

## **Sigmon's Study Examines Caffeine Withdrawal**

Ever miss your daily cup of coffee and subsequently get a pounding headache? According to reports from consumers of coffee and other caffeinated products, caffeine withdrawal is often characterized by a headache, fatigue, feeling less alert, less energetic and experiencing difficulty concentrating. Stacey Sigmon, Ph.D., research associate professor of psychiatry at the University of Vermont College of Medicine and colleagues at Johns Hopkins School of Medicine sought to investigate the biological mechanisms of caffeine withdrawal in a paper published recently in the online edition of the scientific journal *Psychopharmacology*. They looked at brain electrical activity and blood flow during caffeine withdrawal to examine what was taking place physiologically during acute caffeine abstinence, including the likely mechanism underlying the common "caffeine withdrawal headache."

The group examined caffeine's effects in a double-blind study, which involved the administration of caffeine and placebo capsules. Each participant's response to the caffeine or placebo was measured using three different measures - brain electrical activity via electroencephalogram (EEG); blood flow velocity in the brain via ultrasound; and participants' self-reports of subjective effects via questionnaires.

The team demonstrated that stopping daily caffeine consumption produces changes in cerebral blood flow velocity and quantitative EEG that are likely related to the classic caffeine withdrawal symptoms of headache, drowsiness and decreased alertness. More specifically, acute caffeine abstinence increased brain blood flow, an effect that may account for commonly reported withdrawal headaches. Acute caffeine abstinence also produced changes in EEG (increased theta rhythm) that has previously been linked to the common withdrawal symptom of fatigue. Consistent with this, volunteers reported increases in measures of "tired," "fatigue," "sluggish" and "weary." Overall, these findings provide the most rigorous demonstration to date of physiological effects of caffeine withdrawal.

The researchers also discovered a provocative and somewhat unexpected finding - that there were no net benefits associated with chronic caffeine administration.

"In addition to looking at caffeine withdrawal, this rigorous design also permitted comparison of chronic caffeine maintenance with chronic placebo maintenance, which provides unique information about the extent to which there are net beneficial effects of daily caffeine administration," said Sigmon, who is first author on the study. "In contrast to what most of us coffee lovers would think, our study showed no difference between when the participant was maintained on chronic placebo and when the participant was stabilized on chronic caffeine administration. What this means is that consuming caffeine regularly does not appear to produce any net beneficial effects, based on the measures we examined."

*Co-authors on the study, which was a collaboration between Sigmon and Roland Griffiths, Ph.D., at the Johns Hopkins University School of Medicine, include Griffiths, as well as Ronald Herning, Warren Better and Jean Cadet of the National Institute on Drug Abuse's Molecular Neuropsychiatry section.*

## **Women live longer, not better, largely because of obesity and arthritis**

CHICAGO – Obesity and arthritis that take root during early and middle age significantly contribute to women's decreased quality of life during their senior years, according to researchers at Duke University Medical Center.

In a study that included 5,888 people over 65, women suffered up to two and a half times more disabilities than men of the same age.

Higher rates of obesity and arthritis among these women explained up to 48 percent of the gender gap in disability – above all other common chronic health conditions.

"While women tend to live longer than men, this study shows that they are at greater risk of living with disability and much of the excess disability is attributable to higher rates of obesity and arthritis," said Heather Whitson, M.D., assistant professor of medicine and lead investigator of the study presented today at the Annual Scientific Meeting of the American Geriatrics Society. "This is important because it suggests that women's tendency to pack on extra pounds in their child-bearing and peri-menopausal years translates into loss of independence in their old age."

Researchers said the study is the first to isolate the impact of specific chronic health conditions on the difference in disability rates between older men and women. While many people are studying how chronic conditions affect mortality, the investigators were surprised to see the extent to which these conditions explained the gender difference in disability.

"The reason for this discrepancy in disability has not been well understood but we found that chronic health conditions that women experience in greater numbers than men may explain part of that gap," said Harvey Jay Cohen, M.D., the study's senior author, chair of the Department of Medicine and director of Duke's Center for the Study of Aging and Human Development.

"Women have a natural tendency to gain more weight than men over the lifespan, but may be more motivated to maintain a healthy weight if they realize that those extra pounds make it more likely that they will be disabled in later years - potentially becoming a burden to their children or requiring a nursing home," Whitson said.

The current study is an analysis of the Cardiovascular Health Study which asked participants about their ability to conduct common activities of daily living, such as grooming, eating, getting dressed, managing money and upper and lower body movement, including reaching, grasping, walking and climbing stairs.

The Duke team said the study also draws attention to two concerning health trends that could worsen the average quality of life for women in the future. First, as the rate of obesity continues to rise, the rates of disability in older adults are expected to increase. To the extent that women are more likely than men to develop obesity, the obesity epidemic will have its greatest impact on older women's quality of life.

Second, the investigators note that women are gaining equality with men on cardiovascular disease, stroke and emphysema, which had previously been less common among women. Rates of cardiovascular disease are not improving as quickly among women as they are among men and smoking-related disease is becoming more common in women. If the occurrence of these conditions becomes more comparable between men and women, the result would be an even wider gap in disability rates.

"The findings of our study are more troubling when you consider the increasing rates of obesity among women and the higher rates of other conditions that are currently over-represented among men," Cohen said. "We need to help women make better decisions earlier in life."

In addition to obesity and arthritis, the study found the women were more likely than men to experience fractures, vision problems and bronchitis. Men were more likely to have emphysema, coronary heart disease, congestive heart failure, stroke, diabetes and hearing problems.

Researchers say that the next step is to determine whether older women who have been disabled by obesity or arthritis regain function if they undergo treatment to help them achieve a healthy weight or to control their arthritis pain. If not, then it becomes even more important to focus efforts on preventing obesity and arthritis in younger populations.

*Study co-authors include Drs. Lawrence L. Landerman, Anne B Newman, Linda P. Fried and Carl F. Pieper. The research was supported by National Institutes of Health, University of Pittsburgh Claude D. Pepper Older Americans Independence Center, John A. Hartford Center for Excellence, Duke Claude D. Pepper Older American Independence Center, a John A. Hartford Foundation Geriatrics Outcomes Research Award and Paul B. Beeson Career Development Award.*

### **Narcolepsy is an autoimmune disorder, Stanford researcher says**

STANFORD, Calif. - Ten years ago, Stanford University School of Medicine scientist Emmanuel Mignot, MD, PhD, and his colleagues made headlines when they identified the culprit behind the sleep disorder narcolepsy. Now Mignot and his collaborators have shown for the first time that a specific immune cell is involved in the disorder - confirming experts' long-held suspicion that narcolepsy is an autoimmune disease.

The work, which will be published online May 3 in *Nature Genetics*, could lead to better treatments for the sleep disorder and help immunologists understand other, more common autoimmune diseases, such as multiple sclerosis and juvenile diabetes.

"We're now getting the main pieces of what's happening in narcolepsy," said Mignot, a Howard Hughes Medical Institute investigator who has been studying the disease for more than two decades. "What's most satisfying to me is that we're bringing this story to a close and that we can use narcolepsy as a model for other diseases."

Narcolepsy affects about one in 2,000 people and is characterized by daytime drowsiness, irregular sleep at night and cataplexy - a sudden loss of muscle tone and strength. Mignot and others showed in the late 1990s that the disease stems from a lack of hypocretin, a hormone that promotes wakefulness; they later showed that narcoleptics are missing brain cells that produce this hormone.

Mignot and others believe that the body's immune system plays a role in killing hypocretin-making cells, primarily because of scientific literature showing a link between narcolepsy and a variant for the human leukocyte antigen, or HLA, gene. The immune system uses HLAs to differentiate between "self" cells and foreign cells (and attacks those presented as foreign), and most autoimmune diseases are associated with variants of HLA. In recent studies, more than 90 percent of narcolepsy patients were shown to carry one such variant.

"For a long time, people have suspected narcolepsy had something to do with the immune system - that it was killing cells that produce hypocretin," said Mignot, a professor of psychiatry and behavioral sciences and director of Stanford's Center for Narcolepsy. "But there hasn't been direct proof."

During this study, the researchers ran whole-genome scans - which allow for the analysis of hundreds of thousands of genetic variations - of 1,800 people carrying the same HLA gene variant. Of the group, 800 had narcolepsy, and the goal was to find what differentiated these people from control subjects. The team found that a specific variation of a gene belonging to T cells - specialized immune cells that play a role in all immune responses - was present in narcolepsy.

Because T cells are involved, Mignot believes the mechanism behind narcolepsy stems from the immune system. "Our discovery clearly shows narcolepsy is an autoimmune disease," he said.

"This is a very important finding," said Merrill Mitler, PhD, a sleep disorders expert and program director at the National Institute of Neurological Disorders and Stroke, who was not involved in the study. "It puts in place another piece of the puzzle and shows a way to link [this gene variant] to hypocretin-containing neurons via an autoimmune attack."

Mignot said it's likely that HLA and this T cell variant interact in a way that kills hypocretin cells. How exactly this interaction is triggered is not yet known, and he said future studies will focus on solving this mystery. Once more details emerge, he said, scientists may be able to identify people who are predisposed to narcolepsy and block specific gene variants in that person to stop the development of the disease.

In the meantime, Mignot expects the findings to aid researchers studying other autoimmune diseases. No other autoimmune disease has shown an association with this specific T cell gene, he noted.

"I'm sure immunologists are going to be very excited," said Mignot of the findings. "If we can work out what happens specifically in patients with narcolepsy, we'll be able to better understand the role of T cells in other autoimmune diseases that are more complicated and difficult to detect."

*The work was primarily funded by NINDS. The co-first authors are Juliette Faraco, PhD, and Joachim Hallmayer, MD; other Stanford co-authors are Ling Lin, MD, PhD; Minae Kawashima, PhD, and Mali Einen.*

### **Late motherhood boosts family lifespan**

#### **Same genes linked to longevity and births after age 45**

SALT LAKE CITY – Women who have babies naturally in their 40s or 50s tend to live longer than other women. Now, a new study shows their brothers also live longer, but the brothers' wives do not, suggesting the same genes prolong lifespan and female fertility, and may be more important than social and environmental factors.

"If women in your family give birth at older ages, you may well have a chance of living longer than you would otherwise," says the study's lead author, demographer Ken R. Smith, a professor of family and consumer studies at the University of Utah. "If you have a female relative who had children after age 45, then there may be some genetic benefit in your family that will enhance your longevity."

For descendants of the Utah and Quebec pioneers studied, "you may be able to look at the ages when your female ancestors gave birth – rather than just their longevity – in estimating how long you may live," says Smith, whose study will be published online May 4 and in the June 10 print issue of the *Journal of Gerontology: Biological Sciences*.

The researchers examined high-quality genealogical records from the Utah Population Database at the University of Utah with its records of 1.6 million Utah Mormon pioneers and their descendants. They also used the University of Montreal's Program on Demographic History Research, which has records on 400,000 people who lived in heavily Catholic Quebec between 1608 and 1850.

Specifically, the study involved the records of 11,604 Utah men who were born between 1800 and 1869 and who had at least one sister who lived at least to age 50; and the records of 6,206 Quebec men who lived between 1670 and 1750, and had at least one sister who lived to 50 or older. The key findings:

Women who had "late fertility" – a birth at age 45 or older – were 14 percent to 17 percent less likely to die during any year after age 50 than women who did not deliver a child after age 40. That confirmed earlier studies. But those studies did not determine if the women gave birth later and lived longer because of genes or because of social and environmental factors such as good nutrition or healthy living.

Brothers who had at least three sisters, including at least one sister who gave birth at age 45 or later, were 20 percent to 22 percent less likely to die during any year after age 50 than brothers who had no "late fertile" sisters. That indicates what earlier studies did not, namely, the same genes may influence the lifespan of both sexes and women's ability to give birth at older ages.

The brothers' wives didn't have longer lives, suggesting any environmental or social factors that influence lifespan had only a weak influence, and that genes may explain why brothers lived longer when they had a sister who gave birth in her 40s. The study didn't address how much longevity is due to genetics, but Smith says scientists believe genes account for up to 25 percent of differences in longevity.

Smith conducted the study with two other University of Utah researchers: Richard Cawthon, a research associate professor of human genetics, and demographer Geraldine Mineau, a research professor and director of

population sciences at the university's Huntsman Cancer Institute, where Smith also is an investigator. Other coauthors were demographer Alain Gagnon and sociologist Ryan Mazan of the University of Western Ontario, and demographer Bertrand Desjardins, of the University of Montreal.

### **Good Genes Versus a Good Environment**

Smith says that during the last decade, "there have been several studies that show a number of species, including humans, are able to reproduce late without medical intervention – and those females live longer." Other studies found that late menopause also is associated with women having prolonged fertility and longevity.

"There is a genetic component to longevity, especially for living to very old ages," Smith says. "The new thing here is what most evolutionary biologists long have argued: that survival and reproduction are intrinsically linked to one another. So the novel finding in this paper is discovering this link in humans before modern contraception."

But he says the link between late motherhood and longevity "could be something that is not inherited. It could be good nutrition or really good living, suggesting that if you are a healthier mom you live longer."

That is why the researchers looked at the lifespan of the brothers of women who had babies late, and of those brothers' wives. The wives are not blood relatives, so genetic factors shared by sisters and brothers wouldn't be the same in the brothers' wives.

Smith says the study focused on the longevity of brothers rather than sisters of late-fertile women because "men's own reproductive history doesn't get in the way of assessing the role of their female relatives' fertility."

The study focused on the two pioneer groups not only because of the quality of the data but because of the absence of modern birth control and an unfavorable attitude toward natural family planning methods by Mormons and Catholics. Also, a link between late fertility and lifespan is easier to observe in large families with more sisters.

Since all of those studied are now dead, the researchers could look at the full length of their fertile periods and lives. "Not many data sets could do this," Smith says.

The researchers controlled for various factors that could skew the results. For example, they excluded any individuals who did not live to at least 50 because a husband's death at a younger age would influence his wife's child-bearing.

### **Late Babies Linked to Longer Life for Moms and Blood Uncles**

The study confirmed earlier research showing that women who have babies late tend to live longer.

Compared with women who had their last baby before age 41, Utah pioneer women who had their last baby at age 41 to 44 were 6 percent less likely to die during any given year past age 50, and Utah pioneer women who had their final birth at age 45 or older were 14 percent less likely to die during any given year after age 50.

In other words, imagine woman A had her last baby at age 35, woman B had her last baby at 42 and woman C had her last baby at 46. Then at age 52 – or any other age past 50 – woman B would be 6 percent less likely to die than woman A, and woman C would be 14 percent less likely to die than woman A.

In Quebec, slightly different age groups were analyzed. Compared with younger mothers, women who had their last child between ages 42 and 44½ were 6 percent less likely to die during any given year past age 50, and women who had their last child at age 44½ or older were 17 percent less likely to die during any given year past age 50.

By looking at the brothers of women who had children late, the study suggests the same age-slowness genes may be responsible for both prolonged fertility in women and longer lifespan in both sexes. The effects of late fertility were strongest for brothers with at least three sisters because the larger the number of sisters, the more likely it is at least one will give birth in middle age.

So in the Utah group, brothers with three or more sisters – at least one of whom gave birth at age 45 or older – were 20 percent less likely to die during any given year after age 50 than men without late-fertile sisters.

In Quebec, brothers with three or more sisters – at least one of whom gave birth at age 44½ or older – were almost 23 percent less likely to die during any single year after age 50 than men without sisters who gave birth late.

It is possible social and environmental reasons – good water, good nutrition, a healthy environment – could explain why the brothers and their late-birthing sisters had longer lives. So the researchers also examined the longevity of the brothers' wives.

They found no increase in lifespan, indicating that heredity – far more than environmental factors – played a role in the prolonged fertility and longer lives of the women, and the longer lives of their brothers.

Smith says the new findings do not conflict with one of his earlier studies finding that having larger families reduced parents' lifespan. Both findings can operate together.

## **Study: Furniture tip-over injuries rising**

### **41 percent increase in number of children injured; nearly 15,000 ER visits yearly**

(COLUMBUS, Ohio)- Although most parents do not consider furniture and televisions to be dangerous, children are often injured when these items tip over. A recent study conducted by the Center for Injury Research and Policy of The Research Institute at Nationwide Children's Hospital found that from 1990-2007 an average of nearly 15,000 children younger than 18 years of age visited emergency departments annually for injuries received from furniture tip-overs.

According to the study, published in the online issue of *Clinical Pediatrics* in May, most furniture tip-over-related injuries occurred among children younger than 7 years of age and resulted from televisions tipping over. More than one quarter of the injuries occurred when children pulled over or climbed on furniture. Children ages 10-17 years were more likely to suffer injuries from desks, cabinets or bookshelves tipping over. Head and neck injuries were most common among younger children, while children older than 9 years were more likely to suffer injuries to the lower body.

Despite warnings from the U.S. Consumer Product Safety Commission, the number of injuries involving televisions and other furniture tipping over onto children has increased in this country since the early 1990s.

"There was a more than 40 percent increase in the number of injuries during the study period, and the injury rate also significantly increased during these years," said study senior author Gary Smith, MD, DrPH, director of the Center for Injury Research and Policy at Nationwide Children's Hospital. "This trend demonstrates the inadequacy of current prevention strategies and underscores the need for increased prevention efforts."

Parents can minimize risks to children by placing televisions low to the ground and near the back of their stands and strapping televisions and furniture to the wall with safety straps or L-brackets. Purchasing furniture with wide legs or with solid bases, installing drawer stops on chests of drawers and placing heavy items close to the floor on shelves will also help prevent tip-overs. Additionally, parents can reduce a child's desire to climb furniture by not placing attractive items, such as toys or the remote control, high on top of furniture or the television.

"Pediatricians and child caregivers should be aware that furniture tip-overs are an important source of childhood injury," said Dr. Smith, also a faculty member of The Ohio State University College of Medicine. "Following a few simple prevention steps will decrease the number of injuries to children associated with furniture tip-overs."

Data for this study were collected from the National Electronic Injury Surveillance System (NEISS), which is operated by the U.S. Consumer Product Safety Commission. The NEISS dataset provides information on consumer product-related and sports and recreation-related injuries treated in hospital emergency departments across the country.

## **Study: Furniture tip-over injuries rising**

(COLUMBUS, Ohio) - As you sit down to watch TV with your child, you might want to rethink how safe your child is in front of that TV set. A new study says kids being injured by falling furniture - such as TVs, bookcases and dressers - is up significantly.

Sitting down together to watch TV is routine for most families, but for the Stevensons, it's a reminder of a scary situation. Recently Michael and his sister, Julianne were in a bedroom watching TV when they both decided to climb the dresser. In an instant, everything fell and their mother rushed in to find a 40-pound television had crashed onto the head of her 3 year-old son.

"I think the part that scared her the most was blood coming out of one ear, and then, you know - I don't know if I could describe what it's like, but - to see one side of his face not moving," says Shawn Stevenson, Michael's father.

The TV fractured Michael's skull in two places, leaving him temporarily deaf on one side and his face paralyzed on the other. A new study finds injuries like this happen much more often than you might think.

"Each year in this country, almost 15,000 children are treated in hospital emergency departments for injuries related to furniture tip-overs," says Gary Smith, MD of Nationwide Children's Hospital in Columbus, Ohio.

Dr. Smith says, while dressers and book cases are a risk, most of the time it is TVs that fall on kids.\* Television sets have gotten much bigger over the years, and many older models are front heavy, which makes them tip much easier. In his study - published online for the *Journal of Clinical Pediatrics*, Dr. Smith found that between 1990 and 2007, the number of kids injured by furniture tip overs increased by more than 40%.\* Smith says securing larger pieces of furniture to the wall with straps or brackets is crucial. There are also other steps parents can take to prevent these injuries.

"Never put attractive items such as a toy or a TV remote control on top of the furniture, on top of the TV. Children often will try to climb up to reach those and that will cause the furniture to topple over onto them," advises Smith.

Most of the kids who are hurt are like Michael Peterson - most are boys, less than seven years old and most suffer blows to the head.\* Michael has almost fully recovered and suffered no permanent damage.

In all, this study found that between 1990 and 2007 more than 260,000 kids ended up in the emergency department and more than 300 were killed by falling furniture.\*

Experts say flat screen TVs are lighter, but no less dangerous. Many flat screens are still very heavy to young children and have sharp edges that can cut them.

*References: \*Injuries from Furniture Tip-overs Among Children and Adolescents in the United States, 1990-2007, Clinical Pediatrics, May 2009.*

### **Delirium may cause rapid cognitive decline in Alzheimer's disease**

ST. PAUL, Minn. – Alzheimer's disease patients who develop delirium, a sudden state of severe confusion and disorientation, are significantly more likely to experience rapid cognitive decline than Alzheimer's patients who didn't experience delirium, according to research published in the May 5, 2009, print issue of *Neurology*®, the medical journal of the American Academy of Neurology.

"Delirium is a potentially preventable condition," said study author Tamara G. Fong, MD, PhD, with Harvard Medical School in Boston, and a member of the American Academy of Neurology. "Hopefully future studies can determine whether preventing delirium may improve or delay memory problems in Alzheimer's disease patients."

For the study researchers tested the memory, thinking, and concentration skills of 408 Alzheimer's disease patients at the beginning of the study and every six months for at least a year and a half. During that time, 72 of the study participants developed delirium.

The study found that the rate of cognitive decline was three times faster in Alzheimer's patients who had an episode of delirium compared to those who did not. "Our study suggests that over 12 months, Alzheimer's disease patients who become delirious experience the equivalent of a 18-month decline in thinking and memory skills compared to those who do not experience delirium," said Fong.

Among patients who developed delirium, the average decline on cognitive tests was 2.5 points per year at the beginning of the study, but after an episode of delirium there was further decline to an average of 4.9 points per year.

Delirium often follows a medical disturbance or complication, such as infection, medication side effects or surgery. It's estimated that delirium occurs in up to 89 percent of Alzheimer's disease patients during hospitalization. Fong says that delirium in elderly patients should be avoided for many other reasons. "For example, delirium greatly increases the risk of serious complications in hospitalized patients," she said. "Alzheimer's patients need to be monitored more closely for delirium, and prevention strategies could be used such as avoiding medications that have delirium as a potential side effect and treating patients as outpatients where possible to avoid hospitalization."

*The study was supported by the Massachusetts Alzheimer's Disease Research Center, the National Institute on Aging, the Alzheimer's Association and a VA Rehabilitation Career Development Award.*

### **Glowing band aid to zap skin cancer**

\* 04 May 2009 **by Jon Evans**

THE humble sticking plaster is getting a high-tech upgrade. As well as simply patching up small cuts and grazes, plasters embedded with light-emitting diodes could be used to treat skin cancer in combination with light-sensitive drugs.

Polymertronics, based in Banbury, UK, is developing the plasters, which are impregnated with a series of organic light-emitting diodes (OLEDs). The light plasters are designed for use in photodynamic therapy, in which light-sensitive drugs are applied to the skin as a cream. When you shine red light on the area it activates the drugs, which destroy the tumour as they soak through the skin.



*Plasters embedded with light-emitting diodes could be used to help treat skin cancer (Image: Polymertronics Ltd)*

At the moment, expensive lamps and lasers supply the red light for photodynamic therapy, and so the treatment can only be performed in hospitals. The light plasters could allow people with skin cancer to treat themselves at home, says Stephen Clemmet, CEO of Polymertronics. "We're looking at developing a faster, cheaper, easier way to treat skin cancer."

OLEDs emit light when a voltage is applied to them. The company has developed a way to print square clusters of battery-powered red OLEDs, each 4 millimetres square, onto a strip of flexible plastic. The pattern of OLEDs exactly matches the shape of the patient's tumour. The plaster is then placed over the tumour, allowing the red light to be targeted directly at the cancerous tissue.

The company has shown that its OLEDs are able to destroy a range of cancer cells in the laboratory, and will soon begin human trials of the light-emitting plasters. It presented the devices at a meeting on polymer electronics in London on 21 April, and hopes to launch them commercially within two years.

Another UK company, Lumicure, a spin-off from the University of St Andrews, is working on a similar OLED-plaster, also for treating skin cancer.

### **Memory grows less efficient very early in Alzheimer's disease**

#### ***When learning new things, people with emerging symptoms find it harder to separate what's important from what's not***

WASHINGTON - Even very early in Alzheimer's disease, people become less efficient at separating important from less important information, a new study has found.

Knowing this, clinicians may be able to train people in the early stages of Alzheimer's to remember high-value information better, according to a report in the May issue of *Neuropsychology*, published by the American Psychological Association.

Remembering what's most important is central to daily life. For example, if you went to the grocery store but left your shopping list at home, you'd at least want to remember the milk and bread, if not the jam. Or, when packing for a trip, you'd want to remember your wallet and tickets more than your slippers or belt.

Participants in the study were recruited from the Washington University in St. Louis Alzheimer's Disease Research Center. They included 109 healthy older adults (average age of almost 75), 41 people with very mild (very early) Alzheimer's disease (average age of almost 76), 13 people with mild (early) Alzheimer's (average age of almost 77), and 35 younger adults (all 25 or under, average age of almost 20).

The researchers asked participants to study and learn neutral words that were randomly assigned different point values. When asked to recall the items, participants were asked to maximize the total value. All participants, even those with Alzheimer's, recalled more high-value than low-value items. However, the Alzheimer's groups were significantly less efficient than their healthy age peers at remembering items according to their value. It meant they no longer maximized learning and memory, which in healthy people are fairly efficient processes.

The authors speculated that Alzheimer's disease makes it harder for people to encode what they learn in a strategic way. Because encoding is the first step in long-term memory, this affects their ability to remember things according to their value.

The findings also demonstrate that value-directed learning stays intact in healthy aging. Older adults might not remember as much as younger adults, but when healthy, they remain able to distinguish what's important.

This research suggests the potential for improved memory training. People with early-stage Alzheimer's might remember important information better by learning to be more strategic and selective when encoding high-value information, even though it comes at the expense of neglecting less-important information, the authors said.

*Article: "Memory Efficiency and the Strategic Control of Attention at Encoding: Impairments of Value-Directed Remembering in Alzheimer's Disease," Alan D. Castel, PhD, University of California, Los Angeles; David A. Balota, PhD, Washington University in St. Louis; and David P. McCabe, PhD, Colorado State University; Neuropsychology, Vol. 23, No. 3.*

### **More compressions, fewer interruptions lead to higher cardiac arrest survival**

#### **Study highlights:**

- \* Survival rates for sudden cardiac arrest patients increased when professional rescuers focused on minimizing interruptions to chest compressions during CPR.

- \* Compression rate was increased to 50 compressions followed by two breaths.

- \* Rescuers delayed other interventions, such as intubation and IVs, until enough compressions had been given.

DALLAS, May 4, 2009 - Survival rates from out-of-hospital sudden cardiac arrest almost doubled when professional rescuers using cardiopulmonary resuscitation (CPR) gave better chest compressions and minimized interruptions to them, according to research reported in *Circulation: Journal of the American Heart Association*.

"It's a back-to-basics message. Even with professional rescuers, starting IVs and delivering medications can take a back seat to good quality chest compressions," said Alex G. Garza, M.D., M.P.H., lead author of the study and an emergency medicine physician at Washington Hospital and associate professor of emergency medicine Georgetown University School of Medicine in Washington, D.C.

Garza's study tracked results from changes in resuscitation protocols implemented by the Kansas City Emergency Medical Services (EMS) in 2006. The Kansas City EMS put the highest priority on hands-on time to provide chest compressions with limited interruptions. Rescuers performed 50 chest compressions before pausing to provide two breaths. (American Heart Association guidelines call for 30 compressions followed by two breaths.) Other changes included the rescuers delaying intubating the patient and administering medications.

Overall survival from out-of-hospital cardiac arrest increased from 7.5 percent to 13.9 percent after the EMS department made the changes to its resuscitation practices.

***Comparing the 36 months prior to the protocol shift with the 12 months afterwards, the researchers also found:***

\* Of patients whose cardiac arrest was witnessed by bystanders and who were initially in ventricular fibrillation, the success of resuscitation in restoring a heartbeat and getting the patient to the hospital alive improved from 37.8 percent (54 of 143) to 59.6 percent (34 of 57 patients).

\* Of patients whose cardiac arrest was witnessed by bystanders and who were in ventricular fibrillation, survival to hospital discharge rose from 22.4 percent (32 of 143) to 43.9 percent (25 of 57).

\* Of the 25 discharged patients, 88 percent scored well on measures of brain function.

"It takes five to seven chest compressions to raise the pressure enough to begin driving blood into the heart tissue," Garza said. "If you stop too often to provide a couple of breaths, then you haven't helped the heart much and you have to start building pressure all over again."

Nearly 300,000 sudden cardiac arrest (SCA) victims are treated by EMS in the United States each year, according to the American Heart Association. SCA is an abrupt loss of heart function; it usually occurs after the heart's electrical impulses become rapid or erratic, preventing the heart from effectively pumping blood.

"In that five- to 10-minute period after an SCA, a lot of evidence shows that if you do chest compressions to keep blood going to the heart muscle, defibrillation is far more likely to work," Garza said.

*Co-authors are: Matthew C. Gratton, M.D.; Joseph A. Salomone, M.D.; Daniel Lindholm, E.M.T.P., M.I.C.T.; James McElroy, E.M.T.P., M.I.C.T.; and Rex Archer, M.D., M.P.H. Individual author disclosures can be found on the manuscript.*

### **Sea urchin digging teeth are designed to stay sharp**

Sea urchins dig themselves hiding holes in the limestone of the ocean floor using teeth that don't go blunt. Weizmann Institute scientists have now revealed their secrets, which might give engineers insights into creating ever-sharp tools or mechanical parts.

The urchins dig holes to fit their globular bodies using their five teeth, which, like those of rodents, are ground down at the tip but continue to grow on the other end throughout the animals' lives. The amazing part, however, is that the teeth, which need to be harder and stronger than the rocky limestone being dug out, are themselves made almost entirely of calcite – the same calcite that makes up much of the limestone. How is this possible?

In a series of studies spanning more than a decade, Profs. Steve Weiner and Lia Addadi of Weizmann's Structural Biology Department have discovered that the urchins' secret lies in a combination of ingenious design strategies. The latest of these studies, conducted with postdoctoral fellow Yurong Ma and graduate student Yael Politi and in collaboration with Prof. Pupa Gilbert and Dr. Rebecca Metzler of the University of Wisconsin, Drs. Barbara Aichmayer, Oskar Paris and Peter Fratzl from the Max Planck Institute of Colloids and Interfaces in Potsdam, Germany, and Dr. Anders Meibom from Museum National D'Histoire Naturelle in Paris, France, was reported recently in the Proceedings of the National Academy of Sciences (PNAS), USA.

The scientists found that the sea urchins' teeth contain crystals of magnesium calcite, which are smaller, harder and denser than those of pure calcite; they are concentrated at the grinding tip of the tooth, particularly in the tip's center, where the most force is being exerted in the course of grinding. What holds these crystals at the center of the tip is a matrix of larger and softer calcite crystals. While in most such materials a matrix of hard fibers contains a softer filling, the reverse is true for the urchins' tooth: a matrix of relatively soft calcite fibers holds the harder magnesium calcite crystals, which allows these crystals to spread over the entire surface of the tooth. The presence of magnesium calcite crystals acts like sand paper that helps to grind the rock down.

In the latest study, the researchers used X-ray photoelectron emission spectromicroscopy and other high-resolution imaging methods to uncover yet another amazing structural feature of sea urchin tooth design. They found that all the crystalline elements that make up the tooth are aligned in two different arrays, and that these arrays are 'interdigitated,' or interlocked like the fingers of folded hands, just at the tip of the tooth where most of the wear occurs. The scientists believe that interlocking produces a notched, serrated ridge resembling that of a carpenter's file. This ridge is self-sharpening: as the tooth is being ground down, the crystalline layers break in such a way that the ridge always stays corrugated.

*Prof. Lia Addadi's research is supported by the Clore Center for Biological Physics; the Ilse Katz Institute for Material Sciences and Magnetic Resonance Research; the Helen and Martin Kimmel Center for Nanoscale Science; the Helen and*



Milton A. Kimmelman Center for Biomolecular Structure and Assembly; and the Carolito Stiftung. Prof. Addadi is the incumbent of the Dorothy and Patrick Gorman Professorial Chair.

Prof. Stephen Weiner's research is supported by the Kekst Family Center for Medical Genetics; the Helen and Martin Kimmel Center for Archaeological Science; the Helen and Milton A. Kimmelman Center for Biomolecular Structure and Assembly; and the estate of George Schwartzman. Prof. Weiner is the incumbent of the Dr. Walter and Dr. Trude Borchardt Professorial Chair in Structural Biology.

For the scientific paper, please see: <http://www.pnas.org/content/106/15/6048.full?sid=39c9feb7-911b-4679-bc95-f752b74e0dcd>

## Bear tapping: A bile business

\* 04 May 2009 by Marc Bekoff

### [See a gallery of images of bear rescue and rehabilitation at a Chinese centre](#)

JASPER is an Asiatic black bear, also known as a moon bear because of the yellow crescent on his chest. In 2000 he came to the Animals Asia Moon Bear Rescue Centre in Chengdu, China, from a bear farm.

When Jasper arrived his rescuers had to cut him out of a tiny "crush cage" that pinned him down so the farmer could extract lucrative bile from his gall bladder. Bear bile is used in traditional Chinese medicine and fetches a tidy price. In China, the wholesale price is around 4000 yuan (approximately \$580) per kilogram; each bear produces up to 5 kilograms a year. But it comes at terrible cost.

Jasper spent 15 years in his cage. Other bears spend up to 25 years in cages no bigger than their bodies, barely able to move. Bears are milked for bile twice a day. In China, farmers use a crude catheter inserted into the gall bladder or a permanently open wound. In Vietnam, they use long hypodermic needles.

*Abused bear in China (Image: Sipa Press/Rex Features)*

Over the past 10 years, Animals Asia has rescued 260 bears from Chinese bear farms. These are the lucky ones. The official number of farmed bears in China is 7000, but Animals Asia fears the real figure is closer to 10,000.



Despite its obvious cruelty, bear farming is legal in China. While CITES, the Convention on International Trade in Endangered Species, lists Asiatic black bears at the highest level of endangerment, China grants them only second-level protection, which allows them to be farmed. There are no reliable estimates of the remaining wild population in China, though some have put it as low as 15,000.

Bear farming is also practised in Vietnam, where it is illegal but remains widespread because of a lack of enforcement. There are around 4000 bears on Vietnamese farms and yet more in Laos, Cambodia and Korea.

In China, bear farming is justified on the grounds that it satisfies local demand for bile, hence reducing the number of bears taken from the wild. Farms are allowed to breed bears in captivity and hunting wild bears has been illegal since 1989. Despite this, many wild bears are still poached for their whole gall bladders or to restock the farms. Bears sometimes arrive at the rescue centre with missing limbs after being trapped in the wild.

The rescue programme was sparked in 1993 when Animals Asia founder Jill Robinson visited a bear farm. After years of government lobbying the rescue centre was set up in 2000 and now houses up to 175 bears.

### **Broken bodies**

Those bears who reach the centre have invariably suffered serious physical and psychological trauma. Rescued bears can't be released into the wild because of the long-term damage caused by their incarceration. All need surgery to remove damaged gall bladders and many need additional surgery and long-term medical care due to missing claws or paws, infected and necrotic wounds and broken and missing teeth caused by biting at bars or because farmers break them to make the bears less dangerous. Many also have liver cancer as a result of being continually milked for bile, plus a litany of other ailments including blindness, arthritis, peritonitis, weeping ulcers and ingrown claws.

In contrast to the horrors of bear farming, the rehabilitation process is amazing and inspiring to witness. It takes around a year to rehabilitate a bear. Although a handful have to be kept alone for the rest of their lives, most can eventually be housed with other bears. The transition in personality from animals who are violent and fearful to ones who are trusting, inquisitive and completely at ease with people is truly remarkable, Robinson says. She is right. I have visited the rescue centre and it changed my life. That is how powerful the bears' stories are.

In contrast to the horrors of bear farming, the rescue process is inspiring to see

Watching rehabilitated bears play is a joy. Many continually seek out playmates, an indication that they have substantially recovered from their trauma. I once saw two bears called Aussie and Frank frolicking on a hammock. When Aussie saw Jasper ambling over, he jumped off the hammock, approached Jasper, and they

began play-fighting. The deep trauma they had experienced wasn't stopping them from enjoying themselves. Yet some bears have behavioural scars and flashbacks from their unspeakable abuse. Aussie still scampers back to his den when he hears a strange noise.

Despite the rescue programme bear bile extraction remains a cause of wanton and remorseless abuse. It is hard to change attitudes when bear bile has been used in Chinese medicine for more than 3000 years to treat "heat related" ailments such as eye and liver diseases. Today it is used to treat conditions from hangovers to haemorrhoids.

There is some evidence from western medicine that synthetic version of the active ingredient in bear bile, ursodeoxycholic acid, can treat a range of diseases, including hepatitis C. Yet traditional Chinese medicine still insists on using natural bear bile, which is often contaminated with pus, blood, urine and faeces. While healthy bear bile is free-flowing and orangey-green, veterinarians describe bile leaking from the diseased gall bladders of rescued bears as "black sludge".



***Medicines with bear bile as a key ingredient are used in China and elsewhere in Asia against such illnesses as fever, inflammation and kidney stones (Image: Sipa Press/Rex)***

The moon bear rescue project raises a number of important questions. For example, why do bears show large individual differences in response to persecution, and variations in recovery? Rescued bears are powerful ambassadors, but should so much time and money be invested in saving the lives of individuals who will not make any direct contribution to saving their species? How can people from outside China work to free bears while respecting their Chinese colleagues and remaining sensitive to cultural traditions? It also raises questions about how people can act in undignified and shameful ways that ignore the horrific pain and suffering of highly sentient animals.

Efforts to stop bear farming are ongoing. Soon after Robinson founded Animals Asia in 1998, she negotiated an agreement with the Chinese government to work towards the elimination of bear farming. All farms are inhumane, but the very worst are identified for closure by the government and the farmers have their licences permanently revoked. It is from these farms that bears come to the rescue centre. Animals Asia compensates the farmers so that they can start another business or retire. More than 40 farms have so far been closed, and China has not issued any new licences since 1994.

Animals Asia has also submitted a proposal to the government to help wind down the industry, including offers to help bear farms become rescue facilities.

There is still much to be done to right the wrongs of bear farming. Robinson looks to the day when all farmed bears will wake with the sun on their backs and without fear in their hearts. Each bear surely appreciates the effort. Just look into their eyes. I have.

### **Scientists learn why the flu may turn deadly**

***New research published in the Journal of Leukocyte Biology suggests that the influenza virus 'paralyzes' the immune system***

As the swine flu continues its global spread, researchers from the Children's Hospital of Philadelphia, Pennsylvania, have discovered important clues about why influenza is more severe in some people than it is in others. In their research study published online in the Journal of Leukocyte Biology (<http://www.jleukbio.org>), the scientists show that the influenza virus can actually paralyze the immune systems of otherwise healthy individuals, leading to severe secondary bacterial infections, such as pneumonia. Furthermore, this immunological paralysis can be long-lived, which is important to know when developing treatment strategies to combat the virus.

According to Kathleen Sullivan, M.D., Ph.D., the senior researcher involved in the study and Chief of the Division of Allergy and Immunology at the Children's Hospital of Philadelphia, "We have a very limited understanding of why some people who get influenza simply have a bad cold and other people become very sick and even die. The results of this study give us a much better sense of the mechanisms underlying bacterial infections arising on top of the viral infection."

Sullivan and colleagues recruited pediatric patients with severe influenza and examined the level of cytokines, which serve as the first line initiators of immune response, in the blood plasma. Although they found elevated levels of cytokines, they also found a decreased response of toll-like receptors, which activate immune cell responses as a result of invading microbes. This suggests that the diminished response of these receptors may be responsible for the paralysis of the immune system, leading to secondary bacterial infections. The

influenza patients were compared with patients with moderate influenza, respiratory syncytial virus, and a control group of healthy individuals. The immune paralysis appeared to be specifically a result of influenza infection and was not seen in patients with respiratory syncytial virus. This process might explain why one quarter of children who die from influenza, die from a bacterial infection occurring on top of the virus.

"Despite major medical advances since the devastating flu outbreak of 1918 and 1919, influenza virus infection remains a very serious threat," said John Wherry, Ph.D., Deputy Editor of the *Journal of Leukocyte Biology*, "and the current swine flu outbreak is a grim reminder of this fact. The work by Dr. Sullivan and colleagues brings us a step closer to understanding exactly what goes wrong in some people who get the flu, so, ultimately, physicians can develop more effective treatment strategies."

*The Journal of Leukocyte Biology* (<http://www.jleukbio.org>) publishes peer-reviewed manuscripts on original investigations focusing on the cellular and molecular biology of leukocytes and on the origins, the developmental biology, biochemistry and functions of granulocytes, lymphocytes, mononuclear phagocytes and other cells involved in host defense and inflammation.

*The Journal of Leukocyte Biology* is published by the Society for Leukocyte Biology.

Details: Meredith L. Heltzer, Susan E. Coffin, Kelly Maurer, Asen Bagashev, Zhe Zhang, Jordan S. Orange, and Kathleen E. Sullivan. *Immune dysregulation in severe influenza*. doi:10.1189/jlb.1108710. <http://www.jleukbio.org/papbyrecent.shtml>

### **Ebay Has Unexpected, Chilling Effect On Looting Of Antiquities, Archaeologist Finds**

Having worked for 25 years at fragile archaeological sites in Peru, UCLA archaeologist Charles "Chip" Stanish held his breath when the online auction house eBay launched more than a decade ago.

"My greatest fear was that the Internet would democratize antiquities trafficking, which previously had been a wealthy person's vice, and lead to widespread looting," said the UCLA professor of anthropology, who directs the UCLA Cotsen Institute of Archaeology.

Indeed, eBay has drastically altered the transporting and selling of illegal artifacts, Stanish writes in an article in the May/June issue of *Archaeology*, but not in the way he and other archaeologists had feared.

By improving access to a worldwide market, eBay has inadvertently created a vast market for copies of antiquities, diverting whole villages from looting to producing fake artifacts, Stanish writes. The proliferation of these copies also has added new risks to buying objects billed as artifacts, which in turn has worked to depress the market for these items, further reducing incentives to loot. "For most of us, the Web has forever distorted the antiquities trafficking market in a positive way," Stanish said.

Looting, which is illegal, is widely recognized as destructive to cultural heritage because it can remove from public ownership tangible links to a people's past. In addition, looting is perceived as the enemy of scholarship because it typically is done without regard to any appropriate methods that allow scientists to date objects and to place them in a larger, more meaningful context.

One of the world's premiere authorities on Andean archaeology and supervisor, at UCLA, of one of the world's largest collections of working archaeologists, Stanish has been tracking objects billed as antiquities on eBay for more than nine years. His conclusions also are informed by experiences with the U.S. customs service, which occasionally asks him to authenticate objects. In addition, Stanish has visited a number of workshops in Peru and Bolivia that specialize in reproductions of pottery and has interviewed these artisans. While his background is in South American archaeology, he has tracked eBay listings of antiquities from many cultures.

"Chinese, Bulgarian, Egyptian, Peruvian and Mexican workshops are now producing fakes at a frenetic pace," he writes.

When he first started tracking eBay's sales of antiquities, Stanish focused mainly on objects related to his field. At the time, the ratio of real artifacts to fakes was about 50-50, he estimates. About five years later, 95 percent were fakes. Now, he admits, he can't always tell, because the quality of the fakes has improved so much.

He estimates that about 30 percent of "antiquities" currently for sale on eBay are obvious fakes, in so much as creators mix up iconography and choose colors and shapes for visual effect rather than authenticity. Another 5 percent or so are genuine treasures. The rest fall in the ambiguous "I would have to hold it in my hand to be able to make an informed decision" category, he writes. Stanish admits himself to occasionally being duped by fakes encountered in shops in areas where both looted items and fakes are sold.

The advent of eBay has had the biggest impact on the antiquities market by reducing the incentive to unearth precious treasures in the first place, Stanish has found.

"People who used to make a few dollars selling a looted artifact to a middleman in their village can now produce their own 'almost-as-good-as-old' objects and go directly to a person in a nearby town who has an eBay account," he said. "They will receive the same amount or even more than they could have received for actual antiquities."

As a result of the rise of a ready market, many of the primary purveyors have shifted from looting sites to faking antiquities.

In addition to linking craftsmen with a market for cheap fakes, eBay has tended to have a depressing effect on prices for real looted artifacts, further discouraging locals from pillaging precious sites.

"The value of ... illicit digging decreases every time someone buys a 'genuine' Moche pot for \$35, plus shipping and handling," he writes. (An authentic antiquity would sell for upwards of \$15,000.)

So far, authentication techniques have struggled to keep abreast of increasingly sophisticated fakes, Stanish said. Pottery can still be authenticated reliably, although the process is costly. In addition, forgers tend to only guarantee the authenticity of their pieces as long as no form of "destructive" analysis is used. While just a tiny flake of pottery is required for thermoluminescence dating - the gold standard for pottery - the process is technically considered destructive, Stanish points out, so the test invalidates such warrantees, no matter its conclusion.

Thanks to laser technology and chemical processes for forming antique-appearing patinas, stone and metal, reproductions are "almost impossible" to authenticate using today's technology, Stanish writes. However, the prospect of authentication techniques eventually catching up with today's fakes is also having a chilling effect on the market for antiquities, by dramatically adding to the risk of illicit, high-end trafficking.

"Who wants to spend \$50,000 on an object 'guaranteed' to be ancient by today's standards, when someone can come along in five years with a new technology that definitively proves it to be a fake," he asks.

### **'Stench of life' prevents ants from being buried alive**

\* 22:00 04 May 2009 by Ewen Callaway

Life really stinks for Argentine ants. New research shows that while alive, the ants produce two odoriferous chemicals that prevent their compatriots from immediately carting their bodies away to the 'morgue'.

Within minutes of their death, however, the conspicuous absence of these chemicals prompts workers to remove the carcasses, explaining how the foraging ants are able to detect and dispose of their dead before infectious pathogens and pungent chemicals fill the corpse.

The work overturns a long-held idea – first suggested by ant expert E. O. Wilson – that it is the buildup of fats after death that encourages workers to collect the dead.

*Pupae that had been coated with the chemicals that signal life - dolichodial and iridomyrmecin - were ignored by workers (Image: National Academy of Sciences/PNAS)*

Dong-Hwan Choe, an entomologist at the University of California, Riverside, says the accrual of fats can't explain why some ants and bees dispose of their dead well before the chemicals reach a high level.

#### **Sign of life**

In laboratory experiments, Choe and colleagues found that workers do indeed pick up and dispose of ants more quickly when the ants have been dead for at least an hour. They believe that live ants constantly produce chemicals that encourage their bodies to be discarded and also chemicals that override that signal. When they die, the "override" chemicals disappear, causing workers to cart away the ants' carcasses.

It's not yet clear which chemicals encourage body disposal, but evidence for this comes from the fact that when Choe's team coated pupae with fats extracted from live ants, workers carried them to the refuse pile within 10 minutes.

But his team did identify two molecules, dolichodial and iridomyrmecin, that seem to override the disposal signal, preventing ants from carting one another away. The molecules are present on the cuticles of live Argentine ants, but not on insects that have been dead for more than 40 minutes. When the researchers painted the chemicals onto pupae – which don't produce them – worker ants ignored the pupae.

#### **Widespread myth**

The emission of chemicals that send out a signal saying "I'm alive" speeds the removal of corpses and the pathogens they could soon spread, says Choe. It also prevents ants that are tainted with the chemicals from their dead brethren from being buried alive.

Deborah Gordon, an entomologist at Stanford University, says the research will put paid to the notion that it is the accumulation of chemicals after death that signals workers to carry corpses away. "This is an exciting result that helps to dispel a widespread myth that persisted despite the lack of evidence," she told New Scientist.

She adds: "It seems to me very possible that there are similar chemical changes in other social insects and I hope this work inspires people to look." *Journal reference: PNAS (DOI: 10.1073/pnas.0901270106)*



## Even mildly premature infants have increased risk of a common respiratory tract infection

Even mildly premature infants (gestational ages of 33 weeks through 36 weeks) have an increased risk of medically attended respiratory syncytial virus infection, which is the leading cause of lower respiratory tract infection in infants and young children and can lead to pneumonia in babies, according to a Kaiser Permanente Division of Research study. The RSV infection risk is higher among infants exposed to supplemental oxygen or assisted ventilation during the neonatal period, said the researchers, explaining that the need for oxygen is sometimes unavoidable for babies who need intensive care.

The results of the study are being presented at the Pediatric Academic Societies Annual Meeting to be held in Baltimore on Tuesday, May 5.

"Although extreme prematurity is a known risk factor for severe RSV infection, this study helped us to learn more about risk factors for RSV infection among mildly premature infants. We detected an increased risk even in babies born at 37 weeks," said the study's lead investigator Gabriel J. Escobar, MD, a hospital-based pediatrician and research scientist with the Kaiser Permanente Division of Research in Oakland, Calif. "Further research is needed to determine whether strategies to prevent or mitigate RSV infections are indicated in late preterm infants."

The study included 108,794 babies at least 33 weeks gestation discharged from six Kaiser Permanente hospitals between January 1996 and December 2002. Compared to babies 38-40 weeks, babies born at 37 weeks had a 37 percent increased odds of RSV infection, while babies born at 34-36 weeks had a 70 percent increased odds. In contrast, babies born at 41 or more weeks had 14 percent decreased odds. Even after controlling for prematurity, babies who received supplemental oxygen during the birth hospitalization had a 50 to 120 percent increased odds of medically attended RSV infection in the first year of life.

Researchers used a retrospective cohort study design using logistic regression and Cox proportional hazards modeling to control for varying follow-up lengths.

*Additional researchers on the study include: Patricia Kipnis, Ph.D., Arona Ragins, MA, Sherian Xu Li, MS, and Laura Prager, MD, Pharm D, all with Kaiser Permanente; and Jennifer Graff with Medimmune.*

*Funding was provided by Medimmune, LLC.*

## Early domestic animals were surprisingly well bred

\* 05 May 2009 by Andy Coghlan and Ewen Callaway

THEY may not have known about genes and Darwinism, but our ancestors knew how to drive the evolution of once-wild beasts to serve their own needs. A spate of studies published last week show how domestication suddenly gave horses coats of many colours, cows the extra genes to produce milk and fight infection - and even shrank sheep's horns.

The studies also support what archaeologists have long argued about the domestication of wild beasts: that sheep were probably the first farmed animals, about 11,000 years ago, followed by cattle. Then, around 5500 years ago humans tamed horses, giving riders hitherto unmatched military might, speed and mobility. "It was a huge innovation," says Arne Ludwig of the Leibniz Institute for Zoo and Wildlife Research in Berlin, Germany.



*Soay sheep on St Kilda, Scotland, represent some of the earliest examples of domesticated sheep (Image: Dan Burton / Nature Picture Library/Rex)*

Ludwig led a team which analysed six genes linked with coat colour in 89 horse fossils, originating from 40,000 years ago to the Middle Ages, which were collected from sites ranging from Spain to China.

The genetic analysis revealed that before about 5500 years ago, almost all horses had reddish-brown or black coats (Science, vol 324, p 485). Then, in what is now Ukraine, Romania and Russia, there was an explosion in colour when humans tamed horses and bred animals with a new range of coat colours, from chestnut to cream, white and dappled.

Our impact on the ancestors of sheep was no less dramatic, show several studies, including one led by Massimo Palmarini of the University of Glasgow in the UK. By analysing harmless "stowaway viruses" in the genetic material of sheep, Palmarini's team was able to distinguish ancient from modern breeds (Science, vol 324, p 532).

They found that sheep were domesticated in two waves. Examples of the first wave still survive as semi-wild breeds, such as the shaggy Soay and Orkney breeds on Scottish islands. The second wave started about 6000 years ago, when farmers in what is now Iraq and Iran began selecting for characteristics such as reduced

moulting and smaller horns. Their more ancient, shaggier counterparts were exiled to the fringes of Europe, where they became semi-wild again.

Also, the first analyses of the entire cow genome show that with domestication came a big spurt in the diversity of genes linked with milk production, musculature and immunity to bacterial infection (Science, vol 324, pps 522 and 528). "There are several areas of the genome you can see that clearly differentiate between beef breeds and dairy breeds," says Harris Lewin of the University of Illinois at Urbana-Champaign, who leads the international cow-genome sequencing project.

**Personal Health**  
**High Functioning, but Still Alcoholics**  
**By JANE E. BRODY**

Sarah Allen Benton is hardly your stereotypical alcoholic. She has a master of science degree from Northeastern University and is a licensed mental health counselor at Emmanuel College in Boston. In recovery from alcoholism for the last five years, she has written an enlightening new book about people like herself, "Understanding the High-Functioning Alcoholic" (Praeger Publishers).

As Ms. Benton describes them, high-functioning alcoholics are able to maintain respectable, even high-profile lives, usually with a home, family, job and friends. That balancing act continues until something dreadful happens that reveals the truth — to themselves or to others — and forces the person to enter a treatment program or lose everything that means anything.



Yarek Waszul

### **A Hidden Problem**

Typical high-functioning alcoholics, or H.F.A.'s as Ms. Benton calls them, are in denial about their abuse of alcohol. Coworkers, relatives and friends often enable the abusive behavior to continue by refusing to acknowledge and confront it.

"The story of the H.F.A. is seldom told," Ms. Benton writes, "for it is not one of obvious tragedy, but that of silent suffering."

Based on surveys and professional experience, she estimates that as many as half of all alcoholics are high-functioning types. The abuse can go on for decades until and unless some alcohol-related crisis occurs, like being arrested for drunken driving, exposed for having made unwanted sexual advances or being asked for a divorce when their spouses can no longer tolerate the abusive drinking.

Or, like Ms. Benton, they may seek help after recognizing that no matter what they try, they are unable to drink normally and fear that sooner or later their luck will run out.

Many well-known people have publicly acknowledged their battles with alcohol and entered recovery before their lives were destroyed. Among those listed by Ms. Benton are Betty Ford, the astronaut Buzz Aldrin, the actresses Elizabeth Taylor and Mary Tyler Moore, the actor Robin Williams, the singers Keith Urban and Eric Clapton, the football legend Joe Namath and former President George W. Bush.

But there are millions of others — including dentists and doctors, professors and teachers, lawyers and judges, journalists and authors, firemen and C.E.O.'s of major companies — who work for years while abusing alcohol, sometimes putting their lives, and the lives of others, at great risk. Surgeons have been known to operate with shaking hands, yet colleagues who knew or suspected that alcohol abuse was the cause failed to confront the doctor. Employees who suspect a problem often cover up for their bosses.

Ms. Benton emphasized that people in positions of power are often the hardest to detect and help because they tend not to be closely supervised at work, they are assumed to be able to deal successfully with the pressures of their jobs, their high pay enables them to escape the financial consequences of excessive drinking, and they see drinking as their reward for hard work.

As the writer Pete Hamill said in his memoir, "A Drinking Life," "If I was able to function, to get the work done, there was no reason to worry about drinking. It was part of living, one of the rewards."

In some cases, the culture of the workplace fosters high-functioning alcoholism. Abusive drinking was once commonplace among journalists, who had "liquid lunches" and frequently met for drinks after work. When work and social lives blend, excessive drinking may be considered part of the job.

### **Double Lives**

A further problem in identifying and getting help for high-functioning alcoholics is that they often do not meet the criteria for alcohol abuse described in the psychiatric diagnostic manual. They have good jobs, perform the expected tasks of daily life and avoid legal problems.

As Dr. Mark L. Willenbring of the National Institute on Alcohol Abuse and Alcoholism put it in Ms. Benton's book: "People can be dependent and not have abuse problems at all. They're successful students. They're good parents, good workers. They watch their weight. They go to the gym. Then they go home and have four martinis or two bottles of wine. Are they alcoholics? You bet."

As for herself, Ms. Benton said: "Having outside accomplishments led me and others to excuse my drinking and avoid categorizing me as an alcoholic. My success was the mask that disguised the underlying demon and fed my denial."

Even those who recognize they have an alcohol problem may avoid seeking help because they perceive it as a sign of weakness.

High-functioning alcoholics are highly skilled at leading double lives, Ms. Benton wrote. They appear to the outside world to be managing life well and defy the alcoholic stereotype by being fashionable, physically attractive, even elegant. They also tend to hide their excessive consumption by drinking alone or sneaking alcohol before or after a social event, and disguising or excusing the odor of alcohol on their breath.

High-functioning alcoholics also may not be physically addicted to alcohol, abstaining for days or weeks without suffering withdrawal symptoms. But they are psychologically dependent on alcohol, often focused on when they can drink again and convinced that they need to drink in certain settings. They are also likely to experience blackouts, remembering nothing the next day about a night of heavy drinking, with only a hangover as evidence of their abusive behavior.

"But just because people are high-functioning doesn't mean they are not putting themselves and others in danger," Ms. Benton said in an interview. Under the influence of excessive amounts of alcohol, they may operate motor vehicles or dangerous machinery or engage in risky sexual encounters. They may be picked up for driving under the influence, miss important professional or family obligations or repeatedly arrive late to work. And, Ms. Benton said, "They can face the same health risks as a lower-functioning alcoholic."

### **Knowing the Signs**

In the interview, Ms. Benton listed several characteristics that can help people recognize themselves as high-functioning alcoholics:

They have trouble controlling their intake even after deciding that they will drink no more alcohol than a given amount. They find themselves thinking obsessively about drinking - when and where and with whom they will drink next. When they drink, they behave in ways that are uncharacteristic of their sober self.

They experience blackouts, unable to remember what took place during a drinking bout.

"It's not the number of drinks that defines an alcoholic," Ms. Benton said. "It's what happens to you when you're drinking."

## **A Battle to Preserve a Visionary's Bold Failure**

**By WILLIAM J. BROAD**

In 1901, Nikola Tesla began work on a global system of giant towers meant to relay through the air not only news, stock reports and even pictures but also, unbeknown to investors such as J. Pierpont Morgan, free electricity for one and all.

It was the inventor's biggest project, and his most audacious.

The first tower rose on rural Long Island and, by 1903, stood more than 18 stories tall. One midsummer night, it emitted a dull rumble and proceeded to hurl bolts of electricity into the sky. The blinding flashes, *The New York Sun* reported, "seemed to shoot off into the darkness on some mysterious errand."

But the system failed for want of money, and at least partly for scientific viability. Tesla never finished his prototype tower and was forced to abandon its adjoining laboratory.

Today, a fight is looming over the ghostly remains of that site, called Wardencllyffe — what Tesla authorities call the only surviving workplace of the eccentric genius who dreamed countless big dreams while pioneering wireless communication and alternating current. The disagreement began recently after the property went up for sale in Shoreham, N.Y.

A science group on Long Island wants to turn the 16-acre site into a Tesla museum and education center, and hopes to get the land donated to that end. But the owner, the Agfa Corporation, says it must sell the property to raise money in hard economic times. The company's real estate broker says the land, listed at \$1.6 million, can "be delivered fully cleared and level," a statement that has thrown the preservationists into action.

The ruins of Wardencllyffe include the tower's foundation and the large brick laboratory, designed by Tesla's friend Stanford White, the celebrated architect.

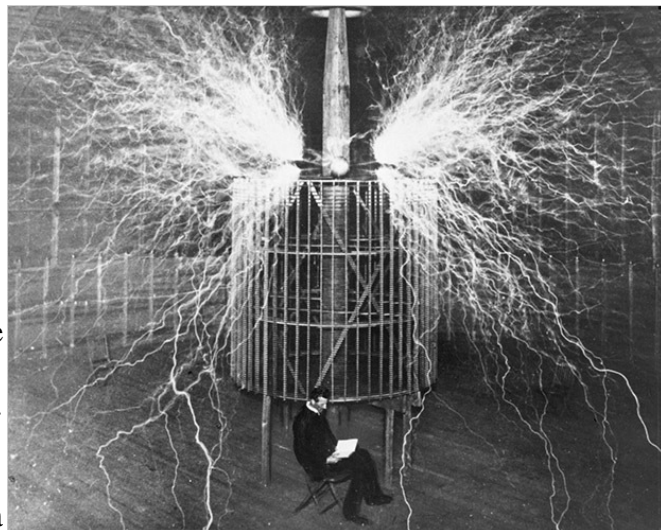
"It's hugely important to protect this site," said Marc J. Seifer, author of "Wizard," a Tesla biography. "He's an icon. He stands for what humans are supposed to do — honor nature while using high technology to harness its powers."

Recently, New York State echoed that judgment. The commissioner of historic preservation wrote Dr. Seifer on behalf of Gov. David A. Paterson to back Wardenclyffe's preservation and listing in the National Register of Historic Places.

On Long Island, Tesla enthusiasts vow to obtain the land one way or another, saying that saving a symbol of Tesla's accomplishments would help restore the visionary to his rightful place as an architect of the modern age.

"A lot of his work was way ahead of his time," said Jane Alcorn, president of the Tesla Science Center, a private group in Shoreham that is seeking to acquire Wardenclyffe.

Dr. Ljubo Vujovic, president of the Tesla Memorial Society of New York, said destroying the old lab "would be a terrible thing for the United States and the world. It's a piece of history."



**REMNANTS OF A DREAM** *Nikola Tesla in a multiple-exposure photo in 1899, as a Tesla coil discharged millions of volts. A science group wants to preserve the remains of his lab* Dickenson V. Alley/Burndy Library.

Tesla, who lived from 1856 to 1943, made bitter enemies who dismissed some of his claims as exaggerated, helping tarnish his reputation in his lifetime. He was part recluse, part showman. He issued publicity photos (actually double exposures) showing him reading quietly in his laboratory amid deadly flashes.

Today, his work tends to be poorly known among scientists, though some call him an intuitive genius far ahead of his peers. Socially, his popularity has soared, elevating him to cult status.

Books and Web sites abound. Wikipedia says the inventor obtained at least 700 patents. YouTube has several Tesla videos, including one of a break-in at Wardenclyffe. A rock band calls itself Tesla. An electric car company backed by Google's founders calls itself Tesla Motors.

Larry Page, Google's co-founder, sees the creator's life as a cautionary tale. "It's a sad, sad story," Mr. Page told Fortune magazine last year. The inventor "couldn't commercialize anything. He could barely fund his own research."

Wardenclyffe epitomized that kind of visionary impracticality.

Tesla seized on the colossal project at the age of 44 while living in New York City. An impeccably dressed bon vivant of Serbian birth, he was widely celebrated for his inventions of motors and power distribution systems that used the form of electricity known as alternating current, which beat out direct current (and Thomas Edison) to electrify the world.

His patents made him a rich man, at least for a while. He lived at the Waldorf-Astoria and loved to hobnob with the famous at Delmonico's and the Players Club.

Around 1900, as Tesla planned what would become Wardenclyffe, inventors around the world were racing for what was considered the next big thing — wireless communication. His own plan was to turn alternating current into electromagnetic waves that flashed from antennas to distant receivers. This is essentially what radio transmission is. The scale of his vision was gargantuan, however, eclipsing that of any rival.

Investors, given Tesla's electrical achievements, paid heed. The biggest was J. Pierpont Morgan, a top financier. He sank \$150,000 (today more than \$3 million) into Tesla's global wireless venture.

Work on the prototype tower began in mid-1901 on the North Shore of Long Island at a site Tesla named after a patron and the nearby cliffs. "The proposed plant at Wardenclyffe," The New York Times reported, "will be the first of a number that the electrician proposes to establish in this and other countries."

The shock wave hit Dec. 12, 1901. That day, Marconi succeeded in sending radio signals across the Atlantic, crushing Tesla's hopes for pioneering glory.

Still, Wardenclyffe grew, with guards under strict orders to keep visitors away. The wooden tower rose 187 feet over a wide shaft that descended 120 feet to deeply anchor the antenna. Villagers told The Times that the ground beneath the tower was "honeycombed with subterranean passages."

The nearby laboratory of red brick, with arched windows and a tall chimney, held tools, generators, a machine shop, electrical transformers, glass-blowing equipment, a library and an office.

But Morgan was disenchanted. He refused Tesla's request for more money.

Desperate, the inventor pulled out what he considered his ace. The towers would transmit not only information around the globe, he wrote the financier in July 1903, but also electric power.

"I should not feel disposed," Morgan replied coolly, "to make any further advances."



Margaret Cheney, a Tesla biographer, observed that Tesla had seriously misjudged his wealthy patron, a man deeply committed to the profit motive. “The prospect of beaming electricity to penniless Zulus or Pygmies,” she wrote, must have left the financier less than enthusiastic.

It was then that Tesla, reeling financially and emotionally, fired up the tower for the first and last time. He eventually sold Wardencllyffe to satisfy \$20,000 (today about \$400,000) in bills at the Waldorf. In 1917, the new owners had the giant tower blown up and sold for scrap.

Today, Tesla’s exact plan for the site remains a mystery even as scientists agree on the impracticality of his overall vision. The tower could have succeeded in broadcasting information, but not power.

“He was an absolute genius,” Dennis Papadopoulos, a physicist at the University of Maryland, said in an interview. “He conceived of things in 1900 that it took us 50 or 60 years to understand. But he did not appreciate dissipation. You can’t start putting a lot of power” into an antenna and expect the energy to travel long distances without great diminution.

Wardencllyffe passed through many hands, ending with Agfa, which is based in Ridgefield Park, N.J. The imaging giant used it from 1969 to 1992, and then shuttered the property. Silver and cadmium, a serious poison, had contaminated the site, and the company says it spent some \$5 million on studies and remediation. The cleanup ended in September, and the site was put up for sale in late February.

Real estate agents said they had shown Wardencllyffe to four or five prospective buyers.

Last month, Agfa opened the heavily wooded site to a reporter. “NO TRESPASSING,” warned a faded sign at a front gate, which was topped with barbed wire.

Tesla’s red brick building stood intact, an elegant wind vane atop its chimney. But Agfa had recently covered the big windows with plywood to deter vandals and intruders, who had stolen much of the building’s wiring for its copper. The building’s dark interior was littered with beer cans and broken bottles. Flashlights revealed no trace of the original equipment, except for a surprise on the second floor. There in the darkness loomed four enormous tanks, each the size of a small car. Their sides were made of thick metal and their seams heavily riveted, like those of an old destroyer or battleship. The Agfa consultant leading the tour called them giant batteries.

“Look up there,” said the consultant, Ralph Passantino, signaling with his flashlight. “There’s a hatch up there. It was used to get into the tanks to service them.”

Tesla authorities appear to know little of the big tanks, making them potential clues to the inventor’s original plans.

After the tour, Christopher M. Santomassimo, Agfa’s general counsel, explained his company’s position: no donation of the site for a museum, and no action that would rule out the building’s destruction.

“Agfa is in a difficult economic position given what’s going on in the global marketplace,” he said. “It needs to maximize its potential recovery from the sale of that site.”

He added that the company would entertain “any reasonable offer,” including ones from groups interested in preserving Wardencllyffe because of its historical significance. “We’re simply not in a position,” he emphasized, “to donate the property outright.”

Ms. Alcorn of the Tesla Science Center, who has sought to stir interest in Wardencllyffe for more than a decade, seemed confident that a solution would be worked out. Suffolk County might buy the site, she said, or a campaign might raise the funds for its purchase, restoration and conversion into a science museum and education center. She said the local community was strongly backing the preservation idea.

“Once the sign went up, I started getting so many calls,” she remarked. “People said: ‘They’re not really going to sell it, are they? It’s got to be a museum, right?’ ”

Sitting at a reading table at the North Shore Public Library, where she works as a children’s librarian, Ms. Alcorn gestured across a map of Wardencllyffe to show how the abandoned site might be transformed with not only a Tesla museum but also a playground, a cafeteria and a bookshop.

“That’s critical,” she said.

Ms. Alcorn said the investigation and restoration of the old site promised to solve one of the big mysteries: the extent and nature of the tunnels said to honeycomb the area around the tower.

“I’d love to see if they really existed,” she said. “The stories abound, but not the proof.”

### **Still irritating after all these years: Study of adult children and parents**

ANN ARBOR, Mich.—The majority of parents and adult children experience some tension and aggravation with one another, a new study says.

But parents generally are more bothered by the tensions—and the older the child, the greater the bother.

“The parent-child relationship is one of the longest lasting social ties human beings establish,” said Kira Birditt, lead author of the study and a researcher at the University of Michigan Institute for Social Research

(ISR). "This tie is often highly positive and supportive but it also commonly includes feelings of irritation, tension and ambivalence."

The study will be featured in an upcoming issue of the journal *Psychology and Aging*.

For the study, supported by a grant from the National Institutes of Health, Birditt and colleagues at Purdue and Pennsylvania State universities analyzed data on 474 parents and adult children who were at least 22 years old. The adult children lived within 50 miles of their parents. African Americans made up one-third of the sample and the rest were European Americans.

The researchers asked about tensions related to a variety of topics, including personality differences, past relationship problems, children's finances, housekeeping habits, lifestyles, and how often they contacted each other.

Parents and adult children in the same families had different perceptions of tension intensity, with parents generally reporting more intense tensions than children did particularly regarding issues having to do with the children's lifestyle or behavior (finances, housekeeping). According to Birditt, tensions may be more upsetting to parents than to children because parents have more invested in the relationship. Parents are also concerned with launching their children into successful adulthood.

Both mothers and fathers reported more tension in their relationships with daughters than with sons. Daughters generally have closer relationships with parents that involve more contact which may provide more opportunities for tensions in the parent-daughter tie.

Both adult sons and adult daughters reported more tension with their mothers than with their fathers, particularly about personality differences and unsolicited advice. "It may be that children feel their mothers make more demands for closeness," Birditt said, "or that they are generally more intrusive than fathers."

Birditt found it surprising that parental perceptions of tension increased with the adult children's age, particularly about topics having to do with how they interact (e.g., personality differences). "Middle-aged children may be less invested in the parent-child tie than young adult children because they're more likely to have formed their own families and experience multiple role demands," Birditt said. And as parents age and come to want or need more from their relationship with adult children, adult children may pull away, creating greater relationship tensions.

Although most parents and adult children experience at least a little tension, Birditt found that some topics were more harmful than others to parent-child relationships.

"Relationship problems like basic personality differences and parents providing unsolicited advice tend to cause more problems," Birditt said. "It may be that these kinds of tensions are longer-term, and reflect deep-seated conflicts that you just can't escape, whereas conflicts about lifestyles, education or finances can sort of be put off to the side if you make an effort."

In related, unpublished research, Birditt analyzed the strategies parents and adult children used to cope with relationship tensions. The good news is that both parents and children were most likely to deal with problems constructively by trying to accommodate each other's wishes when problems came up, working to find solutions to problems, and trying to accept and understand the other's point of view.

The more intense the tension level, though, the less likely parents and children were to use constructive strategies and the more likely they were to try avoiding the issues or use destructive strategies such as yelling or arguing. And according to Birditt, that is bad news. Avoidance and destructive strategies are associated with poorer quality relationships overall.

"The old adage, 'If you can't say something nice, don't say anything at all,' isn't good advice for parents and adult children," she said. "Avoidance doesn't work as a strategy for dealing with conflicts. It appears to make things worse."

### **CT Scans Increase Cancer Risk Estimates in Multiply-Imaged Emergency Department Patients**

Physicians should review a patient's CT imaging history and cumulative radiation dose when considering whether to perform another CT exam, according to researchers at Brigham and Women's Hospital, Boston, MA, and Washington University School of Medicine, St. Louis, MO.

The study included 130 patients who had at least three emergency department visits within one year in which they had a CT scan of the neck, chest, abdomen or pelvis. "We gathered the recent CT exam histories for each of these patients and found that half had undergone ten or more CT scans in the previous eight years, up to a maximum of 70 CT scans," said Aaron Sodickson, MD, PhD. "Using typical dose values and standard risk estimation methods, we calculated that half of our group had accrued additional radiation-induced cancer risks above baseline greater than 1 in 110, up to a maximum of 1 in 17."

“A patient’s cumulative risk of radiation-induced cancers is believed to increase with increasing cumulative radiation dose. The level of risk is further increased for patients scanned at young ages and is in general greater for women than for men. There is no absolute threshold, however, and the potential risks of radiation induced cancer must be balanced against the expected clinical benefits of the CT scan for the patient’s particular scenario,” he said.

“CT is a tremendously valuable clinical tool in a wide variety of settings and disease processes, and as a result CT utilization has grown rapidly in recent years. Continued attention will be needed to keep radiation risks in check through a combination of technological advances, optimized imaging techniques, appropriateness criteria and patient-specific risk/benefit assessments,” said Dr. Sodickson.

*This study appears in the April issue of the American Journal of Roentgenology. For a copy of the full study, please contact Heather Curry via email at [hcurry@arrs.org](mailto:hcurry@arrs.org).*

### **3T MRI Detects “Early” Breast Cancer Not Seen on Mammography and Sonography**

3T MRI, a powerful tool for evaluating patients with a high risk of having breast cancer, can detect a significant number of lesions not found on mammography and sonography, according to a study performed at the University of Toledo Medical Center, Toledo, OH.

The study included 434 women who underwent mammography, sonography and 3T MRI for the detection of malignant breast lesions—all women were at high risk. Results showed that 3T MRI detected 66/66 malignant lesions; mammography detected 54/66 malignant lesions; and sonography detected 57/66 malignant lesions. “3T MRI depicted a significantly higher number of malignant tumors of the breast than mammography and sonography,” said Haitham Elsamaloty, MD, lead author of the study.

“Our study detected ‘early’ breast cancer (lesions as small as 4 mm) in size and also identified malignant lesions that were only detected by MRI and confirmed by MRI guided biopsy. These crucial findings led to a significant change in patient management in 18.2% of the cases in our study.

“Our study suggests an important role for 3T MRI in such high risk groups for an early diagnosis of breast cancer and better accuracy in evaluating the extent of disease—a crucial factor in appropriate therapy planning,” said Dr. Elsamaloty.

“High field strength (3T) MRI systems are becoming increasingly available in the clinical setting and more of them are being used for the evaluation of breast malignancy. 3T MRI is an important addition to mammography and sonography,” he said.

*This study appears in the April issue of the American Journal of Roentgenology. For a copy of the full study, please contact Heather Curry via email at [hcurry@arrs.org](mailto:hcurry@arrs.org). [Click here for abstract.](#)*

### **Flow of potassium into cells implicated in schizophrenia Blocking errant protein could stem runaway brain activity in psychosis**

A study on schizophrenia has implicated machinery that maintains the flow of potassium in cells and revealed a potential molecular target for new treatments. Expression of a previously unknown form of a key such potassium channel was found to be 2.5 fold higher than normal in the brain memory hub of people with the chronic mental illness and linked to a hotspot of genetic variation.

An extensive series of experiments suggest that selectively inhibiting this suspect form could help correct disorganized brain activity in schizophrenia – without risk of cardiac side effects associated with some existing antipsychotic medications. Scientists at the National Institutes of Health and European colleagues report on threads of converging evidence in the May, 2009 issue of the journal *Nature Medicine*.

"The end game in linking genes with complex disorders like schizophrenia requires that we not only demonstrate statistical association, but also show how a gene version acts biologically to confer risk," explained Daniel Weinberger, M.D., director of National Institute of Mental Health's (NIMH) Genes Cognition and Psychosis Program, who led the research. "We found schizophrenia-like effects in brain circuitry and mental processing in perfectly healthy people who carry the risk-associated version of this potassium channel gene, even though they don't show any psychotic behavior."

Evidence suggests that schizophrenia stems from complex interactions between multiple genes and environmental factors. Several candidate genes have recently been statistically linked to the illness in large genome-wide association studies.

"Our study goes further, spanning discovery of a new gene variant, confirmation of its association with the illness, and multi-level probes into how it works – in human post mortem brain tissue, the living human brain, and neurons," added Weinberger.

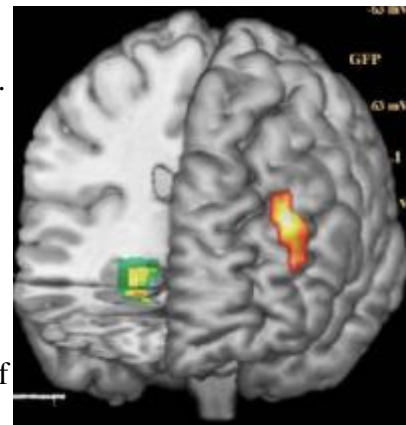
By regulating the flow of potassium ions into the cell, potassium channels control when neurons fire – electrically discharge and release a chemical messenger that signals neighboring neurons in a circuit. This flow

is regulated, in part, by activity of the chemical messenger dopamine, the main target of antipsychotic medications used to treat schizophrenia.

One type of potassium channel, called KCNH2, attracted the researchers' interest for its potential role in sustaining the type of neuronal firing that supports the higher mental functions disturbed in schizophrenia. Spurred by hints from postmortem studies of genetic variation linked to schizophrenia in the genomic neighborhood of KCNH2, the researchers analyzed the gene's association with the illness in 5 independent samples comprising hundreds of families. This pinpointed 4 variations associated with schizophrenia within a small region of the KCNH2 gene.

"Yet this statistical association didn't imply a mechanism," said Weinberger. "It didn't explain how KCNH2 might increase risk for schizophrenia. So we went back to the post-mortem brain tissue in search of an answer."

It was only then that the researchers discovered a previously unknown version of KCNH2, called Isoform 3.1, that soared to levels 2.5 times higher-than-normal in the hippocampus (memory hub) of people who had schizophrenia – especially those with the risk-associated variations. Isoform 3.1 was also higher-than-normal in healthy individuals who carried the risk-associated variations. This signaled the existence of a risk-associated version of the KCNH2 gene.



*This shows areas in the prefrontal cortex (right) and hippocampus (left) where activity differed in healthy control subjects during thinking tasks, depending on whether they had the risk version of the KCNH2 potassium channel gene. The image is made from functional magnetic resonance imaging data superimposed on 3-D MRI reconstruction of the brain. NIMH Genes Cognition and Psychosis Program*

#### **Healthy controls carrying the risk gene version also:**

- \* Performed significantly worse-than-normal on measures of IQ and mental processing speed. Previous studies have linked similar performance with genetic risk for schizophrenia.

- \* Inefficiently processed memory in the hippocampus and working memory in the prefrontal cortex, as revealed by functional MRI (magnetic resonance imaging) scans. Although they performed similarly to controls on these tasks, their brains had to work harder to compensate for disordered tuning of circuitry – a phenomenon previously implicated in schizophrenia.

- \* Showed significantly decreased volume in the hippocampus – a heritable trait – in anatomical MRI scans.

#### **In addition, Isoform 3.1:**

- \* Showed levels 1,000 times lower in the heart than the other main form of KCNH2 and does not exist in lower animals, suggesting that it has evolved a unique role in the primate brain. Mutant forms of KCNH2 in the heart can lead to arrhythmias and even sudden death – a rare risk of taking antipsychotic medications, many of which interact with KCNH2. So targeting this brain-specific form potentially opens the way to development of new treatments free of such cardiac side-effects.

- \* Dramatically changed activity in rodent brains toward a neuronal firing pattern that may be important for thinking and memory tasks unique to primates.

- \* Is expressed much more prior to birth, compared to the other main form of KCNH2, suggesting that it plays a prominent role in the early stages of brain development.

- \* Is associated with a hotspot of variation in an area that controls gene expression, hinting that the suspect variations may contribute to schizophrenia risk by over-expressing Isoform 3.1.

Even though it is normally important for our higher order executive functioning, such over expression of Isoform 3.1 in schizophrenia could result in "abnormally increased neuronal excitability, runaway circuit activity and inefficient information processing," suggested Stephen Huffaker, Ph.D., the article's lead author, now a medical student at Harvard. The researchers propose that a treatment designed to inhibit just Isoform 3.1, might spare any heart-related side effects while improving the disorganized neural firing characteristic of the brain in schizophrenia.

*In addition to the NIMH, researchers from the NIH's National Institute on Child Health and Human Development (NICHD) also participated in the research.*

**Reference:** *A primate-specific, brain isoform of KCNH2 affects cortical physiology, cognition, neuronal repolarization and risk of schizophrenia. Huffaker SJ, Chen J, Nicodemus KK, Sambataro F, Yang F, Mattay V, Lipska BK, Hyde TM, Song J, Rujescu D, Giegling I, Mayilyan K, Proust MJ, Soghoyan A, Caforio G, Callicott JH, Bertolino A, Meyer-Lindenberg A, Chang J, Ji Y, Egan MF, Goldberg TE, Kleinman JE, Lu B, Weinberger DR. Nat Med. 2009 May 3.*

## **Treatment for extreme nausea, vomiting during pregnancy**

### ***Collaborative Canada-France study published in European Journal of Obstetrics and Gynecology and Reproductive Biology***

Montreal, May 6, 2009 – Nausea and vomiting are telltale indicators of pregnancy, affecting more than 80 percent of future mothers. For a few moms-to-be, symptoms can become so severe that hospitalization is required.

Yet a new medication protocol, introduced by the Sainte-Justine University Hospital Center, appears effective in improving symptoms more quickly and provides a safer option than those previously available. The findings, which are good news for moms and babies, are published in a recent edition of the *European Journal of Obstetrics and Gynecology and Reproductive Biology*.

"In 2002, we had to quickly change the medication protocol to treat hyperemesis gravidarum (HG), or severe nausea and vomiting of pregnancy, due to a FDA and Health Canada warnings," says senior researcher Anick Bérard, a professor at the Université de Montréal's Faculty of Pharmacy and director of the Research Unit on Medications and Pregnancy of the Sainte-Justine University Hospital Center.

"The warning found that a previously used anti-vomiting medication might cause adverse cardiovascular effects in mothers. We had to quickly choose another treatment, which was safer. The current study looks back at the data to evaluate the effectiveness of this treatment."

#### **Metoclopramide versus droperidol**

Dr. Bérard and her team, which included researchers from the Université de Bourgogne, evaluated 229 pregnant women who were admitted to hospital and treated for HG. The scientists compared use of the standard drug droperidol versus the administration of a newer medication called metoclopramide.

They found that metoclopramide worked faster to quell symptoms of nausea and vomiting than droperidol. Importantly, they found no evidence that either of these medications increased the birth defect rate compared to women who received no medication. As expected, metoclopramide was not associated with other serious side effects.

"This study validates our protocol," says Dr. Bérard. "Clinical trials are not conducted on pregnant women, so we had to rely on data from prospective and retrospective studies in this case. We anticipate that other institutions will now be comfortable adopting this new treatment regime."

#### **About hyperemesis gravidarum**

Hyperemesis gravidarum, or severe nausea and vomiting of pregnancy, affects about one percent of pregnant women. If left untreated, it can result in severe weight loss, dehydration, or death. Symptoms to look out for include severe vomiting and nausea; incapacity to keep food down for two to three days; lack of energy.

According to Dr. Bérard, women should not wait too long before seeking medical help. "The longer the symptoms continue, the longer the hospital stay," she says, adding most women with HG leave the hospital within three days and many are required to take medication throughout their pregnancy.

#### **About the study:**

"Metoclopramide and diphenhydramine in the treatment of hyperemesis gravidarum: Effectiveness and predictors of rehospitalization," published in *European Journal of Obstetrics and Gynecology and Reproductive Biology*, was authored by Anais Lacasse, Ema Ferreira and Anick Bérard of the Université de Montréal and the Sainte-Justine University Hospital Centre and Amandine Lagoutte of the Université de Bourgogne.

*Partners in Research: This study was funded by the Fonds de la Recherche en Santé du Québec.*

#### **Remember facts by cramming with fat**

Indulging in a fatty meal after studying for an exam could boost your results. A study in rats shows that eating a certain type of fat produces a hormone that helps the brain cement short-term memories into long-term ones.

Daniele Piomelli and colleagues at the University of California at Irvine trained rats to complete two tasks: avoid an area that gave them a shock, and find a platform in a pool of water. Immediately after the training periods, they injected some of the rats with oleoylethanolamide (OEA) - a chemical produced in the small intestine of vertebrates which creates a sense of fullness after eating fat. When the rats were retested one or two days later, the ones that received OEA performed better, suggesting they had stronger memories of their training (*Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.0903038106).

More experiments with the rats showed that OEA activates the same areas of the brain that mediate the formation of emotionally charged memories in humans, which are more vivid than typical memories.

The findings make sense from an evolutionary perspective, says Piomelli. When foraging animals find a fatty meal, they do well to remember exactly where and how they found it. Since humans also produce OEA, Piomelli says there is a good chance that it boosts our memory too.

OEA is only produced after eating a healthy unsaturated fat called oleic acid, so a cheeseburger after a night of cramming may not work - try food with olive oil or soybean oil, says Piomelli.

## Tonal languages are the key to perfect pitch

\* 06 April 2009 by Hazel Muir

IF YOU want your child to have perfect pitch like musical maestros Mozart and Chopin, then start them early on Mandarin or Vietnamese lessons. The likelihood of developing perfect pitch seems to be strongly linked to the language people speak, confirming that children can pick up the ability when they are very young.

Estimates suggest that perfect pitch is very rare in the US and Europe, with only about 1 in 10,000 people being able to hear a single tone and identify it as middle C, for instance. But it is slightly more common in people who start musical training under five.

Also, a 2006 study by psychologist Diana Deutsch of the University of California, San Diego, showed that perfect pitch is common in Chinese music students who speak Mandarin. Mandarin, like Cantonese and Vietnamese, is a tonal language in which the pitch of a spoken word is essential to its meaning. "In my experience, musicians in China don't regard perfect pitch as anything remarkable because it's very common," says Deutsch.

To find out if Chinese people have a genetic advantage, Deutsch's team tested 203 music students for perfect pitch - they had to identify all 36 notes from three octaves played in haphazard order. Those tested included 27 ethnic Chinese and Vietnamese students who had different levels of fluency in the tonal language learned from their parents.

It turned out that the Asian students scored no better than white students if they weren't fluent in their parents' language (*Journal of the Acoustical Society of America*, vol 125, p 2398). But very fluent students scored highly, getting about 90 per cent of the notes correct on average (see diagram). "They did incredibly well. It was overwhelming," says Deutsch.

This suggests that learning a tonal language plays a far greater role in perfect pitch than genes. "It really looks as though infants should acquire perfect pitch if they are given the opportunity to attach verbal labels to musical notes at the age when they learn speech," concludes Deutsch.

### "Hobbit" Foot Like No Other In Human Fossil Record

Newswise — An international team of paleoanthropologists, anatomists and archeologists have published the first scientific analysis of the foot of *Homo floresiensis*, the fossil found in Indonesia in 2003 and popularly referred to as the "Hobbit." Lead author William L. Jungers, Ph.D., of Stony Brook University, and colleagues documented the Hobbit's unusual combination of ape-like and human-like foot features, which clearly enabled bipedal walking, a hallmark of all humans and their extinct relatives (hominins), despite its surprisingly primitive design. Their findings, reported in the May 7 issue of *Nature*, provide further evidence that the ancestor of this species was perhaps not *Homo erectus* but instead another more primitive and remote hominin.



*Assembly of the "Hobbit" foot.*

The authors point out that the Hobbit foot has a relative foot length that far exceeds the upper limits for modern humans either of average or short stature. The foot is similar in relative length to pygmy chimpanzees, with long and curved toes, but also sports a short big toe in line with the other toes. While the foot has an overall structure that signals bipedal walking, it appears to have been "flat-footed" and poorly designed for running, one of the critical pedal features believed to characterize human ancestors since the time of *Homo erectus*.

"A foot like this one has never been seen before in the human fossil record," says Dr. Jungers, Distinguished Teaching Professor and Chair of the Department of Anatomical Sciences at Stony Brook. "Our analysis offers the most complete glimpse to date of how a primitive bipedal foot was designed and differed from that of later hominins and modern humans."

"Arches are the hallmark of a modern human foot," explains co-author Dr. William E. H. Harcourt-Smith of the American Museum of Natural History. "This is another strong piece of the evidence that the 'hobbit' was not like us."

In "The foot of *Homo floresiensis*," the authors also suggest that despite these feet being dated to the Late Pleistocene age (17,000 years ago), their features together with many other parts of the *Homo floresiensis* skeleton, might represent the primitive condition for our own genus *Homo*. This could imply a dispersal event out of Africa earlier than what paleoanthropologists have long thought.

“These particular ‘hobbit’ feet may have never walked into Mordor, but they certainly remind us how little we know about which other hominin species walked out of Africa and the many possible places their feet helped take them,” adds co-author Dr. Matthew Tocheri, of the Smithsonian Institution.

Dr. Jungers points out that “if the feet and skeleton of the ‘hobbits’ are instead the result of ‘island dwarfing’ from the Southeast Asian *Homo erectus* as some scientists suspect, then an amazing number of evolutionary reversals to primitive conditions had to occur as an unexplained and unprecedented by-product.”

Continued excavations on Flores and other parts of Indonesia, to be led by co-author Dr. Mike Morwood, of the University of Wollongong in Australia, in collaboration with Indonesian scientists from the National Research and Development Centre for Archeology in Jakarta, may unearth an answer to the competing theories on the origins and nature of *Homo floresiensis*.

*The research for this international study was supported by grants from the Australian Research Council, the National Geographic Society, the Wenner-Gren Foundation for Anthropological Research, the Wellcome Trust and the Leakey Foundation.*

*In addition to Dr. Jungers, co-authors of the study include: W. E. H. Harcourt-Smith, Division of Paleontology, American Museum of Natural History; R.E. Wunderlich, Department of Biological Sciences, James Madison University; M.W. Tocheri, Department of Anthropology, Smithsonian Institution; Susan G. Larson, Department of Anatomical Sciences, Stony Brook University Medical Center; T. Sutikna and Rhokus Awe Due, of the National Research and Development Centre for Archeology, Jakarta, Indonesia, and M.J. Morwood, School of Earth and Environmental Sciences, University of Wollongong, New South Wales, Australia.*

### **New universal breast cancer marker predicts recurrence and clinical outcome**

#### ***The marker appears to be widely applicable to all breast cancer patients, regardless of other established prognostic indicators***

(PHILADELPHIA) Reporting online in the American Journal of Pathology, researchers from the Kimmel Cancer Center at Jefferson have implicated the loss of a stromal protein called caveolin-1 as a major new prognostic factor in patients with breast cancer, predicting early disease recurrence, metastasis and breast cancer patient survival.

The absence of caveolin-1 in the stroma also appeared to be a marker for drug resistance in patients receiving tamoxifen, according to Michael Lisanti, M.D., Ph.D., professor in the departments of Cancer Biology, Medical Oncology and Biochemistry and Molecular Biology at Jefferson Medical College of Thomas Jefferson University.

According to Dr. Lisanti, who is also director of the Jefferson Stem Cell Biology and Regenerative Medicine Center at the Kimmel Cancer Center, caveolin-1 is expressed by cells in the stroma called fibroblasts, which are present in the connective tissue surrounding cancer cells. When cancer cells arise, the fibroblasts stop making caveolin-1.

"The idea that a prognostic biomarker is present in the stroma rather than the epithelial cancer cell is paradigm-shifting," Dr. Lisanti said. "Importantly, these findings could be developed into a diagnostic test that would not require DNA-based technologies. This inexpensive and cost-effective test would allow doctors to identify high-risk breast cancer patients at diagnosis and treat them more aggressively."

Dr. Lisanti, along with first author Agnieszka Witkiewicz, M.D., assistant professor of Pathology, Anatomy and Cell Biology at Jefferson, and other colleagues analyzed breast tissue samples from 154 women diagnosed with breast cancer. All samples were obtained from the University of Michigan. They used three tissue cores from each patient tumor sample, and analyzed each core for stromal caveolin-1 using immunohistochemistry staining.

The absence of stromal caveolin-1 was strongly associated with other predictors of more aggressive disease, such as higher tumor stage and lymph node metastasis. Among each subgroup of patients – grouped by prognostic factors such as hormone status, disease stage or lymph node status – a loss of stromal caveolin-1 remained the single strongest predictor of breast cancer patient outcome.

Also of note, among patients with ER-positive breast cancer who were taking tamoxifen, a loss of stromal caveolin-1 still predicted recurrence and poor clinical outcome. As many as 40 percent of patients who take tamoxifen in this setting relapse despite its significant effect on survival when used in the early stages of the disease.

"Resistance to tamoxifen is thought to be an epithelial 'cancer cell' phenomenon, but we show here that it is clearly a 'stromal' phenomenon," Dr. Lisanti said.

Progression-free survival (PFS) was also affected by the loss of stromal caveolin-1. Overall, the PFS in patients with an absence of stromal caveolin-1 was reduced by approximately 3.6-fold. In lymph-node positive patients, the difference in PFS was especially pronounced: The approximate five-year survival rate for patients

positive for stromal caveolin-1 was 80 percent, vs. 7 percent for patients negative for stromal caveolin-1. That is an approximate 11.5-fold reduction in five-year PFS.

"This marker serves not only as a prognostic marker, but also as a means of therapeutic stratification," Dr. Lisanti said. "We can identify this marker at breast cancer diagnosis, which is important because high-risk patients would benefit from more aggressive treatment and/or anti-angiogenic therapy."

In an additional study, published online in *Cancer Biology & Therapy*, the researchers also found that the loss of stromal caveolin-1 in ER-positive non-invasive breast cancers called ductal carcinoma in situ (DCIS) serves as a biomarker for progression to invasive breast cancer.

"This marker was highly predictive of development of invasive breast cancer in patients with DCIS," said Gordon Schwartz, M.D., a professor of Surgery at Jefferson, who was involved with the DCIS study. "We have been searching for a marker to separate patients with DCIS who require further treatment from those who might be treated with lumpectomy alone. If this marker can be validated further, then high-risk patients may be identified and treated to prevent the development of an invasive breast cancer. Those at low-risk would be spared from radiation therapy and/or mastectomy."

The prognostic value of a loss of caveolin-1 has now been validated in three independent patient populations. In an editorial appearing online in *Cell Cycle*, the researchers propose a "stromal" classification system that divides patients into high-risk and low-risk groups based on caveolin-1 status. Patients without caveolin-1 should be offered more aggressive therapy in addition to standard treatments.

"These are significant findings that do have to be validated in prospective breast cancer clinical trials," said Richard Pestell, M.D., Ph.D., director of the Kimmel Cancer Center at Jefferson, who was also involved with the studies. "However, we should start taking the breast tumor stroma into our clinical considerations sooner, rather than later."

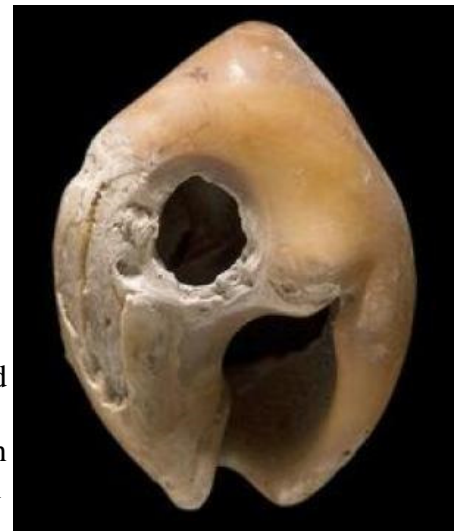
*Note: Dr. Lisanti serves as Editor-in-Chief of the American Journal of Pathology. A guest editor acted as editor-in-chief for the manuscript referenced in this press release. No person at Thomas Jefferson University was involved in the peer review process or final disposition for this article*

### **World's Oldest Manufactured Beads Are Older Than Previously Thought**

ScienceDaily (May 7, 2009) — A team of archaeologists has uncovered some of the world's earliest shell ornaments in a limestone cave in Eastern Morocco. The researchers have found 47 examples of *Nassarius* marine shells, most of them perforated and including examples covered in red ochre, at the Grotte des Pigeons at Taforalt.

The fingernail-size shells, already known from 82,000-year-old Aterian deposits in the cave, have now been found in even earlier layers. While the team is still awaiting exact dates for these layers, they believe this discovery makes them arguably the earliest shell ornaments in prehistory.

The shells are currently at the centre of a debate concerning the origins of modern behaviour in early humans. Many archaeologists regard the shell bead ornaments as proof that anatomically modern humans had developed a sophisticated symbolic material culture. Up until now, Blombos cave in South Africa has been leading the 'bead race' with 41 *Nassarius* shell beads that can confidently be dated to 72,000 years ago.



**Archaeologists have uncovered some of the world's earliest shell ornaments.** (Credit: Image courtesy of University of Oxford)

Aside from this latest discovery unearthing an even greater number of beads, the research team says the most striking aspect of the Taforalt discoveries is that identical shell types should appear in two such geographically distant regions. As well as Blombos, there are now at least four other Aterian sites in Morocco with *Nassarius* shell beads. The newest evidence, in a paper by the authors to be published in the next few weeks in the *Journal of Quaternary Science Reviews*, shows that the Aterian in Morocco dates back to at least 110,000 years ago.

Research team leader, Professor Nick Barton, from the Institute of Archaeology at the University of Oxford, said: 'These new finds are exciting because they show that bead manufacturing probably arose independently in different cultures and confirms a long suspected pattern that humans with modern symbolic behaviour were present from a very early stage at both ends of the continent, probably as early as 110,000 years ago.'

Also leading the research team Dr Abdeljalil Bouzouggar, from the Institut National des Sciences de l'Archéologie et du Patrimoine in Morocco, said: 'The archaeological and chronological contexts of the Taforalt discoveries suggest a much longer tradition of bead-making than previously suspected, making them perhaps the earliest such ornaments in the world.'



Archaeologists widely believe that humans in Europe first started fashioning purely symbolic objects about 40,000 years ago, but in Africa this latest evidence shows that humans were engaged in this activity at least 40,000 years before this.

Excavations in April 2009 also continued in the upper levels of Taforalt to investigate a large well-preserved cemetery dating to around 12,500 years ago. The project, coordinated by Dr Louise Humphrey, from the Natural History Museum in London, has found adult as well as infant burials at the site. The infant burials throw an interesting light on early burial traditions as many of the infants seem to be buried singly beneath distinctive blue stones with the undersides smeared with red ochre. By contrast, studies by Dr Elaine Turner of the Römisch Germanisches Zentralmuseum, Mainz, show that the adults' grave pits were generally marked by the horn cores of wild Barbary sheep. Taforalt remains the largest necropolis of the Late Stone Age period in North Africa presently under excavation.

Professor Barton said: 'Taking our new discovery of the shell beads at Taforalt, together with the discoveries of the decorated burials excavated by Dr Louise Humphrey, it shows that the cave must have retained its special interest for different groups of people over many thousands of years. One of its unique attractions and a focal point of interest seems to have been a freshwater spring that rises next to the cave.'

### Rise of Oxygen Caused Earth's Earliest Ice Age

By Gwyneth Dickey

COLLEGE PARK, Md - An international team of geologists may have uncovered the answer to an age-old question - an ice-age-old question, that is. It appears that Earth's earliest ice age may have been due to the rise of oxygen in Earth's atmosphere, which consumed atmospheric greenhouse gases and chilled the earth.

Scientists from the University of Maryland, including post-doctoral fellows Boswell Wing and Sang-Tae Kim, graduate student Margaret Baker, and professors Alan J. Kaufman and James Farquhar, along with colleagues in Germany, South Africa, Canada and the United States, uncovered evidence that the oxygenation of Earth's atmosphere - generally known as the Great Oxygenation Event - coincided with the first widespread ice age on the planet.

"We can now put our hands on the rock library that preserves evidence of irreversible atmospheric change," said Kaufman. "This singular event had a profound effect on the climate, and also on life."

Using sulfur isotopes to determine the oxygen content of ~2.3 billion year-old rocks in the Transvaal Supergroup in South Africa, they found evidence of a sudden increase in atmospheric oxygen that broadly coincided with physical evidence of glacial debris, and geochemical evidence of a new world-order for the carbon cycle.

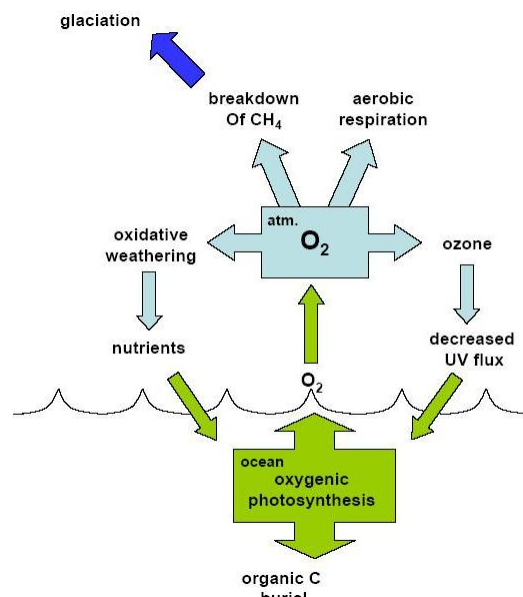
"The sulfur isotope change we recorded coincided with the first known anomaly in the carbon cycle. This may have resulted from the diversification of photosynthetic life that produced the oxygen that changed the atmosphere," Kaufman said.

Two and a half billion years ago, before the Earth's atmosphere contained appreciable oxygen, photosynthetic bacteria gave off oxygen that first likely oxygenated the surface of the ocean, and only later the atmosphere. The first formed oxygen reacted with iron in the oceans, creating iron oxides that settled to the ocean floor in sediments called banded iron-formations - layered deposits of red-brown rock that accumulated in ocean basins worldwide. Later, once the iron was used up, oxygen escaped from the oceans and started filling up the atmosphere.

***The evolution of organic photosynthesis ca.2.5 billion years ago would have had a profound effect on Earth's surface environments, and potentially on aerobic respiration by eukaryotes.***

Once oxygen made it into the atmosphere, the scientists suggest that it reacted with methane, a powerful greenhouse gas, to form carbon dioxide, which is 62 times less effective at warming the surface of the planet. "With less warming potential, surface temperatures may have plummeted, resulting in globe-encompassing glaciers and sea ice" said Kaufman.

In addition to its affect on climate, the rise in oxygen stimulated the rise in stratospheric ozone, our global sunscreen. This gas layer, which lies between 12 and 30 miles above the surface, decreased the amount of damaging ultraviolet sunrays reaching the oceans, allowing photosynthetic organisms that previously lived deeper down, to move up to the surface, and hence increase their output of oxygen, further building up stratospheric ozone.



"New oxygen in the atmosphere would also have stimulated weathering processes, delivering more nutrients to the seas, and may have also pushed biological evolution towards eukaryotes, which require free oxygen for important biosynthetic pathways," said Kaufman.

The result of the Great Oxidation Event, according to Kaufman and his colleagues, was a complete transformation of Earth's atmosphere, of its climate, and of the life that populated its surface. The study is published in the May issue of *Geology*.

### **Orange stars are just right for life**

\* 18:12 06 May 2009 by **David Shiga**, Baltimore

The universe's best real estate for life may be around stars a little less massive than the sun, called orange dwarfs, according to a new analysis. These stars live much longer than sun-like stars, and have safer habitable zones – where liquid water can exist – than those of lighter red dwarf stars.

Stars similar in mass to the sun, categorised as a yellow dwarf, have received the most attention from planet hunters. But recent research suggests orange dwarfs may provide an even better hunting ground for life-bearing planets.

Edward Guinan of Villanova University in Pennsylvania, leads a team that has been studying how the properties of stars vary with mass. The team is using observations from a variety of sources, such as archival measurements from the ROSAT X-ray satellite, and more recent measurements from ground-based telescopes.

#### **Long lifetimes**

The results confirm that red dwarf stars, which weigh between 10 and 50% as much as the sun, are far more prone to unleashing powerful flares that can deliver deadly radiation to nearby planets. This activity declines as the red dwarfs age, and scientists have not ruled out red dwarf planets as potential abodes for life, but any such life would certainly face some big challenges.

Orange dwarfs, on the other hand, with masses between 50 and 80% that of the sun, have only a little bit more flare activity than sun-like stars. They would also provide a haven for life for a much longer time – roughly double the 10-billion-year lifetime of a sun-like star.

Moreover, they change very little in brightness compared to sun-like stars. Our own sun has brightened by about 30% since the solar system began, and will likely make Earth too hot for life in about 1 billion years, even though the sun will still have about 5 billion years of fuel left to burn.

#### **Good targets**

The odds of intelligent life arising may be better on planets around orange dwarfs than sun-like stars, given the extra time available for it to evolve.

That makes orange dwarfs not only good targets for habitable planet searches, but for the search for extraterrestrial intelligence (SETI) as well, Guinan says. "There are old ones around – some are 8 to 9 billion years old, and could have planets that are more evolved," he told *New Scientist*.

Orange dwarfs are about three to four times as abundant as sun-like stars, making planet searches easier. Indeed, some planets have already been found around orange dwarfs, though outside the stars' habitable zones.

But Gregory Laughlin of the University of California, Santa Cruz, says it should be possible with current technology to find Earth-mass planets in the habitable zones of nearby orange dwarfs. "They do seem to be a sweet spot for prospects of actually detecting habitable planets," he told *New Scientist*.

Guinan discussed his research this week at an astrobiology conference in Baltimore, Maryland.

### **Bioelectricity promises more 'miles per acre' than ethanol**

Stanford, CA - Biofuels such as ethanol offer an alternative to petroleum for powering our cars, but growing energy crops to produce them can compete with food crops for farmland, and clearing forests to expand farmland will aggravate the climate change problem. How can we maximize our "miles per acre" from biomass? Researchers writing in the online edition of the May 7 *Science* magazine say the best bet is to convert the biomass to electricity, rather than ethanol. They calculate that, compared to ethanol used for internal combustion engines, bioelectricity used for battery-powered vehicles would deliver an average of 80% more miles of transportation per acre of crops, while also providing double the greenhouse gas offsets to mitigate climate change.

"It's a relatively obvious question once you ask it, but nobody had really asked it before," says study co-author Chris Field, director of the Department of Global Ecology at the Carnegie Institution. "The kinds of motivations that have driven people to think about developing ethanol as a vehicle fuel have been somewhat different from those that have been motivating people to think about battery electric vehicles, but the overlap is in the area of maximizing efficiency and minimizing adverse impacts on climate."

Field, who is also a professor of biology at Stanford University and a senior fellow at Stanford's Woods Institute for the Environment, is part of a research team that includes lead author Elliott Campbell of the University of California, Merced, and David Lobell of Stanford's Program on Food Security and the

Environment. The researchers performed a life-cycle analysis of both bioelectricity and ethanol technologies, taking into account not only the energy produced by each technology, but also the energy consumed in producing the vehicles and fuels. For the analysis, they used publicly available data on vehicle efficiencies from the US Environmental Protection Agency and other organizations.

Bioelectricity was the clear winner in the transportation-miles-per-acre comparison, regardless of whether the energy was produced from corn or from switchgrass, a cellulose-based energy crop. For example, a small SUV powered by bioelectricity could travel nearly 14,000 highway miles on the net energy produced from an acre of switchgrass, while a comparable internal combustion vehicle could only travel about 9,000 miles on the highway. (Average mileage for both city and highway driving would be 15,000 miles for a bioelectric SUV and 8,000 miles for an internal combustion vehicle.)

"The internal combustion engine just isn't very efficient, especially when compared to electric vehicles," says Campbell. "Even the best ethanol-producing technologies with hybrid vehicles aren't enough to overcome this."

The researchers found that bioelectricity and ethanol also differed in their potential impact on climate change. "Some approaches to bioenergy can make climate change worse, but other limited approaches can help fight climate change," says Campbell. "For these beneficial approaches, we could do more to fight climate change by making electricity than making ethanol."

The energy from an acre of switchgrass used to power an electric vehicle would prevent or offset the release of up to 10 tons of CO<sub>2</sub> per acre, relative to a similar-sized gasoline-powered car. Across vehicle types and different crops, this offset averages more than 100% larger for the bioelectricity than for the ethanol pathway. Bioelectricity also offers more possibilities for reducing greenhouse gas emissions through measures such as carbon capture and sequestration, which could be implemented at biomass power stations but not individual internal combustion vehicles.

While the results of the study clearly favor bioelectricity over ethanol, the researchers caution that the issues facing society in choosing an energy strategy are complex. "We found that converting biomass to electricity rather than ethanol makes the most sense for two policy-relevant issues: transportation and climate," says Lobell. "But we also need to compare these options for other issues like water consumption, air pollution, and economic costs."

"There is a big strategic decision our country and others are making: whether to encourage development of vehicles that run on ethanol or electricity," says Campbell. "Studies like ours could be used to ensure that the alternative energy pathways we chose will provide the most transportation energy and the least climate change impacts."

*This research was funded through a grant from the Stanford University Global Climate and Energy Project, with additional support from the Stanford University Food Security and Environment Project, The University of California at Merced, the Carnegie Institution for Science, and a NASA New Investigator Grant*

### **Constant sunlight linked to summer suicide spike**

Suicide rates in Greenland increase during the summer, peaking in June. Researchers writing in the open access journal BMC Psychiatry speculate that insomnia caused by incessant daylight may be to blame.

Karin Sparring Björkstén from the Karolinska Institutet, Sweden, led a team of researchers who studied the seasonal variation of suicides in all of Greenland from 1968-2002. They found that there was a concentration of suicides in the summer months, and that this seasonal effect was especially pronounced in the North of the country – an area where the sun doesn't set between the end of April and the end of August. Björkstén said, "In terms of seasonal light variation, Greenland is the most extreme human habitat. Greenland also has one of the highest suicide rates in the world. We found that suicides were almost exclusively violent and increased during periods of constant day. In the north of the country, 82% of the suicides occurred during the daylight months (including astronomical twilight)".

The researchers found that most suicides occurred in young men and that violent methods, such as shooting, hanging and jumping, accounted for 95% of all suicides. No seasonal variation in alcohol consumption was found. The authors speculate that light-generated imbalances in turnover of the neurotransmitter serotonin may lead to increased impulsiveness that, in combination with lack of sleep, may explain the increased suicide rates in the summer. They said, "People living at high latitudes need extreme flexibility in light adaptation. During the long periods of constant light, it is crucial to keep some circadian rhythm to get enough sleep and sustain mental health. A weak serotonin system may cause difficulties in adaptation".

Björkstén concludes, "Light is just one of many factors in the complex tragedy of suicide, but this study shows that there is a possible relationship between the two."

*Notes to Editors 1. Accentuation of suicides but not homicides with rising latitudes of Greenland in the sunny months Karin S Björkstén, Daniel F Kripke and Peter Bjerregaard BMC Psychiatry (in press)*

## **Transmission of MRSA and Clostridium difficile through dogs**

London, UK, 7 May 2009 – In a letter to the Editor of the Journal of Hospital Infection (<http://www.elsevier.com/locate/jhin>), published by Elsevier, S. Lefebvre and J.S. Weese from the University of Guelph in Canada describe a study that investigated whether MRSA and C.difficile could be passed between pet therapy dogs and patients. The findings suggested that MRSA and C. difficile may have been transferred to the fur and paws of these canine visitors through patients handling or kissing the dogs, or through exposure to a contaminated healthcare environment.

This study was conducted amongst 26 pet therapy dog-handler teams between June – August 2007. Twelve teams visited acute care facilities and 14 visited long-term care facilities. Prior to each visit, the dog's forepaws and their handlers' hands were tested for MRSA, vancomycin-resistant enterococci and C.difficile. In addition, the investigator sanitized her hands, handled each dog, and then tested her hands for the same pathogens. Testing was repeated on departure from the facility. The dog-handler teams were observed at all times during the visits and all interactions with patients and staff were closely monitored.

None of the tested pathogens were found on the hands of the investigator or the handlers or the paws of the pet-therapy dogs prior to these visits. However, after visiting an acute care facility, one dog was found to have C.difficile on its paws. When the investigator's hands were tested after handling another dog that had just visited a long-term care facility, MRSA was detected, suggesting the dog had acquired MRSA on its fur. The dog that acquired C.difficile had politely shaken paws with many of the patients. The dog found to have acquired MRSA on its fur, had been allowed onto patient's beds and was seen to be repeatedly kissed by two patients.

Finding MRSA on the hands of the investigator who petted a dog after its visit to the long-term facility suggests that dogs that have picked up these pathogens can transfer them back to people. Even transient contamination presents a new avenue for transmission, not only for the pathogens evaluated in the study, but potentially for others such as influenza and norovirus.

The authors conclude that in order to contain the transmission of pathogens through contact with pet therapy animals, all patients and handlers should follow recommended hand sanitation procedures; as for the dogs, perhaps it's time they learn how to clean themselves after contact with humans!

*Notes to Editors: "Contamination of pet therapy dogs with MRSA and Clostridium difficile" by S.L Lefebvre and J.S. Weese, appears in the Journal of Hospital Infection, doi:10.1016/j.jhin.2009.02.019 published by Elsevier on behalf of the Hospital Infection Society. For courtesy review copies of the article please contact [newsroom@elsevier.com](mailto:newsroom@elsevier.com).*

### **Morning sickness may be sign of a bright baby**

SICK of morning sickness? Take heart: it may be a sign that your child is developing a high IQ.

Irena Nulman and colleagues at the Hospital for Sick Children in Toronto, Canada, contacted 120 women who years earlier had called a morning sickness hotline. Thirty did not have morning sickness, but the researchers asked the rest to recall the severity of their sickness, and gave the children of all the women, now aged between 3 and 7, a standard intelligence test. Those whose mothers had nausea and vomiting during pregnancy were more likely to get high scores than those whose mothers did not (The Journal of Pediatrics, DOI: 10.1016/j.jpeds.2009.02.005). The reported severity of the vomiting also correlated with the IQ scores.

Morning sickness, which affects most pregnant women, is thought to be a reaction to the hormones human chorionic gonadotropin and thyroxine, which are secreted at unusually high levels during pregnancy to maintain a healthy placenta. Now Nulman speculates that these hormones, which are higher in women who experience morning sickness, may protect the fetus's developing brain.

Her team found that taking the morning sickness drug Diclectin had no effect on the IQ scores.

### **'Anaconda' harnesses wave power**

**By Christine McGourty** Science correspondent, BBC News

A new wave energy device known as "Anaconda" is the latest idea to harness the power of the seas. Its inventors claim the key to its success lies in its simplicity: Anaconda is little more than a length of rubber tubing filled with water. Waves in the water create bulges along the tubing that travel along its length gathering energy. At the end of the tube, the surge of energy drives a turbine and generates electricity.

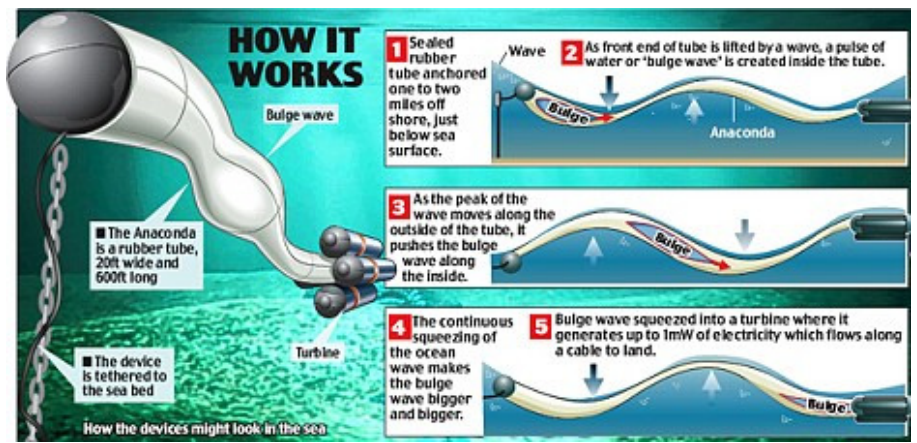
The device is being developed by Checkmate Seaenergy Ltd, which has been testing a small-scale 8m-long prototype in a wave tank in Gosport, Hampshire, owned by the science and technology company Qinetiq.

Paul Auston, chairman of Checkmate, says the tests have proved the concept works.

The company is now looking to raise £7m from investors to build a larger version to test at sea.

"We've seen excellent results in scale-model testing, and now we are gearing up to attract the necessary investment to develop Anaconda and begin producing the first full-sized units for ocean testing within the next three years," he told BBC News.

"The UK is known for its engineering excellence and politicians from all parties have been keen to challenge companies to come up with renewable energy projects that can be sold around the world. "With Anaconda, we have an invention that changes conventional thinking and it can help to meet government targets for cutting CO2 by providing renewable wave energy from our coastal waters. "It will also help cement the UK's world-leading position in this technology."



### *'Anaconda' harnesses wave power*

The co-inventor of the device, Professor Rod Rainey of engineering design consultants Atkins, has been working in the field for several decades.

He said: "The beauty of wave energy is its consistency. However, the problem holding back wave energy machines is that devices tend to deteriorate over time in the harsh marine environment.

"Anaconda is non-mechanical. It is mainly rubber, a natural material with a natural resilience, and so has very few moving parts to maintain."

The long-term plan is to have hundreds of these devices offshore where waves are big, in northern Scotland for example. Other potential locations would be on western seaboard - off the coast of America, Australia, Ireland and Japan, to name a few. It is claimed that a group of 50 full-size Anacondas - each 200m long - could provide electricity for 50,000 homes.

Professor Godfrey Boyle, an expert in renewable energy at the Open University, said the device sounded quite promising. If the required investment capital can be raised, the team "could be on to a winner", he said.

But he cautioned that the developers would need to achieve very long lifetimes for the device and the very high reliability required to withstand decades of battering by the waves - combined with low capital and maintenance costs and high-energy conversion efficiency.

### **Study finds homicidal poisoning rising, more likely in infants and elderly**

**Writer: Sam Fahmy**

Athens, Ga. – Homicidal poisonings are rare but on the rise—and infants are the most common victims—according to a new University of Georgia study that aims to raise awareness of this often overlooked crime.

Greene Shepherd, clinical professor in the UGA College of Pharmacy, and recent graduate Brian Ferslew examined seven years of recent federal mortality data and identified 523 deaths due to homicidal poisoning—a figure that corresponds to a rate of 0.26 poisonings per million people. The study found that although poisonings account for less than one percent of all homicides, they appear to be on the rise. The study documented a low of 0.20 cases per million in 2000 and a high of 0.35 in 2004. In 2005, the last year for which data is available, the rate was 0.3 per million people.

"Homicidal poisoning is rare relative to a lot of other causes of death, but the numbers are trending higher," said Shepherd, whose results appear in the May issue of the journal *Clinical Toxicology*. "We may never know the true incidence because some cases undoubtedly evade detection and classification."

Shepherd is a former poison control center director who had heard several anecdotal accounts of homicidal poisonings but found very little data on their incidence. Because such data is a critical starting point for efforts to reduce the risk of poisonings, he and Ferslew began combing through data compiled by the National Center for Health Statistics.

While books and television dramas often portray homicidal poisoning as a premeditated crime committed against adults, the researchers found that infants are the most common victims. Children less than one year old are approximately nine times more likely to be victims than the general population, the study found. Shepherd said that rather than being premeditated acts, the majority of these poisonings are likely negligent homicides committed by parents or caretakers.

"Anyone who has been a new parent knows about the long hours and the stress of an inconsolable child," Shepherd says. "In some cases people make bad decisions and try to sedate their children with medication or alcohol. I think there's a role for pharmacists and other health care workers to better educate new parents about the inappropriateness of sedating newborns."

Further analysis by race found that African-American infants—who are 21 times more likely to be victims than the general population—are most at risk. Shepherd said this increased risk among African Americans is “a tragic result of socioeconomic status,” as stressful situations and poor coping skills are more common in young parents lacking family support and economic stability.

The study found that older adults also had a significantly higher rate of poisoning than the general population. Older adults who require institutional or home care are particularly susceptible to abuse, Shepherd said, and are at risk of being administered excessive doses of sedatives or other medications.

The study also found that drugs, medications and other biological substances accounted for 65 percent of the poisonings during the 1999 to 2005 study period, while assault by gasses and vapor accounted for 28 percent of poisonings. The remaining seven percent of assaults involved other chemicals, corrosive substances or pesticides.

“Though rare, these crimes do happen,” Shepherd said. “Now that we’ve identified at-risk populations, we have the potential to raise awareness and possibly save lives.”

### **Massage after exercise myth busted by Queen’s research team**

#### ***Massage after exercise myth busted by Queen’s research team***

#### ***Massage actually impairs blood flow to the muscle after exercise***

Kingston, ON – A Queen’s University research team has blown open the myth that massage after exercise improves circulation to the muscle and assists in the removal of lactic acid and other waste products.

“This dispels a common belief in the general public about the way in which massage is beneficial,” says Kinesiology and Health Studies professor Michael Tschakovsky. “It also dispels that belief among people in the physical therapy profession. All the physical therapy professionals that I have talked to, when asked what massage does, answer that it improves muscle blood flow and helps get rid of lactic acid. Ours is the first study to challenge this and rigorously test its validity.”

The belief that massage aids in the removal of lactic acid from muscle tissue is so pervasive it is even listed on the Canadian Sports Massage Therapists website as one of the benefits of massage, despite there being absolutely no scientific research to back this up.

Kinesiology MSc candidate Vicky Wiltshire and Dr. Tschakovsky set out to discover if this untested hypothesis was true, and their results show that massage actually impairs blood flow to the muscle after exercise, and that it therefore also impairs the removal of lactic acid from muscle after exercise.

*This study will be presented at the annual American College of Sports Medicine conference in Seattle, Washington May 27-30, 2009*

### **Increased food intake alone explains the increase in body weight in the United States**

Amsterdam, the Netherlands: New research that uses an innovative approach to study, for the first time, the relative contributions of food and exercise habits to the development of the obesity epidemic has concluded that the rise in obesity in the United States since the 1970s was virtually all due to increased energy intake.

How much of the obesity epidemic has been caused by excess calorie intake and how much by reductions in physical activity has been long debated and while experts agree that making it easier for people to eat less and exercise more are both important for combating it, they debate where the public health focus should be.

A study presented on Friday at the European Congress on Obesity is the first to examine the question of the proportional contributions to the obesity epidemic by combining metabolic relationships, the laws of thermodynamics, epidemiological data and agricultural data.

“There have been a lot of assumptions that both reduced physical activity and increased energy intake have been major drivers of the obesity epidemic. Until now, nobody has proposed how to quantify their relative contributions to the rise in obesity since the 1970s. This study demonstrates that the weight gain in the American population seems to be virtually all explained by eating more calories. It appears that changes in physical activity played a minimal role,” said the study's leader, Professor Boyd Swinburn, chair of population health and director of the World Health Organization Collaborating Centre for Obesity Prevention at Deakin University in Australia.

The scientists started by testing 1,399 adults and 963 children to determine how many calories their bodies burn in total under free-living conditions. The test is the most accurate measure of total calorie burning in real-life situations.

Once they had determined each person's calorie burning rate, Swinburn and his colleagues were able to calculate how much adults needed to eat in order to maintain a stable weight and how much children needed to eat in order to maintain a normal growth curve.

They then worked out how much Americans were actually eating, using national food supply data (the amount of food produced and imported, minus the amount exported, thrown away and used for animals or other non-human uses) from the 1970s and the early 2000s.

The researchers used their findings to predict how much weight they would expect Americans to have gained over the 30-year period studied if food intake were the only influence. They used data from a nationally representative survey (NHANES) that recorded the weight of Americans in the 1970s and early 2000s to determine the actual weight gain over that period.

"If the actual weight increase was the same as what we predicted, that meant that food intake was virtually entirely responsible. If it wasn't, that meant changes in physical activity also played a role," Swinburn said. "If the actual weight gain was higher than predicted, that would suggest that a decrease in physical activity played a role."

The researchers found that in children, the predicted and actual weight increase matched exactly, indicating that the increases in energy intake alone over the 30 years studied could explain the weight increase.

"For adults, we predicted that they would be 10.8 kg heavier, but in fact they were 8.6 kg heavier. That suggests that excess food intake still explains the weight gain, but that there may have been increases in physical activity over the 30 years that have blunted what would otherwise have been a higher weight gain," Swinburn said.

"To return to the average weights of the 1970s, we would need to reverse the increased food intake of about 350 calories a day for children (about one can of fizzy drink and a small portion of French fries) and 500 calories a day for adults (about one large hamburger)," Swinburn said. "Alternatively, we could achieve similar results by increasing physical activity by about 150 minutes a day of extra walking for children and 110 minutes for adults, but realistically, although a combination of both is needed, the focus would have to be on reducing calorie intake."

He emphasized that physical activity should not be ignored as a contributor to reducing obesity and should continue to be promoted because of its many other benefits, but that expectations regarding what can be achieved with exercise need to be lowered and public health policy shifted more toward encouraging people to eat less.

## The Day the Universe Froze

By David F. Salisbury

Imagine a time when the entire universe froze. According to a new model for dark energy, that is essentially what happened about 11.5 billion years ago, when the universe was a quarter of the size it is today.

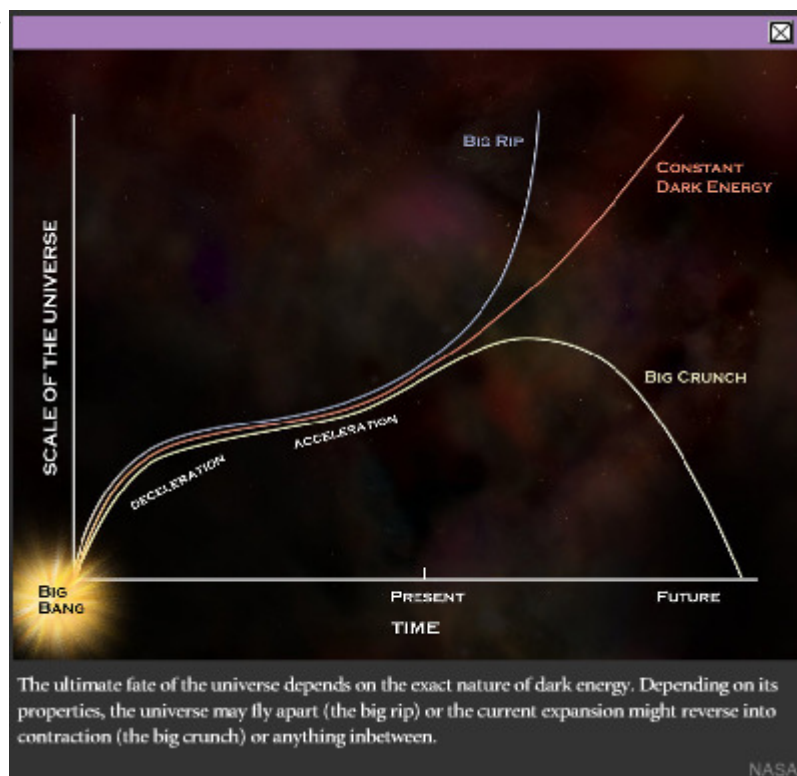
The model, published online May 6 in the journal *Physical Review D*, was developed by Research Associate Sourish Dutta and Professor of Physics Robert Scherrer at Vanderbilt University, working with Professor of Physics Stephen Hsu and graduate student David Reeb at the University of Oregon.

A cosmological phase transition ? similar to freezing ? is one of the distinctive aspects of this latest effort to account for dark energy ? the mysterious negative force that cosmologists now think makes up more than 70 percent of all the energy and matter in the universe and is pushing the universe apart at an ever-faster rate.

Another feature that distinguishes the new formulation is that it makes a testable prediction regarding the expansion rate of the universe. In

addition, the micro-explosions created by the largest particle colliders should excite the dark energy field and these excitations could appear as exotic, never-seen-before sub-atomic particles.

"One of the things that is very unsatisfying about many of the existing explanations for dark energy is that they are difficult to test," says Scherrer, "We designed a model that can interact with normal matter and so has observable consequences."



The model associates dark energy with something called vacuum energy. Like a number of existing theories, it proposes that space itself is the source of the repulsive energy that is pushing the universe apart. For many years, scientists thought that the energy of empty space averaged zero. But the discovery of quantum mechanics changed this view. According to quantum theory, empty space is filled with pairs of “virtual” particles that spontaneously pop into and out of existence too quickly to be detected.

This sub-atomic activity is a logical source for dark energy because both are spread uniformly throughout space. This distribution is consistent with evidence that the average density of dark energy has remained constant as the universe has expanded. This characteristic is in direct contrast to ordinary matter and energy, which become increasingly dilute as the universe inflates.

The theory is one of those that attribute dark energy to an entirely new field dubbed quintessence. Quintessence is comparable to other basic fields like gravity and electromagnetism, but has some unique properties. For one thing, it is the same strength throughout the universe. Another important feature is that it acts like an antigravity agent, causing objects to move away from each other instead of pulling them together like gravity.

In its simplest form, the strength of the quintessence field remains constant through time. In this case it plays the role of the cosmological constant, a term that Albert Einstein added to the theory of general relativity to keep the universe from contracting under the force of gravity. When evidence that the universe is expanding came in, Einstein dropped the term since an expanding universe is a solution to the equations of general relativity. Then, in the late 90’s, studies of supernovae (spectacular stellar explosions so powerful that they can briefly outshine entire galaxies consisting of millions of stars) indicated that the universe is not just expanding but also that the rate of expansion is speeding up instead of slowing down as scientists had expected.

That threw cosmologists for a loop since they thought gravity was the only long-range force acting between astronomical objects. So they had no idea what could possibly be pushing everything apart. The simplest way to account for this bizarre phenomenon was to bring back Einstein’s cosmological constant with its antigravity properties. Unfortunately, this explanation suffers from some severe drawbacks so physicists have been actively searching for other antigravity agents.

These antigravity agents (dubbed “dark energy models” in the technical literature) usually invoke quintessence or even more exotic fields. Because none of these fields have been detected in nature; however, their proponents generally assume that they do not interact significantly with ordinary matter and radiation.

One of the consequences of allowing quintessence to interact with ordinary matter is the likelihood that the field went through a phase transition ? froze out ? when the universe cooled down to a temperature that it reached 2.2 billion years after the Big Bang. As a result, the energy density of the quintessence field would have remained at a relatively high level until the phase transition when it abruptly dropped to a significantly lower level where it has remained ever since.

This transition would have released a fraction of the dark energy held in the field in the form of dark radiation. According to the model, this dark radiation is much different than light, radio waves, microwaves and other types of ordinary radiation: It is completely undetectable by any instrument known to man. However, nature provides a detection method. According to Einstein’s theory of general relativity, gravity is produced by the distribution of energy and momentum. So the changes in net energy and momentum caused by the sudden introduction of dark radiation should have affected the gravitational field of the universe in a way that has slowed its expansion in a characteristic fashion.

In the next 10 years or so, the large astronomical surveys that are just starting up to plot the expansion of the universe by measuring the brightness of the most distant supernovas should be able to detect the slowdown in the expansion rate that the model predicts. At the same time, new particle accelerators, like the Large Hadron Collider nearing operation in Switzerland, can produce energies theoretically large enough to excite the quintessence field and these excitations could appear as new exotic particles, the researchers say.

*The research was funded by grants from the U.S. Department of Energy.*

### **Bacteria Play Role in Preventing Spread of Malaria**

#### ***Microbes in Mosquito’s Gut Stimulate Immune Response Against Malaria Parasite***

Bacteria in the gut of the *Anopheles gambiae* mosquito inhibit infection of the insect with *Plasmodium falciparum*, the parasite that causes malaria in humans, according to researchers at the Johns Hopkins Bloomberg School of Public Health. Scientists with the Bloomberg School’s Malaria Research Institute found that removing these bacteria, or microbial flora, with antibiotics made the mosquitoes more susceptible to *Plasmodium* infection because of a lack of immune stimulation. Their study is published in the May 8, 2009, edition of the journal *PLoS Pathogens*.



As part of the malaria transmission cycle, a mosquito acquires the malaria-causing parasite when it feeds on blood from an infected person. The parasite develops within the mosquito and can then be transmitted to another human when the mosquito feeds again.

“Our study suggests that the microbial flora of mosquitoes is stimulating immune activity that protects the mosquito from Plasmodium infection. The same immune factors that are needed to control the mosquito’s infection from the microbes are also defending against the malaria parasite Plasmodium,” said George Dimopoulos, PhD, senior author of the study and associate professor with Johns Hopkins Malaria Research Institute. “The interplay between bacteria and the mosquito’s immune system may have significant implications for the transmission of malaria in the field where mosquitoes may be exposed to different types of bacteria in different regions. Theoretically, these bacteria could be introduced to the mosquitoes to boost their immunity to the malaria parasite and make them resistant and incapable of spreading the disease. Our current research aims at identifying those bacteria that trigger the strongest mosquito immune defense against the malaria parasite.”

As part of the study, the Johns Hopkins researcher treated mosquitoes with antibiotics to kill the gut bacteria. Treated mosquitoes were more susceptible to infection by Plasmodium when feeding on infected blood compared to mosquitoes that were not treated with antibiotics. To further verify the results, bacteria-free mosquitoes were infected with bacteria to determine if they were less susceptible to Plasmodium infection.

In addition, the researchers determined that mosquitoes infected with bacteria died earlier than mosquitoes without bacteria when infected with Plasmodium; 60 percent of the mosquitoes with gut-bacteria died compared to 40 percent of those free of bacteria—even with Plasmodium levels five times higher than those with bacteria.

“The malaria parasite must live in the mosquito for about two weeks in order to complete its life cycle and be transmitted to a person. The fact that these bacteria shorten the mosquito’s life span is additional good news,” said Dimopoulos.

Malaria kills over one million people worldwide each year; the majority of deaths are among children living in Africa.

*The study on the “Implication of the mosquito midgut microbiota in the defense against malaria parasites” was published by Yuemei Dong, Fabio Manfredini and George Dimopoulos. The research was supported by the Johns Hopkins Malaria Research Institute and the National Institute for Allergy and Infectious Diseases (NIAID), National Institutes of Health.*

## **Swine Flu Cases Worldwide Exceed 2,300**

**By DONALD G. McNEIL Jr.**

The World Health Organization said Thursday that 2,371 people in 24 countries now had confirmed cases of swine flu.

Only 46 people are known to have died of the virus, all but 2 of them in Mexico.

Scientists on Thursday described 11 cases of Americans who were infected before the current outbreak with swine flus that partly matched the new epidemic strain that emerged in Mexico in March. The first case was in December 2005.

In articles published online in The New England Journal of Medicine, virologists from the Centers for Disease Control and Prevention described those cases, most of them in young people in the Midwest who touched or were near pigs. All had a “triple reassortant” virus that combined human, swine and avian flu genes.

The H1N1 flu now spreading out from Mexico also has those genes, as well as genes from Eurasian swine.

The Eurasian genes “have never been seen in the Americas before, in humans or swine,” Michael W. Shaw, a member of the C.D.C.’s virus investigation team, said in a news conference on Thursday. “There is a gap in the surveillance.”

But, he added, “a lot of researchers are digging through their freezers” for stored samples that might contain the Eurasian genes.

The 11 patients all recovered, though 4 had to be hospitalized.

In Mexico, university and high school students returned to classes on Thursday. Fearing that bringing people back together could cause a resurgence of the virus, the Mexican authorities continued to recommend face masks on public transit. Restaurants reopened, but all staff members had to wear masks, too.

Dr. Keiji Fukuda, a W.H.O. assistant director general, noted that, in previous pandemics, up to a third of the world was eventually infected with each new virus over the course of one to two years.

The total number of swine flu cases in Europe increased to about 150. But there is not enough evidence of sustained community transmission there to justify raising the W.H.O. pandemic alert level, Dr. Fukuda said.

In the United States, state health authorities are not testing every possible case of the virus because backlogs have developed and 100 different viruses can cause flu symptoms. In New York, for example, the authorities test only people with flu symptoms serious enough to warrant hospitalization.

On Thursday evening, the C.D.C. case tally stood at 896 cases in 41 states.

“We are not seeing any signs of this petering out,” said Dr. Richard E. Besser, the C.D.C.’s acting director. “We are still on the upswing of the epidemic curve.”

Only about 10 percent of those infected had a travel history to Mexico, he said.

About 5 percent of the people with confirmed cases have been hospitalized. That is a much higher proportion than normal for seasonal flu, and the median age is 15, which is unusually young. But because some states are now testing only seriously ill patients for the novel virus, such skewing of the data is to be expected, Dr. Besser said.

While schools do not need to close because of a case of swine flu, he said, children who have it should stay home for seven days, including a day after their symptoms disappear.

Holding “swine flu parties” or otherwise deliberately trying to get infected with the virus on the theory that it will provide immunity if the disease returns in the fall “is a big mistake,” Dr. Besser said.

“How an individual person will be impacted by the infection is something we do not know,” he added. “We do not recommend that people follow that course.” *Sharon Otterman contributed reporting.*

### **Volcanic shutdown may have led to 'snowball Earth'**

\* 09 May 2009 by David Shiga

A 250-million-year shutdown of volcanic activity which is thought to have occurred early in Earth's history may be what turned the planet into a glacier-covered snowball. It could also have helped give rise to our oxygen-rich atmosphere.

Previous studies have noted that very little volcanic material has been dated to between 2.45 and 2.2 billion years ago, but it was widely assumed the gap would vanish as more samples were dated. Now an analysis of thousands of zircon minerals collected from all seven continents indicates that the gap may be real after all. Zircons provide a record of past volcanic activity, as the date they were formed can be calculated from the radioactive isotopes they contain.

The failure of so many samples from all over the world to fill the gap suggests there was a major slowdown in the planet's volcanic activity during this period, says Kent Condie of New Mexico Tech in Socorro, who led the study (*Earth and Planetary Science Letters*, DOI: 10.1016/j.epsl.2009.03.033). "Volcanism didn't shut off, but it became much, much less widespread during this time."

The lull could be tied to a pause in the motion of tectonic plates, which drives much of Earth's volcanic activity, Condie says. Computer simulations suggest this motion, which now takes place continuously, would have been intermittent early in Earth's history, when the planet's interior was hotter and less viscous, so less able to drag the plates.

The lull may in turn be a major factor behind a suspected "snowball Earth" event between 2.4 and 2.3 billion years ago, when much of the planet is thought to have been covered with ice (*New Scientist*, 2 December 2006, p 14). With no new carbon dioxide being spewed from volcanoes, its concentration in the atmosphere would have declined, leading to global cooling.

The lull could also be behind the rise in atmospheric oxygen that is known to have taken place around 2.4 billion years ago (*New Scientist*, 17 January, p 10). Prior to the lull, any oxygen produced by marine microorganisms was consumed in reactions with iron in the ocean. With no fresh volcanic material to replenish the iron, oxygen would have been free to build up in the atmosphere.

This in turn could have further cooled the Earth by removing another powerful greenhouse gas from the atmosphere. Methane is thought by some to have been relatively abundant in Earth's early history, helping to keep the planet warm at a time when the sun was much dimmer than it is now. But it would have been scrubbed away by the oxygen that was building up in the atmosphere.

Mark Harrison of the University of California, Los Angeles, says the idea of a lull is plausible, and agrees it would have had major climate effects. "It's intriguing, but it's going to be hard to demonstrate a smoking gun," he says. Alternatively, the lull could merely be an illusion that has arisen because volcanic material from this period has not been well preserved, Harrison warns.