the mineral, which constantly emit ionizing radiation and thus split the fluorite into calcium and elemental fluorine. The fluorine remains in minute inclusions, separated from the calcium by the non-reactive fluorite and thus retains its elemental form. The ionizing radiation also leads to the formation of calcium clusters, which give "antozonite" its dark color.

*Occurrence of Difluorine F<sub>2</sub> in Nature – In Situ Proof and Quantification, Joern Schmedt auf der Guenne, Martin Mangstl und Florian Kraus, Angewandte Chemie, Int. Ed. Early View, 4. Juli 2012, DOI: 10.1002/ange.201203515, Link: <http://onlinelibrary.wiley.com/doi/10.1002/ange.201203515/abstract>*

<http://www.sciencedaily.com/releases/2012/07/120705133918.htm>

**Simple Exercises Are an Easy and Cost-Effective Treatment for Persistent Dizziness**  
***A called on doctors to give patients with persistent dizziness a booklet of simple exercises, after research shows that it is a cost effective treatment for common causes of the condition***

ScienceDaily - A professor from the University of Southampton has called on doctors around the world to give patients with persistent dizziness a booklet of simple exercises, after new research has shown that it is a very cost effective treatment for common causes of the condition.

Lucy Yardley, who has been researching dizziness for many years, will urge GPs at the international WONCA conference July 5 to ensure that the booklet is translated so that patients of all nationalities can benefit. Professor Yardley's urgent appeal comes after her study, funded by the National Institute for Health Research (NIHR) and published in the British Medical Journal, revealed that the exercises, such as turning your head right to left and back again or nodding your head up and down, led to reduced dizziness within a matter of weeks of starting, and the benefits lasted for at least a year.

Dizziness is a common condition, especially among older people, but it can affect any age. It can interfere with people's daily activities and cause stress. It also increases the risk of falling and fear of falling, which in turn, can result in substantial further limitation of activity, injury, and healthcare costs.

Research has shown that an exercise-based treatment known as "vestibular rehabilitation" or "balance retraining" is the most effective means of treating dizziness related to inner ear problems (a very common cause of dizziness), however currently only about one in ten suitable patients are referred for this treatment.

During the study, which Professor Yardley is presenting at the WONCA conference, more than 300 participants were randomly allocated to receive either routine medical care (commonly just reassurance and medication to suppress dizziness symptoms), booklet based vestibular rehabilitation only, or booklet based vestibular rehabilitation with telephone support from a healthcare professional.

The majority of patients within the study, an NIHR Research for Patient Benefit project, suffered from dizziness due to an inner ear problem, however there were many patients who had undiagnosed dizziness.

Nearly twice as many patients who had the booklet and telephone support said they felt much better or totally well at the end of the study, compared with those who had routine care.

Even without any support, getting the booklet led to better recovery than routine care. Only 5 per cent of patients receiving the booklet with support reported worse symptoms at the end of the study, compared with 15 per cent of those receiving usual care.

Professor Yardley says: "Dizziness can be a frustrating and sometimes frightening condition. Many people are undiagnosed, have no treatment for it and just learn to live with it. This leads to a low quality of life and can have high healthcare costs. By being given something as simple as a booklet by their GP, that contains these simple head, neck and eye exercises, many patients will see real benefits in just a few weeks. These easy to understand exercises, which can be carried out at home, have the potential to improve the quality of life for thousands of people."

The University of Southampton worked with the Ménière's Society UK during the study. The Society supplied the exercise booklets used in the study and has been giving them to health professionals and members of the public for seven years.

Natasha Harrington-Benton, UK Director of the Society, comments: "Dizziness and balance disorders can be extremely debilitating and affect a person's quality of life. This study demonstrates the benefits of vestibular rehabilitation in helping people to manage the symptoms of their condition. We are pleased to be able to provide access to the exercise booklets for both patients and health professionals and, to-date, we have distributed over 8,000 copies."

*L. Yardley, F. Barker, I. Muller, D. Turner, S. Kirby, M. Mullee, A. Morris, P. Little. Clinical and cost effectiveness of booklet based vestibular rehabilitation for chronic dizziness in primary care: single blind, parallel group, pragmatic, randomised controlled trial. BMJ, 2012; 344 (jun06 1): e2237 DOI: 10.1136/bmj.e2237*

## Fertilizer for the Face?

***A RECENT Monday morning found me at Shizuka New York Day Spa in Midtown, getting the Geisha Facial, whose main ingredient is bird poop.***

**By ALIX STRAUSS**

The treatment, I was told by Asako Nunose, the aesthetician, originated centuries ago when Japanese entertainers damaged their skin from the high lead level in their white makeup. As a remedy, they used a mask containing nightingale droppings that had enzymes said to break down dead skin cells.

For this modernized hourlong version, which costs \$180, the excrement is sanitized under ultraviolet light, then mixed with rice bran, an exfoliant and brightener. Because the poop contains guanine, a nucleobase, it supposedly shines the skin as well.

I was calm as Ms. Nunose explained all of this while applying the poop powder, prepared and flown in from Japan. Then it brushed up against my lips and slipped into my mouth. I fought my desire to leave, and surprisingly the next morning my skin did glow. When it comes to fighting aging, many of us will try anything. “Though turning to animal ingredients isn’t the newest concept, it categorically popped out of nowhere,” said Jeanine Recckio, of Mirror Mirror Imagination Group, which forecasts beauty trends. “Consumers are gravitating toward their exotic or shock appeal.”

Some of these consumers are famous, like the Duchess of Cornwall and Gwyneth Paltrow, who have reportedly tried the Bee Venom mask, the creation of Deborah Mitchell, a beauty specialist. According to promotional literature, bee venom is said to freeze muscles, creating a Botox-like effect. And Mel Gibson has acknowledged using cow brains, or selegiline, a smelly yellow ointment that, in other forms, is used to treat Parkinson’s disease and depression. In his case, he has said that “it cleans the neurotransmitters and sharpens mental focus.” According to Karen Grant, vice president and global beauty analyst of the NPD Marketing Group, cosmeceutical brands, which include biologically active ingredients like those derived from animals, were the fastest-growing segment of the prestige skin-care market in 2011. Perhaps this is because some people trying high-tech ingredients (like peptides or StriVectin) or stem-cell technology or even purportedly natural and organic products have been disappointed. “People discovered organic didn’t always mean organic, and marketed naturals could be harmful to one’s skin,” said Dr. Joshua Zeichner, director of cosmetic and clinical research in the dermatology department at Mount Sinai Hospital in New York. “Animal extracts are a new way of treating the skin, while offering a new definition of natural.”

Over the next several months, creatures like snails, bees and worms will inch their way from the great outdoors to human skin.

Wrinkle Butter with earthworm complex, a cream derived from earthworm excrement, went on the market at the end of December. An appearance on the show “The Doctors” increased sales, said Wayne Perry, the entrepreneur who invented it (as well as Sinus Buster, a popular nasal spray derived from chile peppers). The cream is sold in almost 500 health-food stores nationwide, and more earthworm-based products are planned. And in May, after Sonya Dakar’s synthetic-snake-venom face cream became a best seller in 2009, Nate Dakar, the original company’s founder, released MicroVenom Daily Defense SPF 30 for the face and body. The product contains Syn-Ake, a synthetic snake venom that, according to the label, offers results similar to Ms. Mitchell’s bee mask. And last month, Dermelect Cosmeceuticals introduced its ME collection of anti-aging nail lacquers, an extension of its well-selling treatment line. The six polishes contain ProSina, a protein-peptide derived from New Zealand sheep’s wool, which, the company says, closely resembles protein found in nails. “For many, a plant or a completely organic product isn’t satisfactory to women who want healing properties and a solution to their problems,” said Amos Lavian, founder of Dermelect Cosmeceuticals, who said he got the idea for the sheep’s wool from reading the New Zealand Journal of Medicine.

Drug companies have strict testing guidelines and different protocols from over-the-counter cosmetics. “We have very little data to know if those cosmetics work,” Dr. Zeichner said. “Perhaps all they do is moisturize. But these animal ingredients have some medical research behind them. All we can do is to wait and see how well they work.” Masque\*ology, a new mask-based skin-care line developed in South Korea, whose Cell Renewal Mask contains snail secretion, recently arrived at Sephora. “I’d been searching for an animal-extract product for a few years, but couldn’t find one that seemed legit,” said Carolyn Bojanowski, Sephora’s director of skin-care merchandising. Independent vendors with homegrown concepts don’t have conglomerates behind them, she said, “which can mean they don’t have testing or stability, so the product can be sketchy.”

After a week of smearing snail secretion and snake and bee venom - the worm poop was a bit too hard to commit to - over my face and body, my pores looked slightly smaller, and my skin felt marginally softer and

moisturized. It wasn't the visual transformation I was hoping for - I still require Botox for the massive crease in my forehead - but I didn't break out either.

And this kind of stuff is a great conversation starter - for after dinner, of course.

<http://news.discovery.com/space/what-if-particle-is-not-higgs-120706.html>

### **What If the New Particle Isn't the Higgs Boson?**

***There are subtle indications that the particle may not, in fact, be the Higgs.***

**Content provided by Natalie Wolchover, Life's Little Mysteries**

Physicists at the Large Hadron Collider (LHC) say they've discovered a new "Higgs-like" particle: a bundle of energy that has most of the trappings of the long-sought Higgs boson. They're not naming the newcomer outright, because there are subtle indications that the particle may not, in fact, be the plain old Higgs itself, but rather a close doppelganger.

Don't let that disappoint you. To the contrary, Harvey Newman, a high-energy physicist at the California Institute of Technology and a member of the Compact Muon Solenoid (CMS) experiment (one of two LHC experiments that discovered the new particle), said finding a more exotic variety of Higgs boson is actually "one of the most exciting things that can happen." Here's why.

The Higgs field, with its corresponding Higgs boson, was predicted to exist as the simplest explanation of why all the elementary particles in the universe have mass. In short, the Higgs field is a cosmos-size swimming pool, and everything is swimming in it. Particles that interact strongly with the Higgs field, "like a heavyset man swimming with his clothes on," in the words of John Gunion, a physicist at the University of California at Davis, are heavier than particles that breeze through the pool "like an Olympic swimmer in a wetsuit."

One Higgs swimming pool (and one corresponding Higgs boson - a sort of splash in the pool) is enough to impart mass to all the particles in the Standard Model: the standard theory describing the known elementary particles and the forces acting between them. But the Standard Model is not the whole story.

"It's simple and powerful, but we know it can't be the complete theory," Newman told Life's Little Mysteries. Believing in the Standard Model "would be like believing in Newton's laws of motion." The laws assume that space and time are separate and immutable entities. This is fine for describing the movements of slow and low-mass objects, but the laws break down for objects approaching the speed of light, or for black holes, which bend space and time. "Newton's laws are beautifully simple and describe so much, but we know it's not the fundamental theory, just the low-energy limit of a more fundamental theory" - that is, Einstein's theory of relativity, which seems to describe space-time exactly. "It's the same thing here. We know there must be a more fundamental theory than the Standard Model."

The Standard Model is incomplete, Newman said, because it doesn't account for the particles that make up 84 percent of the matter in the universe: the invisible substance known as dark matter. It also fails to incorporate gravity. Furthermore, the Standard Model treats matter and its oppositely-handed twin, antimatter, as if they are symmetrical, and so it doesn't account for why there is so much more matter than antimatter in the universe. And lastly, when you try to project the Standard Model to higher energies like those that existed in the early moments of the universe, "the theory essentially falls in on itself," Newman said.

The leading theory that places the Standard Model within a more powerful, all-encompassing framework is called supersymmetry, or SUSY. According to SUSY (which is incorporated into string theory), all the known particles have much heavier supersymmetric partners, known as sparticles. Not only does SUSY predict the existence of dark matter particles, it is also able to explain particle interactions at very high energies, like those just after the Big Bang. What's more, SUSY may account for nature's strange preference for matter over antimatter: It requires there to be at least five superimposed swimming pools in place throughout the universe, which could have a built-in asymmetry (like a giant counterclockwise whirlpool), giving rise to a surplus of matter. Those five swimming pools are Higgs fields, each with a Higgs-like boson.

When generated in a particle collider like the LHC, each Higgs-like boson would be expected to decay into a unique set of lighter particles. It appears that the newfound particle at the LHC decayed in a way that the run-of-the-mill Standard Model Higgs would not have, the physicists said - although more data is needed before they'll know for certain what kind of Higgs they've got. But if the particle is, in fact, a more exotic Higgs, then it could be a SUSY Higgs, or at least a non-Standard Model Higgs. And this would be the first discovery of physics beyond the Standard Model.

"The Higgs sector particle not being the simplest Higgs boson would be the first indication that, yes, there is new physics out there. And that would provide tremendous momentum to the whole field," Gunion said, referring to the "sector" or group of possible Higgs particles.

Newman echoed the sentiment: "Overall, we have this tremendous view in front of us."

[http://www.eurekalert.org/pub\\_releases/2012-07/gsoa-zrp070612.php](http://www.eurekalert.org/pub_releases/2012-07/gsoa-zrp070612.php)

## **Zebrafish reveal promising mechanism for healing spinal cord injury**

***A scientist is studying the mechanisms of spinal cord repair in zebrafish, which, unlike humans and other mammals, can regenerate their spinal cord following injury***

BETHESDA, MD - Yona Goldshmit, Ph.D., is a former physical therapist who worked in rehabilitation centers with spinal cord injury patients for many years before deciding to switch her focus to the underlying science.

"After a few years in the clinic, I realized that we don't really know what's going on," she said.

Now a scientist working with Peter Currie, Ph.D., at Monash University in Australia, Dr. Goldshmit is studying the mechanisms of spinal cord repair in zebrafish, which, unlike humans and other mammals, can regenerate their spinal cord following injury. On June 23 at the 2012 International Zebrafish Development and Genetics Conference in Madison, Wisconsin, she described a protein that may be a key difference between regeneration in fish and mammals.

One of the major barriers to spinal regeneration in mammals is a natural protective mechanism, which incongruously results in an unfortunate side effect. After a spinal injury, nervous system cells called glia are activated and flood the area to seal the wound to protect the brain and spinal cord. In doing so, however, the glia create scar tissue that acts as a physical and chemical barrier, which prevents new nerves from growing through the injury site.

One striking difference between the glial cells in mammals and fish is the resulting shape: mammalian glia take on highly branched, star-like arrangements that appear to intertwine into dense tissue. Fish glia cells, by contrast, adopt a simple elongated shape – called bipolar morphology – that bridges the injury site and appears to help new nerve cells grow through the damaged area to heal the spinal cord.

"Zebrafish don't have so much inflammation and the injury is not so severe as in mammals, so we can actually see the pro-regenerative effects that can happen," Dr. Goldshmit explained.

Studies in mice have found that mammalian glia can take up the same elongated shape, but in response to the environment around the injury they instead mature into scar tissue that does not allow nerve regrowth.

Dr. Goldshmit and her colleagues have focused on a family of molecules called fibroblast growth factors (Fgf), which have shown some evidence of improving recovery in mice and humans with spinal cord damage. The Monash University group found that Fgf activity around the damage site promotes the bipolar glial shape and encourages nerve regeneration in zebrafish.

Preliminary results in mice show that Fgf injections near a spinal injury increase both the number of glia cells at the site and the elongated morphology. Their evidence suggests that Fgfs may work to create an environment more supportive of regeneration in mammals as well and could be a valuable therapeutic target.

Spinal injury patients usually have few options, Dr. Goldshmit emphasized, and development of new, biologically-based approaches will be critical. "This is a nice example of how we can use the zebrafish model," she said. "When we learn from the zebrafish what to look at, we can find things that give us hope for finding therapeutic approaches for spinal cord injury in humans."

[http://www.eurekalert.org/pub\\_releases/2012-07/sdsu-ktf062812.php](http://www.eurekalert.org/pub_releases/2012-07/sdsu-ktf062812.php)

## **Keeping the flu away**

***A new discovery from SDSU's Donald P. Shiley BioScience Center finds the synthetic protein EP67 helps kick-start the immune system, preventing the flu***

San Diego State University researchers at the Donald P. Shiley BioScience Center may have found the secret to helping the immune system fight off the flu before it gets you sick.

A new study published today in the Public Library of Science journal PLoS ONE, finds that EP67, a powerful synthetic protein, is able to activate the innate immune system within just two hours of being administered.

Prior to this study, EP67 had been primarily used as an adjuvant for vaccines, something added to the vaccine to help activate the immune response. But Joy Phillips, Ph.D. a lead author of the study with her colleague Sam Sanderson, Ph.D. at the University of Nebraska Medical Center, saw potential for it to work on its own.

"The flu virus is very sneaky and actively keeps the immune system from detecting it for a few days until you are getting symptoms," Phillips said. "Our research showed that by introducing EP67 into the body within 24 hours of exposure to the flu virus caused the immune system to react almost immediately to the threat, well before your body normally would."

Because EP67 doesn't work on the virus but on the immune system itself, it functions the same no matter the flu strain, unlike the influenza vaccine which has to exactly match the currently circulating strain. Phillips said while this study focuses on the flu, EP67 has the potential to work on other respiratory diseases and fungal infections and could have huge potential for emergency therapeutics. "When you find out you've been exposed

to the flu, the only treatments available now target the virus directly but they are not reliable and often the virus develops a resistance against them," Phillips said. "EP67 could potentially be a therapeutic that someone would take when they know they've been exposed that would help the body fight off the virus before you get sick." It could even be used in the event of a new strain of infectious disease, before the actual pathogen has been identified, as in SARS or the 2009 H1N1 influenza outbreak, Phillips said.

Right now, the testing has been done primarily in mice by infecting them with a flu virus. Those that were given a dose of EP67 within 24 hours of the infection didn't get sick (or as sick) as those that were not treated with EP67. The level of illness in mice is measured by weight loss. Typically, mice lose approximately 20 percent of their weight when they are infected with the flu but mice treated with EP67 lost an average of just six percent. More importantly, mice who were treated a day after being infected with a lethal dose of influenza did not die, Phillips said. She said there are also huge implications for veterinary applications, since EP67 is active in animals, including birds.

Future research will examine the effect EP67 has in the presence of a number of other pathogens and to look closer at exactly how EP67 functions within different cells in the body.

<http://arstechnica.com/science/2012/07/new-record-for-faking-data-set-by-japanese-researcher/>

**New record for faking data set by Japanese researcher**  
***Anesthesiologists published 212 papers; only 3 clearly fraud-free.***  
**by John Timmer - July 7 2012, 1:13am TST**

The Fukushima report isn't the only interesting one to come out of Japan this week. The Retraction Watch blog has been following the case of one Dr. Yoshitaka Fujii from Toho University's medical school, who has published extensively in the field of anesthesia. Unfortunately, however, it seems that Dr. Fujii has not bothered to perform extensive research to create those publications. Toho University has now published the results of an investigation into Fujii's work, and found that the vast majority of the underlying "data" was simply made up. Of 212 papers credited to the researcher, the investigation only found clear indications of supportive data for three. At least 172 of the rest are clearly based on fabricated data. Fujii apparently claimed his studies were all double-blind and performed at multiple institutions, factors that would make tracking down the underlying data more challenging. And, to make sure he had indications of collaborators at other institutions, he simply forged their signatures on papers he submitted.

Fujii slipped through the cracks partly because there was no obvious responsible party. The fraudulent results were spread across dozens of journals, contained authors from multiple institutions, and probably involved diverse sources of funding. Things only came to a head when the editors of the journal *Anesthesia* hired an outside consultant to investigate instances of Fujii's work where problems were obvious for all to see: some of his published findings only had a one-in-1033 chance of being based on real data.

Assuming all of the fraudulent papers get retracted, Fujii will set a new record for the most retractions ever, more than doubling his closest competitor. At Retraction Watch, where they follow these issues closely, they're pondering whether anesthesia itself has a problem. Of over 2,000 papers that have been retracted over the last four decades, a full 13 percent have involved anesthesiologists.

<http://phys.org/news/2012-07-dogs-deeply-humans.html>

**Dogs may mourn as deeply as humans do**

***Experts say many canines exhibit clear signs of grief when their owner or animal housemate dies.***

HealthDay - Jon Tumilson's dog, Hawkeye, was an important part of his life.

And, as it turns out, Tumilson was an important part of Hawkeye's life.

After the Navy SEAL was killed in Afghanistan last summer, more than a thousand friends and family attended the funeral in Rockford, Iowa, including his "son" Hawkeye, a black Labrador retriever who, with a heavy sigh, lay down in front of Tumilson's flag-draped casket. There, the loyal dog stayed for the entire service.

Hawkeye's reaction to his owner's death generated a lot of buzz online and in the media. But it's not unusual, according to pet experts, for some dogs to mourn the loss of a favorite person or animal housemate.

Grief is one of the basic emotions dogs experience, just like people, said Dr. Sophia Yin, a San Francisco-based veterinarian and applied animal behaviorist. Dogs also feel fear, happiness, sadness, anger, as well as possessiveness.

Dogs who mourn may show similar signs to when they're separated for long periods of time from the individual they're bonded to, she said. Of those signs, depression is the most common, in which dogs usually sleep more than normal, move slower, eat less and don't play as much.

The beginnings of such a strong inter-species bond between humans and dogs dates back some 15,000 years, when early man and the ancestor of today's dog roamed the Earth together.



Today, after thousands of years of friendship, there's a great deal of attunement between humans and dogs, not only in terms of comprehension of each other's gestures and body language but also emotionally, said Barbara King, a professor of anthropology at the College of William & Mary in Williamsburg, Va.

It's not just evolutionary logic, or reading peer-reviewed science literature that's convinced King that dogs (as well as cats) feel deep grief. Interviews with astute pet owners for her upcoming book, *How Animals Grieve*, and the power of observation, has also led her to this conclusion.

Case in point: a grainy video posted on YouTube that captured the image of a scruffy terrier running onto a busy highway in Chile to rescue another dog, hit moments earlier, by a car. As vehicles whiz by the terrier, he instinctively wraps his paws around the injured dog, dragging him off the road to safety.

"When you look at that sort of example, again, you see that these dogs are thinking and feeling creatures, and that sets the stage for grief," she said.

Through her research, King has found that in households with two dogs who've lived together for a number of years, some owners report that when one dog dies, the other gets depressed. Skeptics might point to a change in daily routine as the cause of depression or, perhaps, because the owner is upset and grieving. But King feels differently.

"The surviving dog is searching around the house for a lost companion -- looking in favorite places, going to places that they spent with their friend, very pointed actions that tell you the dog is missing his friend," she said. In an effort to understand what dogs are thinking, researchers at Emory University in Atlanta are conducting brain scans of dogs using functional MRI (fMRI).

Gregory Berns, director of the Emory Center for Neuropolicy and lead researcher on the project, hopes their work will reveal secrets of the dog-human relationship, from the dog's perspective.

Even with high-tech tools, though, determining whether canines experience grief would be tough, he admitted, because he believes it's unknown how grief looks in the human brain. If it were known, however, Berns said researchers could then look for this emotion in the dog but it would require showing pictures, perhaps movies, of the deceased human or canine.

"It would be fascinating to figure out," said Berns, who normally uses fMRI technology to study how the human mind works. "If I were to speculate, I would guess that, like people, some dogs mourn and others don't." King agrees. After all, she said, dogs possess unique personalities and react differently, even in the same situation. Whether a dog grieves hinges on a dynamic mix of life experiences, added King, including how they were raised and what their people or animal housemates were like.

If a pet mopes around the house after the death of a canine or human companion, Yin suggests the best thing owners can do is to get their dog's mind off the loss by engaging their pet in fun activities such as a game of fetch, brisk walks and play dates with other pets. "The activity depends on what the dog historically likes," she said. Don't expect a quick fix. It may take anywhere from a few weeks to a few months, pet experts believe, before a dog's spirits begin to lift.

<http://www.sciencedaily.com/releases/2012/07/120706164344.htm>

### **Epigenetic Cause of Osteoarthritis Identified**

***U.K. scientists discovered a signature epigenetic change responsible for switching on and off a gene that produces an enzyme that is known to play a role in the destruction of joint cartilage***

ScienceDaily - In what could be a breakthrough in the practical application of epigenetic science, U.K. scientists used human tissue samples to discover that those with osteoarthritis have a signature epigenetic change (DNA methylation) responsible for switching on and off a gene that produces a destructive enzyme called MMP13. This enzyme is known to play a role in the destruction of joint cartilage, making MMP13 and the epigenetic changes that lead to its increased levels, prime targets for osteoarthritis drug development. In addition to offering a new epigenetic path toward a cure for osteoarthritis, this research also helps show how epigenetic changes play a role in diseases outside of cancer.

This finding was recently published online in the FASEB Journal.

"As the population gets older, osteoarthritis presents increasing social and economic problems," said David A. Young, Ph.D., a researcher involved in the work from the Musculoskeletal Research Group at the Institute of Cellular Medicine at Newcastle University in Newcastle upon Tyne in the United Kingdom. "Our work provides a better understanding of the events that cause cartilage damage during osteoarthritis and provides hope that tailored drug development to prevent the progress of disease will improve the quality of life and mobility of many arthritis sufferers."

To make the discovery, Young and colleagues compared the extent to which DNA methylation was different in cartilage from patients suffering from osteoarthritis and healthy people of similar age. They found that at one

small position, the gene for MMP13 had less DNA methylation in diseased patients. Then they confirmed that reduced methylation of this gene increases levels of the destructive enzyme MMP13.

"We've already seen how epigenetics has advanced our approach to cancer. Now we're seeing it with other diseases and even exercise." said Gerald Weissmann, M.D., Editor-in-Chief of the FASEB Journal. "This study not only lays the groundwork for a new understanding of osteoarthritis, but also shows that the old 'either/or' nature v. nurture argument is outdated: epigenetics teaches us that nature (the daily wear and tear of joints) regulates nurture (the genes in our cartilage) to cause arthritis."

*C. Bui, M. J. Barter, J. L. Scott, Y. Xu, M. Galler, L. N. Reynard, A. D. Rowan, D. A. Young. cAMP response element-binding (CREB) recruitment following a specific CpG demethylation leads to the elevated expression of the matrix metalloproteinase 13 in human articular chondrocytes and osteoarthritis. The FASEB Journal, 2012; 26 (7): 3000 DOI: 10.1096/fj.12-206367*

<http://www.bbc.co.uk/news/science-environment-18751374>

### **How Tepco glossed over Fukushima's vulnerability**

***The devastating conclusion that Japan's Fukushima nuclear meltdown was an accident waiting to happen has grabbed the headlines.***

But the investigation has also unearthed worrying questions about the catastrophe and its human cost that deserve attention. Buried in the main body of the official report are new insights into how events unfolded and how as many as 60 local residents died as a result of the muddled response.

Most coverage has rightly focused on the finding that the meltdown was a "man-made disaster" caused by unhealthy collusion between the power company Tepco and the government regulators meant to oversee it. That condemnation is all the more powerful when one thinks of the disaster's implications: a national spasm of fear, genuine concern that the reactors were dangerously out of control and a human legacy in which thousands of people are still living as refugees.

Last September I saw for myself the ghostly scenes in Tomioka, one of the towns inside the 20km (12 miles) exclusion zone, evacuated so rapidly that doors were left unlocked and prized animals were forgotten in the rush to escape.

Now the analysis by the investigating commission suggests that the original account of what went wrong may have glossed over crucial facts - and that the power station was far more vulnerable than previously admitted.

#### **Damning conclusion**

To understand the significance of this, one needs to recall the basic storyline put out by Tepco and the authorities in the wake of the crisis in March last year. According to their account, the power plant survived the massive earthquake unscathed (which suggested that the company was adequately prepared) and only came unstuck when the tsunami turned out to be far larger than anticipated (implying that no-one could possibly have expected such an event). What crippled the reactors, in this narrative, was the sheer size of the great wave that overwhelmed the sea defences and flooded the diesel generators meant to provide backup power.

The attraction of that official account was that it purported to show that the reactors and their buildings were robust and that it was only the freakishly vast scale of the tsunami that was to blame.

But in the months after the accident, various figures questioned whether this picture was too convenient.

A few reports surfaced about possible damage inside the reactor buildings before the wave hit - in other words, the tremors had had an impact on the supposedly safe power plant - but official sources gave these allegations short shrift.

Now though, this comprehensive and very frank report for the Japanese parliament says Tepco was "too quick to cite the tsunami as the cause of the nuclear accident" and that "there is a possibility that the earthquake damaged equipment necessary for safety".

Specifically, the report confirms that:

*the tremors were strong enough to cause damage and that seismic checks to the reactors, ordered before the disaster, had not been carried out*

*a minor loss of coolant in the system "from a crack in the piping" might have occurred but not been detected for as long as 10 hours*

*emergency backup power may have been lost before the tsunami hit the plant. Tepco and the government had reported the wave's arrival at Fukushima not when it actually reached the shore line but when it passed monitoring stations 1.5km offshore, and the difference in timing could be crucial to determine what caused the power to fail*

*several Tepco workers in Reactor building 1 - the oldest of the structures - witnessed a water leak which the commission believes was "not due to water sloshing from the spent fuel pool", implying it might have come from cracked pipework*

In the investigation's view, all this adds up a damning conclusion: that blaming the wave - not the earthquake - was "an attempt to avoid responsibility".

### **Inadequate monitoring**

Further revelations, tucked into an appendix at the back of the report, concern the response to the disaster and its human impact.

The investigators accuse the authorities of being "negligent" in preparing for a disaster and of failing to tell local residents what was happening.

A detailed survey found that only 20% of people closest to the plant knew about the accident when the first evacuation was ordered and most residents within 10km were only told the next day.

Of the people in Tomioka, the town I saw abandoned, less than 20% started moving on the day of the accident. "Many residents," the report says, "had to flee with only the barest necessities and were forced to move multiple times or to areas with high radiation levels."

In one of the sharpest indictments, the investigators describe a picture of radiation monitoring so inadequate that people were sometimes moved from their homes into greater danger.

Although high radiation levels were found up to 30km from the plant, the authorities failed to tell people there and only moved them a full month later.

As many as 70% of people in five small towns had to move no fewer than four times.

The report relates how "hospitals and nursing homes in the 20km zone struggled to secure evacuation transportation and find accommodations".

And it highlights how this created a situation that went far beyond inconvenience and discomfort: "60 patients died in March from complications related to the evacuation".

### **'Fukushima 50'**

Comments gathered from local people provide a moving glimpse of the confusion and fear that prevailed, including this one from a resident of Tomioka:

"We had no clue what was going on but we were told to evacuate to Kawauchi.

When we got there, we had to move from place to place and finally arrived at Miharu but we were told that it was full. We were told to go to the evacuation centre in Motomiya.

We later moved several times after that and are currently staying in a rental in Iwaki. Since then one year has passed but we have no idea of what we are going to do."

But if conditions were bad for local people, spare a thought for the workers inside the plant. There, too, the report discloses a pattern of poor training, a lack of preparedness and an absence of official concern.

Staggeringly, only 10% of subcontractors who were dealing with the disaster had received any kind of advance explanation about the possibility of an accident.

One employee described a nightmare scenario of knowing very little and then effectively being abandoned:

"No information whatsoever about the station blackout was delivered to the end-workers like us. I had to learn about the emergency evacuation orders for residents within 20km of the plant from TV.

"My employer knew there were several employees like me staying in the main anti-earthquake building.

However, the company's managing director, deputy managing director and radiation protection supervisor all evacuated with their families.

"We found that the company car we were planning to use had been taken by Tepco employees, but a colleague gave us a ride."

Another employee told the commission: "I don't think there was much attention paid to the workers who actually dealt with the accident."

At the time there was worldwide admiration for the bravery of the "Fukushima 50" - the selfless workers who agreed to stay behind to work in the most dangerous parts of the complex.

But another - more realistic - side to that story becomes apparent in the testimony of a subcontractor.

He said: "On the news it was reported that the plant workers who were dealing with the accident were prepared to die, but I was watching the news, thinking that there is no way we were ready to die."

As Japan weighs whether to resume its reliance on nuclear power, all this evidence is highly relevant - whether the plants can withstand earthquakes, whether the authorities really are checking them, and whether local people are kept properly informed.

The fact remains that no-one has died of radiation poisoning from Fukushima. But the disaster has left a legacy of disrupted lives and distrust.

[http://www.eurekalert.org/pub\\_releases/2012-07/wuso-uti070512.php](http://www.eurekalert.org/pub_releases/2012-07/wuso-uti070512.php)

## **Urinary tract infections steal from hosts' defense arsenals**

***Humans have known for centuries that copper is a potent weapon against infection.***

New research shows that the bacteria that cause serious urinary tract infections "know" this, too, and steal copper to prevent the metal from being used against them. Blocking this thievery with a drug may significantly improve patients' chances of fighting off infections, according to researchers at Washington University School of Medicine in St. Louis. The findings appear online July 8 in *Nature Chemical Biology*.

In the United States alone, annual treatment costs for urinary tract infections are estimated to run as high as \$1.6 billion. Most urinary tract infections are caused by *Escherichia coli* (*E. coli*).

"While some patients are able to clear these infections without issue, in others the infection persists or recurs despite antibiotic therapy," says senior author Jeff Henderson, MD, PhD, assistant professor of medicine and of molecular microbiology. "In some cases, the infection spreads to the kidney or the blood and becomes life-threatening. We've been investigating what's different about the bacteria that cause these more troublesome infections."

Scientists have known for years that *E. coli* makes a molecule called yersiniabactin that takes iron from host cells. The bacteria need the iron to grow and reproduce. In earlier research, Henderson found that the *E. coli* that cause serious infections are more likely to make yersiniabactin. This finding and the fact that *E. coli* already produce another molecule that steals iron led Henderson and Kaveri Chaturvedi, a student in his laboratory, to suspect that the bacterium might be using yersiniabactin for other purposes.

To test the theory, the researchers put yersiniabactin in urine samples from healthy patients. They found the molecule bound iron as expected but also picked up copper. Next, they conducted the same analysis in samples from patients with urinary tract infections who were treated at the University of Washington in Seattle.

"We found copper bound to yersiniabactin in nearly every patient whose bacteria made the molecule," Henderson says. "Yersiniabactin was often bound to copper more than it was to iron." When researchers put *E. coli* in the same test tube with copper, the bacteria that made yersiniabactin were more likely to survive. Copper's microbe-fighting properties were recognized long before scientists had described the microbes that cause infection. Ancient Greeks and Egyptians knew that treating wounds with copper improved the healing process. Modern researchers have two explanations for copper's anti-microbial effects: the metal can stimulate production of other chemically reactive molecules that damage bacteria; and it is also directly toxic to the bacteria.

Henderson, who treats patients with urinary tract infections at Barnes-Jewish Hospital, is currently studying whether the presence or absence of yersiniabactin can help physicians assess an infection's chances of becoming more serious. He and his colleagues are also looking at other disease-causing bacteria that make yersiniabactin to see if they use it in a fashion similar to the *E. coli* that cause urinary tract infections.

*Chaturvedi KS, Hung CS, Crowley JR, Stapleton AE, Henderson JP. The siderophore yersiniabactin bids copper to protect pathogens during infection. Nature Chemical Biology, July 8, 2012.*

*Funding from the Burroughs-Wellcome Fund and the National Institutes of Health (K12 HD001459-09, AI 07172, HL101263, DK64540, DK082315, RR024992, RR00954, GM103422-35, DK20579 and DK56341) supported this research.*

<http://www.bbc.co.uk/news/magazine-18735544>

## **The 'Viagra' transforming local economies in India**

***A rare fungus some are calling Indian Viagra is starting to transform local economies in the Himalayas.***

**By Craig Jeffrey Indian Himalayas**

But some of those harvesting it are now having to arm themselves to protect what has become a valuable cash crop. There is a fungus that attacks caterpillars in the Indian Himalayas. People in north India call it kira jari. In neighbouring Tibet it is known as yarsagumba. The fungus mummifies its prey and then grows out of the top of the dead caterpillar's head. It appears above ground just as the snow melts in May or June.

In China, kira jari is used as an aphrodisiac. Athletes have used it as a performance-enhancing drug. For villagers in the Indian Himalayas it is a source of income. During the last five years they have begun to collect the caterpillar fungus and sell it to local traders. These middlemen, in turn, sell the fungi to businesspeople in Delhi and it travels on from there to Nepal and China.



When sold in the village, a single fungus fetches 150 Indian rupees (about £2 or \$3) - more than the daily wage of a manual labourer. Some people are able to collect 40 in a single day. So the search for caterpillar fungus has come to resemble a type of Himalayan gold rush.

I have spent the past few months in the Indian Himalayas doing research on youth and social change. I lived in the village of Bemni, located at about 10,000 feet (3,000m) near the Indian border with Tibet.

Much of our time was spent trying to understand the changing economy of the village, and kira jari featured heavily in our interviews.

Take Prem Singh, a 24-year-old man in the village known for his restless energy and appetite for hard work. Prem spent the first two weeks of May in high altitude snowfields collecting kira jari. He went on his own, carrying rice, wheat and daal on his back, camping in a cave on the way, and eventually pitching camp 5,000 metres up. He found nothing during the first three days.

But then his luck changed. He returned to Bemni with 200 fungi stuffed into old sweet jars. He is using his earnings to construct a new house, an impressive two-storey structure built out of local stone.

Kira jari, and the money it earns, is big news for Bemni. Young men have generally been looking outside the village for opportunities to make money in cities down in the plains. They have worked in hotels, in the army, and in some of the new service industries emerging in urban India. Kira jari is reversing this process somewhat. Since 2007, when villagers learnt about the fungus, vast numbers now head not to the big cities but to the high altitude meadows. People joke that the meadows - formerly the preserve of intrepid goatherds - have become small towns of tents, stoves, and clothes' lines. As Prem told us, "Why would I migrate to Delhi to work in a hotel when I can earn in two weeks what I'd make in Delhi in two years?"

But there is a dark side to fungus collection, too.

Some villagers return with nothing to show for their weeks in high altitude snow fields. Many fall ill. Searching for the fungus involves lying on your front, elbows dug into the scree and snow, scouring the ground in front of you for nothing larger than the stalk of an apple. It is freezing cold, there is a howling wind, and your lungs ache.

People often return to the village with snow-blindness, painful joints, and problems breathing. One person died recently as a result of the altitude. Another man fell into an ice crevasse and was only rescued by villagers 13 days later - he had lived on drips from the glacier. (Apparently he is back collecting kira jari this year).

The fungus business is also generating rivalries. There are two villages that are at loggerheads over access to a high-altitude meadow where kira jari is especially abundant. They have to carry guns on their trips for the fungus.

There are other risks, too. It is legal to collect the fungus but not legal to sell it. Two years ago, a confidence trickster arrived in Bemni and promised people he could get a very good price for their crop. He disappeared with people's fungi and has never returned. Because kira jari is part of the black market, the villagers could not complain.

Last year young men from the village tried to sell their fungi in a local town. Someone in the village tipped off the local police who intercepted the young men on the road and seized the entire fungus crop.

Imagine the heartbreak as they trooped back to the village. The men had nothing to show for weeks in the bitter cold, while the police no doubt profited from their booty.

But people seem to take these risks in their stride. As Prem said to us, "You have got your risky work and your safe work. Kira jari is the risk, local manual labour is the safe option." For the time being, India's home-grown version of Viagra has become a decent gamble. And no, I haven't tried it.

<http://phys.org/news/2012-07-american-japan.html>

### **American praised for getting Japan radiation data**

#### ***Japanese seeking radiation information after the Fukushima disaster turn to a group that has created a detailed visual database online***

AP - Japanese seeking information on radiation levels in the aftermath of the Fukushima disaster are turning to a volunteer group founded in the U.S. that has created a detailed and constantly updated visual database online. Sean Bonner, a Los Angeles resident, computer expert and one of the founders of the group called Safecast, said nothing could have been more natural than to jump in and fill the need for information after the March 2011 earthquake and tsunami caused reactor meltdowns at the Fukushima power plant in northeastern Japan. Many Japanese were terrified about the health effects of radiation, especially for children, and worried whether their homes, schools and offices were safe. They were also frustrated by the lack of government or other official data on radiation. Geiger counters were selling out.

Within weeks, Bonner and his team created a handmade Geiger counter connected with a GPS feature that he calls "bGeigie," a reference to Japanese-style "bento" lunchboxes. It is attached to cars and takes a reading every five seconds, resulting in a massive store of data. There are 30 to 35 such mobile devices traversing Japan and 320 fixed devices.

Safecast made the technology and the data open, sharing the design and findings, and has now collected more than 3 million measurements across Japan. Other volunteers have developed online maps with the data.

"There was no data that was available anywhere, and we were rather surprised," Bonner said during a trip to Japan last week to meet with volunteers. "We realized that we could help." Safecast says it is currently focused on Japan but would like to provide data on a global level.

Over the last year and a half, Safecast, billed as "a global sensor network for collecting and sharing radiation measurements to empower people with data about their environments," has grown. It has won grant funding, including The John S. and James L. Knight Foundation, has collected donations and works with Japanese universities. Local governments in Fukushima are also linking up with Safecast to get additional readings, such as in schools, and sharing data with residents. More volunteers are joining, including Europeans, Japanese and other nationalities.

The latest prototype, now as small and elegant as a cellphone, is on its way to becoming a commercial product from major U.S. Geiger counter-maker International Medcom, later this year. Although the government and some scientists had radiation data, they were not as quick as Bonner to go to the Japanese people.

In one case, the Japanese government kept secret its radiation projection data, which had accurately shown wafts of radiation heading northwestward from Fukushima Dai-ichi nuclear plant, far outside the neat 20-kilometer (12-mile) circle defined by government evacuation orders. That kind of secrecy got people unnecessarily exposed, including those who evacuated right into the path of spewing radiation.

The secrecy and the mistrust of the government it has created in the Japanese public, along with officials prone to flip-flopping on their remarks, have helped boost Safecast's popularity.

Toshikatsu Watanabe, who heads a marketing company in Fukushima, is grateful to Safecast. "When you don't know, you become afraid," said Watanabe, who has measured not only his home and office but schools and other places in his neighborhood. "I can only do what I can, and we don't know for sure if the radiation is going to have a bad effect or what," he said. "The people of Fukushima are trying to cope, day by day, and it's a long road ahead."

Besides the regular Geiger counter, Safecast uses relatively simple technology. Yet Safecast filled a critical need in post-disaster Japan. And it did so simply by quick thinking and quick action, bringing people from various countries together.

Safecast is careful not to take sides on whether Japan should stick with nuclear power or abandon it, to preserve its reputation for objective data, unclouded by suspicions they may be manipulated to back one side or the other. Sometimes, people who were getting ready to move found they had been unnecessarily alarmed after examining Safecast data, and stayed. With data, people can make better decisions, said Bonner.

"Everything is radioactive all the time, but nobody was paying any attention to it," he said, referring to the low natural background levels of radiation present everywhere. "Most of us have no point of reference for what radiation is." *More information: Online: Safecast: [blog.safecast.org/](http://blog.safecast.org/)*