

### **Study: New drug cuts deaths after heart attack**

***People recovering from a heart attack or severe chest pain are much less likely to suffer another heart-related problem or to die from one if they take a new blood-thinning drug along with standard anti-clotting medicines, a large study finds.***

But this benefit had a cost: a greater risk of serious bleeding, usually in the digestive tract.

Still, some doctors said the drug, Xarelto, could become a new standard of care for up to a million Americans hospitalized each year for these conditions. A low dose of the drug substantially cut the risk of dying of any cause during the study. "Mortality trumps everything," so a drug that improves survival is a win, said Dr. Paul Armstrong of the University of Alberta in Edmonton, Alberta, Canada.

He had no role in the study, discussed Sunday at an American Heart Association conference in Florida and published online by the New England Journal of Medicine. The study was sponsored by the drug's makers - Johnson & Johnson and Bayer Healthcare - and some researchers work or consult for the companies.

Xarelto is approved now at higher doses for preventing strokes in people with a common heart rhythm problem and for preventing blood clots after joint surgeries. It works in a different way than aspirin and older blood thinners do.

Dr. C. Michael Gibson of Harvard Medical School led a study testing it in 15,500 patients around the world who were leaving the hospital after a heart attack or severe chest pain from clogged arteries. All were prescribed aspirin and an older blood thinner. One-third also received a low dose of Xarelto, and one-third got a higher dose. After about a year on average, nearly 11 percent of those on just the usual medicines had suffered a heart attack, heart-related death or a stroke versus less than 9 percent of those on either dose of Xarelto.

The lower dose proved better and safer. Fewer than 3 percent of those getting Xarelto died of any cause during the study, compared with 4.5 percent of those getting just the usual medicines. That translates to a 32 percent lower risk with Xarelto.

"Our study group has been going for 27 years and we've not seen that" magnitude of benefit from a drug like this, said Dr. Eugene Braunwald of Harvard-affiliated Brigham and Women's Hospital, the study's chairman.

To prevent a single heart-related death, heart attack or stroke, only 56 people would need to be treated for two years with a low dose of the drug, Gibson said.

However, serious bleeding was nearly four times more common with Xarelto, including bleeding in the head, a potentially disabling side effect. Fatal bleeding was no greater with Xarelto, though.

"There's a trade-off" between thinning the blood to prevent clots and raising the risk of bleeding, said Dr. Roger Blumenthal, preventive cardiology chief at Johns Hopkins Medical Center.

Cost is another issue. Usual care for these patients is changing with newer drugs that have come on the market since this study started. One - ticagrelor, sold as Brilinta in the U.S. and other brands elsewhere - also proved beneficial for similar patients taking just aspirin instead of pricier additional medicines used in the Xarelto study.

Xarelto's makers will seek approval to sell it for people like those in this study by the end of the year, a Johnson & Johnson spokesman said. A price has not been set, but the higher doses sold now for other purposes run more than \$7 a day.

The good results with Xarelto contrast with the disappointing ones from an experimental blood thinner by Merck & Co., vorapaxar. The drug flopped in a key late-stage study aimed at preventing heart attacks, strokes and other problems in people similar to those in the study of Xarelto - hospitalized for a heart attack or severe chest pain from clogged arteries. Vorapaxar gave no significant benefit when added to standard medicines in a study of 13,000 patients around the world. It also raised the risk of serious bleeding.

Merck's senior vice president of cardiovascular research, Dr. Michael Mendelsohn, said results due out early next year from another large study testing vorapaxar in different types of patients will tell more about the drug's potential.

[http://www.sciencenews.org/view/generic/id/336077/title/Sleep\\_doesnt\\_help\\_old\\_folks\\_remember](http://www.sciencenews.org/view/generic/id/336077/title/Sleep_doesnt_help_old_folks_remember)

### **Sleep doesn't help old folks remember**

***Reduced quality of slumber with age erases memory benefits of snoozing***

**By Tina Hesman Saey**

WASHINGTON — For young people, snoozing means big gains in memory. But in older folks some of sleep's memory-boosting abilities are erased, a new study finds.

Sleep has been shown in a wide variety of studies to increase people's ability to recall words and objects and to improve physical skills. But that boost may be available only to the young, Lauri Kurdziel and Rebecca

Spencer of the University of Massachusetts Amherst reported November 13 at the Society for Neuroscience annual meeting.

Previously, the researchers had shown that a night of sleep improved young people's ability to learn a series of button presses similar to playing a piano. Adults in the over-50 age group didn't get a bump in performance from sleeping. But that difference may have been due to older folks' slower reaction times.

A new study, though, suggests that it's sleep's memory benefits that are reduced with age. Kurdziel and Spencer had a group of 18- to 30-year-olds and a group of 50- to 80-year-olds learn a sequence of colored doors that would lead them through 10 virtual rooms. The researchers then tested the participants' memories 12 hours later, either in the evening of the same day or after a night of sleep.

Young people who took the test after being awake all day made about 10 errors on average, but a night of sleep nearly halved the number of mistakes. In the over-50 group, a night of sleep didn't help. The people made just as many errors after sleeping all night as they did if they took the test after being awake for 12 hours.

The reason older people have trouble learning new tricks may be due to fragmented sleep patterns, said Kurdziel. Older people sometimes wake up more in the night (often to go to the bathroom), but also as people age, their sleep cycles get shorter. Although older and younger people get the same amount of sleep overall, older people spend less time per cycle in each of sleep's stages. Particularly important in this case may be that older people spend less time in sleep stage 2, in which the day's events are played back and committed to memory. It could be that older people just don't have enough time to replay and remember the entire sequence of door choices, Kurdziel said.

The study suggests that researchers need to identify the reason sleep cycles speed up and sleep becomes more fragmented with age, said Barbara Sahakian, a neuroscientist and clinical psychologist at the University of Cambridge in England. "It's difficult to do much about it at this stage without knowing what's driving it."

<http://www.bbc.co.uk/news/health-15639440>

### **Study links Parkinson's disease to industrial solvent**

***An international study has linked an industrial solvent to Parkinson's disease.***

**By Neil Bowdler Health reporter, BBC News**

Researchers found a six-fold increase in the risk of developing Parkinson's in individuals exposed in the workplace to trichloroethylene (TCE). Although many uses for TCE have been banned around the world, the chemical is still used as a degreasing agent. The research was based on analysis of 99 pairs of twins selected from US data records. Parkinson's can result in limb tremors, slowed movement and speech impairment, but the exact cause of the disease is still unknown, and there is no cure. Research to date suggests a mix of genetic and environmental factors may be responsible. A link has previously been made with pesticide use.

#### **'Significant association'**

The researchers from institutes in the US, Canada, Germany and Argentina, wanted to examine the impact of solvent exposure - specifically six solvents including TCE. They looked at 99 sets of twins, one twin with Parkinson's, the other without.

Because twins are genetically very similar or identical and often share certain lifestyle characteristics, twins were thought to provide a better control group, reducing the likelihood of spurious results. The twins were interviewed to build up a work history and calculate likely exposure to solvents. They were also asked about hobbies.

The findings are presented as the first study to report a "significant association" between TCE exposure and Parkinson's and suggest exposure to the solvent was likely to result in a six-fold increase in the chances of developing the disease. The study also adjudged exposure to two other solvents, perchloroethylene (PERC) and carbon tetrachloride (CCl<sub>4</sub>), "tended towards significant risk of developing the disease". No statistical link was found with the other three solvents examined in the study - toluene, xylene and n-hexane.

"Our study confirms that common environmental contaminants may increase the risk of developing Parkinson's, which has considerable public health implications," said Dr Samuel Goldman of The Parkinson's Institute in Sunnyvale, California, who co-led the study published in the journal *Annals of Neurology*.

He added: "Our findings, as well as prior case reports, suggest a lag time of up to 40 years between TCE exposure and onset of Parkinson's, providing a critical window of opportunity to potentially slow the disease before clinical symptoms appear."

#### **Water contaminant**

TCE has been used in paints, glue, carpet cleaners, dry-cleaning solutions and as a degreaser. It has been banned in the food and pharmaceutical industries in most regions of the world since the 1970s, due to concerns over its toxicity.

In 1997, the US authorities banned its use as an anaesthetic, skin disinfectant, grain fumigant and coffee decaffeinating agent, but it is still used as a degreasing agent for metal parts.

Groundwater contamination by TCE is widespread, with studies estimating up to 30% of US drinking water supplies are contaminated with TCE. In Europe, it was reclassified in 2001 as a "category 2" carcinogen, although it is still used in industrial applications.

PERC, like TCE, is used as a dry-cleaning agent and degreasing agent, and is found in many household products. CCl<sub>4</sub>'s major historical use was in the manufacture of chlorofluorocarbons for use as refrigerants, but it has also been used a fumigant to kill insects in grain.

Commenting on the paper, Dr Michelle Gardner, Research Development Manager at Parkinson's UK, said: "This is the first study to show that the solvent TCE may be associated with an increased risk of developing Parkinson's. "It is important to highlight that many of the previous uses of this solvent have been discontinued for safety reasons over 30 years ago and that safety and protection in work places where strong chemicals such as this solvent are used has greatly improved in recent years." She also called for more research to confirm the link between TCE and other solvents with Parkinson's. "Further larger-scale studies on populations with more defined exposures are needed to confirm the link," she said.

[http://www.eurekalert.org/pub\\_releases/2011-11/hu-ngc111111.php](http://www.eurekalert.org/pub_releases/2011-11/hu-ngc111111.php)

### **Nice guys can finish first**

#### ***Study finds social networks promote cooperation, discourage selfishness***

It turns out nice guys can finish first, and David Rand has the evidence to prove it.

Rand, a post-doctoral fellow in Harvard's Department of Psychology and a Lecturer in Human Evolutionary Biology, is the lead author of a new paper, which found that dynamic, complex social networks encourage their members to be friendlier and more cooperative, with the possible payoff coming in an expanded social sphere, while selfish behavior can lead to an individual being shunned from the group and left – literally – on their own.

As described this week in the Proceedings of the National Academy of Sciences (PNAS), the research is among the first such studies to examine social interaction as a fluid, ever-changing process. Previous studies of complex social networks largely used static snapshots of the groups to examine how members were or were not connected. This new approach, Rand said, is the closest scientists have yet come to describing the way the planet's 6 billion inhabitants interact on a daily basis.

"What we are showing is the importance of the dynamic, flexible nature of real-world social networks," Rand said. "Social networks are always shifting, and they're not shifting in random ways.

"Although people sometimes do nasty things to each other, for the most part we are fantastically cooperative," Rand said. "We do an amazing job of having thousands or even millions of people living in very close quarters in cities all over the world. In a functioning society, things like trade, friendship, even democracy itself require high levels of cooperation, and when everyone does it, you get good collective outcomes."

"Cooperation is a fascinating topic," Sociology and Medicine Professor and Pforzheimer House master Nicholas Christakis said. "We see cooperation everywhere in the biological and social worlds, but it's actually very hard to explain. Why do creatures, including ourselves, cooperate?"

"What our paper shows is that there is a deep relationship between cooperation and social networks. In particular, we found that if you allow people to re-wire their social networks, cooperation is sustained in the population. I believe this paper is the first to show, empirically, how that relationship works. As humans, we do two very special things: we re-shape the social world around us, and in so doing, we create a better place for ourselves by being nice to each other."

To demonstrate how groups reach those good collective outcomes, the scientists, including Sam Arbesman, a former post-doctoral fellow in the Department of Health Care Policy at Harvard Medical School, recruited nearly 800 volunteers, who, in groups of between 20 and 30 people, took part in the study by playing a simple game.

At the outset, Rand said, each player begins with an equal number of points, and is randomly connected with one or more players. As the game progresses, players have the opportunity to be either generous, and pay to give points to each player they are connected with, or be selfish, and do nothing. Following each round, some players are randomly given the opportunity to update their connections, based on whether other players have been generous or selfish.

The findings, Rand said, showed that players re-wired their social networks in intriguing ways that helped both themselves and the group they were in. They were more willing to make new connections or maintain existing connections with those who acted generously, and break connections with those who behaved selfishly.

"Because people have control over who they are interacting with, people are more likely to form connections with people who are cooperative, and much more likely to break those links with people who are not," Rand said. "Basically, what it boils down to is that you'd better be a nice guy, or else you're going to get cut off."

Intriguingly, the study also uncovered a correction mechanism inherent to social groups. Those who were initially non-cooperative, Rand said, were found to be twice as likely to become cooperative after being shunned, suggesting that being cut off from the group acts as a sort of internal discipline, ensuring that cooperation remains high within a social network. "As a result, when you have a network that's dynamic, you see stable, high levels of cooperation, whereas in networks where people have no choice about who to interact with, you see a steady breakdown of cooperation," Rand said.

As important as the study's findings are, the research is also notable for its innovative experimental design. Rather than recruit subjects to come to his lab for testing, Rand relied on Amazon Mechanical Turk, an online labor market created by Amazon.com, to enlist nearly 800 participants from across the globe.

"Lab experiments are incredibly valuable because they let you very tightly control the experimental conditions, which is helpful to demonstrate causality," Rand said. "But lab experiments also tend to be very time-consuming and expensive, because it's difficult to get people to come in. The Internet offers an amazing opportunity for streamlining the process."

Developed several years ago, Mechanical Turk is an online labor market where employers can hire workers to perform what they call "human intelligence tasks" – simple, repetitive tasks that are easy for humans – such as describing the content of a picture, transcribing audio, or translating text from one language to another - but are frustratingly difficult to program computers to perform.

"It's a crowd-sourcing tool," Rand said. "What we're doing is crowd-sourcing experimental social science. We are now an 'employer' on Mechanical Turk, but instead of asking people to label images, we're hiring them to take part in our experiments."

"From a philosophical perspective, I think this is an amazingly important technology for the social sciences, because it's democratizing," Rand continued. "You no longer need to be at a university that has a big lab, with a huge research budget and someone maintaining a subject pool."

Though the paper is one of the first to use Mechanical Turk as a method for recruiting participants, Christakis said the site has already had a wide-reaching impact on the social sciences.

"This is a whole new way of doing social science and conducting experiments," he said. "By creating a virtual laboratory, it broadens the scale and speed of these experiments. In principle, one can do an experiment with thousands of participants, and we are able to control how participants interact and behave in ways that were unimaginable even five years ago. We think this will do for the social sciences what the invention of the microscope did for biology."

[http://www.eurekalert.org/pub\\_releases/2011-11/bmj-cpa111111.php](http://www.eurekalert.org/pub_releases/2011-11/bmj-cpa111111.php)

## **Contraceptive pill associated with increased prostate cancer risk worldwide**

### ***Oral contraceptive use is associated with prostate cancer: An ecological study***

Use of the contraceptive pill is associated with an increased risk of prostate cancer around the globe, finds research published in BMJ Open. Prostate cancer is the most common male cancer in the developed world and the use of the contraceptive pill has soared over the past 40 years, say the authors.

The research team used data from the International Agency for Research on Cancer (IARC) and the United Nations World Contraceptive Use report to pinpoint rates of prostate cancer and associated deaths and the proportion of women using common methods of contraception for 2007. They then analysed the data for individual nations and continents worldwide to see if there was any link between use of the contraceptive pill and illness and death caused by prostate cancer. Their calculations showed that use of intrauterine devices, condoms, or other vaginal barriers was not associated with an increased risk of prostate cancer.

But use of the contraceptive pill in the population as a whole was significantly associated with both the number of new cases of, and deaths from, prostate cancer in individual countries around the world, the analysis showed. These findings were not affected by a nation's wealth.

The authors emphasise that their research is speculative and designed to prompt further consideration of the issues. As such, their analysis does not confirm cause and effect, and therefore definitive conclusions cannot be drawn, as yet. But they refer to several recent studies which have suggested that oestrogen exposure may boost the risk of prostate cancer.

Excess oestrogen exposure is known to cause cancer, and it is thought that widespread use of the Pill might raise environmental levels of endocrine disruptive compounds (EDCs) - which include by-products of oral contraceptive metabolism.



These don't break down easily, so can be passed into the urine and end up in the drinking water supply or the food chain, exposing the general population, say the authors.

"Temporal increases in the incidence of certain cancers (breast, endometrial, thyroid, testis and prostate) in hormonally sensitive tissues in many parts of the industrialised world are often cited as evidence that widespread exposure of the general population to EDCs has had adverse impacts on human health," they write.

[http://www.eurekalert.org/pub\\_releases/2011-11/uobc-ruw111411.php](http://www.eurekalert.org/pub_releases/2011-11/uobc-ruw111411.php)

### **Researchers uncover why the body can't defend against tuberculosis**

#### ***The stealth art of infectious agents: Researchers uncover why the body can't defend against tuberculosis***

Tuberculosis, which kills over 2 million people each year, is caused primarily by infectious bacteria known as *Mycobacterium tuberculosis* – or Mtb. Mtb targets human immune cells as part of its strategy to avoid detection, effectively neutralizing the body's immune response.

Up until now, scientists had a general understanding of the process, but researchers in the Immunity and Infection Research Centre at Vancouver Coastal Health Research Institute and the University of British Columbia have shown Mtb produces a specific protein that allows it to defuse and bypass the body's security system. The results are published today in *The Proceedings of the National Academy of Sciences*, and provide a pathway for improved treatments against this disease.

"TB has been able to completely mislead our immune systems, convincing our body it isn't there, which is why it is such an effective killer," says Dr. Yossef Av-Gay, research scientist with the Immunity and Infection Research Centre at the Vancouver Coastal Research Institute and professor in the Division of Infectious Disease at UBC Faculty of Medicine. "We discovered that the cells in charge of targeting and destroying invading bacteria are being fooled by a special protein that blocks the immune cells ability to recognize and destroy it."

Here is how it works. Macrophages are dedicated human immune cells with the role of identifying and defeating dangerous microorganisms. Normally, macrophages engulf bacteria, or other infectious agents, and contain them in an enclosed secluded environment. Then, special components of the cell (cellular organelles) move to the controlled area and release acid enzymes that dissolve the bacteria. The system works beautifully against most infectious agents. However, as Dr. Av-Gay's team found, Mtb operates in a stealth manner, turning off this immune response.

In the case of Mtb, once the bacteria become engulfed by macrophages, they secrete a protein named PtpA that disables the two separate mechanisms required for making the acidic environment that normally targets them. The end result is that Mtb lives comfortably in the immune cells, like a Trojan horse, hidden from the rest of the immune system. The bacteria then multiply inside the macrophage, and when released, they attack the body.

"We have been engaged in studying the interaction between the TB bacterium and the human macrophage over the past decade," says Dr. Av-Gay. "We are delighted with this discovery. Through learning about the tricks it uses, we now have new targets, so that we can develop better drugs against this devastating disease."

TB is the leading cause of death among infectious diseases in the world today and is responsible for one in four adult preventable deaths, according to the World Health Organization (WHO). Every 20 seconds TB kills someone, with approximately 4400 people dying every day. The WHO estimates that one-third of the world's population is infected.

<http://medicalxpress.com/news/2011-11-group-522m-diabetes.html>

### **1 in 10 adults could have diabetes by 2030**

#### ***The International Diabetes Federation predicts that at least one in 10 adults could have diabetes by 2030, according to its latest statistics.***

(AP) - In a report issued on Monday, the advocacy group estimated that 552 million people could have diabetes in two decades' time based on factors like aging and demographic changes. Currently, the group says that about one adult in 13 has diabetes.

The figure includes both types of diabetes as well as cases that are undiagnosed. The group expects the number of cases to jump by 90 percent even in Africa, where infectious diseases have previously been the top killer. Without including the impact of increasing obesity, the International Diabetes Federation said its figures were conservative.

According to the World Health Organization, there are about 346 million people worldwide with diabetes, with more than 80 percent of deaths occurring in developing countries. The agency projects diabetes deaths will double by 2030 and said the International Diabetes Federation's prediction was possible. "It's a credible figure," said Gojka Roglic, head of WHO's diabetes unit. "But whether or not it's correct, we can't say."

Roglic said the projected future rise in diabetes cases was because of aging rather than the obesity epidemic. Most cases of diabetes are Type 2, the kind that mainly hits people in middle age, and is linked to weight gain and a sedentary lifestyle.

Roglic said a substantial number of future diabetes cases were preventable. "It's worrying because these people will have an illness which is serious, debilitating, and shortens their lives," she said. "But it doesn't have to happen if we take the right interventions." *More information:* <http://www.idf.org>

<http://www.newscientist.com/article/dn21158-smallpox-vaccine-doubles-liver-cancer-survival-time.html>

### **Smallpox vaccine doubles liver cancer survival time**

***It gave us the first ever eradication of an infectious disease; now it may help defeat cancer. Smallpox vaccine has doubled the survival time of people with advanced liver cancer.***

**11:12 14 November 2011 by Debora MacKenzie**

The vaccine that eradicated smallpox consists of a live virus, Vaccinia, with a surprising taste for tumours. It prefers to infect cancer cells because they turn off the antiviral protein interferon and turn on signalling molecules that attract Vaccinia. Early experiments in a variety of tumours reported in 2007 suggested that this might make the virus, which has been used safely in millions of people, a revolutionary cancer treatment.

To enhance this effect, Jennerex Biotherapeutics of San Francisco, California – named after Edward Jenner, who reported his discovery of smallpox vaccine in 1798 – gave the live virus two genetic modifications. One deprives it of an enzyme abundant in cancer cells, to encourage it to replicate there rather than in normal cells. The other makes a protein that attracts an attack by the body's immune system.

In a trial in 30 people at a late stage of the liver cancer hepatocellular carcinoma, those given a high dose of the vaccine survived for 14 months on average, while those given a low dose survived seven.

#### **Late start**

Jennerex first tested the virus in people with late-stage hepatocellular carcinoma, says company spokesperson Jennifer Williams, because they did not have long to live, so it would be clear in a short time whether the treatment had an effect. These results, however, now suggest it should work at earlier stages too.

Hepatocellular carcinoma is the third biggest cause of death by cancer worldwide, and new treatments are badly needed, says Tony Reid of the University of California, San Diego, who presented the results at a conference on liver disease in San Francisco last week. Jennerex also plans to test the virus on colorectal cancer, another common variety that has resisted other treatments.

<http://www.newscientist.com/article/dn21160-breastmilk-stem-cells-may-bypass-ethical-dilemmas.html>

### **Breast-milk stem cells may bypass ethical dilemmas**

***Embryonic-like stem cells have been isolated from breast milk in large numbers. The discovery raises the possibility of sourcing stem cells for regenerative medicine, without the need to destroy embryos.***

**14:30 14 November 2011 by Linda Geddes**

Peter Hartmann at the University of Western Australia in Crawley and his colleagues first announced the discovery of stem cells in breast milk in 2008. Now they have grown them in the lab and shown that they can turn into cells representative of all three embryonic germ layers, called the endoderm, mesoderm and ectoderm – a defining property of embryonic stem cells (ESC). "They can become bone cells, joint cells, fat cells, pancreatic cells that produce their own insulin, liver cells that produce albumin and also neuronal cells," says Foteini Hassiotou, a member of Hartmann's lab team, who led the recent work.

The breast cells also express the majority of protein markers that you would expect to find in ESCs. "What is really amazing is that these cells can be obtained in quite large amounts in breast milk," Hassiotou adds. She says the stem cells constitute around 2 per cent of cells in breast milk although the number varies according to how long the woman has been producing milk and how full her breasts are. Hassiotou will present the team's work at the 7th International Breastfeeding and Lactation Symposium in Vienna, Austria early next year.

Many remain sceptical, however. "Perhaps there are some mammary gland stem cells that can be coaxed to have a slightly broader potential than normal, but I very much doubt that embryonic-like cells normally exist in the breast," says Robin Lovell-Badge of the National Institute for Medical Research in London. For one thing, you would expect tumours to be more common than they are.

The real test will be to inject these cells into mice and see if they form teratomas – tumours containing tissue or structures derived from all three germ layers. "That's the gold standard for whether you have a true pluripotent cell," says Chris Mason of University College London. Hassiotou says they plan to start these tests in the coming weeks.

Embryonic-like stem cells have previously been discovered in amniotic fluid and in the umbilical cord, but this is the first time they have been discovered in an adult. Other adult stem cells exist – such as hematopoietic stem cells, which can generate all types of blood cell and mesenchymal stem cells, which can turn into bone, fat and cartilage cells. But these stem cells cannot generate as many cell types as the breast milk cells apparently can. "If they are truly embryonic, this would be another way of getting stem cells that would not raise ethical concerns," says Mason.

However, even if they do not turn out to be ESCs, these breast milk cells could still have great potential for regenerative medicine. "It might be possible to grow these cells in culture then bank them so that if or when the mother develops some disease later in life, such as diabetes, her cells may be defrosted and differentiated into pancreatic beta cells," says Lyle Armstrong of Newcastle University, UK, although he too, cautions that more tests are needed to determine exactly what these cells are.

The discovery also raises intriguing questions about the role of these cells in breastfed babies. "It has been shown in mice that live immune cells in breast milk pass through the intestinal mucosa into the blood circulation of the pups and engraft in various tissues," says Hassiotou. "If these cells are in human milk and in such high amounts they probably have a role. They might contribute to tissue regeneration and development of the baby or play certain roles if there is a disease."

The team is planning experiments to track what happens to these cells once they get into infants.

[http://www.eurekalert.org/pub\\_releases/2011-11/uosc-rcn111411.php](http://www.eurekalert.org/pub_releases/2011-11/uosc-rcn111411.php)

### **Researchers confirm new cancer-causing virus**

#### ***Common cytomegalovirus has central role in salivary gland cancer and possibly other malignancies***

An important new study from the Laboratory for Developmental Genetics at USC has confirmed cytomegalovirus (CMV) as a cause of the most common salivary gland cancers. CMV joins a group of fewer than 10 identified oncoviruses - cancer-causing viruses - including HPV. The findings, published online in the journal *Experimental and Molecular Pathology* over the weekend, are the latest in a series of studies by USC researchers that together demonstrate CMV's role as an oncovirus, a virus that can either trigger cancer in healthy cells or exploit mutant cell weaknesses to enhance tumor formation.

Lead author Michael Melnick, professor of developmental genetics in the Ostrow School of Dentistry of USC and Co-Director of the Laboratory for Developmental Genetics, said the conclusion that CMV is an oncovirus came after rigorous study of both human salivary gland tumors and salivary glands of postnatal mice.

CMV's classification as an oncovirus has important implications for human health. The virus, which has an extremely high prevalence in humans, can cause severe illness and death in patients with compromised immune systems and can cause birth defects if a woman is exposed to CMV for the first time while pregnant. It may also be connected to other cancers besides salivary gland cancer, Melnick added.

"CMV is incredibly common; most of us likely carry it because of our exposure to it," he said. "In healthy patients with normal immune systems, it becomes dormant and resides inactive in the salivary glands. No one knows what reactivates it."

This study illustrates not only that the CMV in the tumors is active but also that the amount of virus-created proteins found is positively correlated with the severity of the cancer, Melnick said.

Previous work with mice satisfied other important criteria needed to link CMV to cancer. After salivary glands obtained from newborn mice were exposed to purified CMV, cancer developed. In addition, efforts to stop the cancer's progression identified how the virus was acting upon the cells to spark the disease.

Thus, the team not only uncovered the connection between CMV and mucoepidermoid carcinoma, the most common type of salivary gland cancer, but also identified a specific molecular signaling pathway exploited by the virus to create tumors, being the same in humans and mice. "Typically, this pathway is only active during embryonic growth and development," Melnick said, "but when CMV turns it back on, the resulting growth is a malignant tumor that supports production of more and more of the virus."

The study was conducted by Melnick with Ostrow School of Dentistry of USC colleagues Tina Jaskoll, professor of developmental genetics and co-director of the Laboratory for Developmental Genetics; Parish Sedghizadeh, director of the USC Center for Biofilms and associate professor of diagnostic sciences; and Carl Allen at The Ohio State University.

Jaskoll said salivary gland cancers can be particularly problematic because they often go undiagnosed until they reach a late stage. And since the affected area is near the face, surgical treatment can be quite extensive and seriously detrimental to a patient's quality of life.



However, with the new information about CMV's connection to cancer comes hope for new prevention and treatment methods, perhaps akin to the development of measures to mitigate human papilloma virus (HPV) after its connection to cervical cancer was established. Jaskoll added that the mouse salivary gland model created to connect CMV to cancer might also be used to design more effective treatments.

"This could allow us to have more rational design of drugs used to treat these tumors," she said.

Melnick said that in the not too distant future, he expects much more information about viruses and their connections to cancer and other health issues seemingly unrelated to viral infection to emerge. "This should be a most fruitful area of investigation for a long time to come," he said. "This is just the tip of the iceberg with viruses."

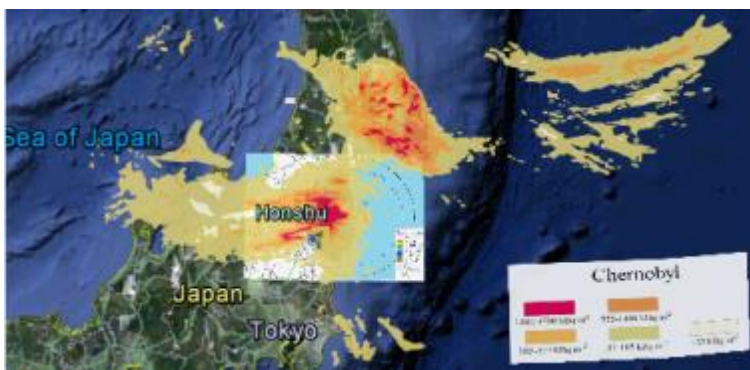
"Human Cytomegalovirus and Mucoepidermoid Carcinoma of Salivary Glands: Cell-Specific Localization of Active Viral and Oncogenic Signaling Proteins is Confirmatory of a Causal Relationship," was funded by the Oral Biology Fund of the Ostrow School of Dentistry of USC.

[http://blogs.nature.com/news/2011/09/directly\\_comparing\\_fukushima\\_t.html](http://blogs.nature.com/news/2011/09/directly_comparing_fukushima_t.html)

### Directly comparing Fukushima to Chernobyl - September 07, 2011

**This Sunday (11 September) marks the six-month anniversary of the triple meltdown at the Fukushima Daiichi nuclear power plant in Japan.**

The accident has slipped from the headlines, but new data are coming out all the time. Some of the most recent findings are allowing the best comparison yet of Fukushima with Chernobyl. A lot of media outlets (ourselves included) first made the Fukushima-Chernobyl comparison back in April, when the Japanese revised their estimate of the Fukushima accident - rating it a seven on the seven-point international INES scale. The conclusion most reached at the time was that, although the rating was the same, Fukushima was a much smaller accident. A couple of things have changed since those first reports. First, the Japanese doubled their estimate of the radiation released by Fukushima in June to  $7.7 \times 10^{17}$  Becquerels (Bq). Then, on 30 August, they released the first maps of radioactive caesium-137 (Cs-137) contamination from the plant. Cs-137 has a half-life of 30 years, and it's considered the major long-term contaminate for both accidents.



[Embedded KML Viewer](#)

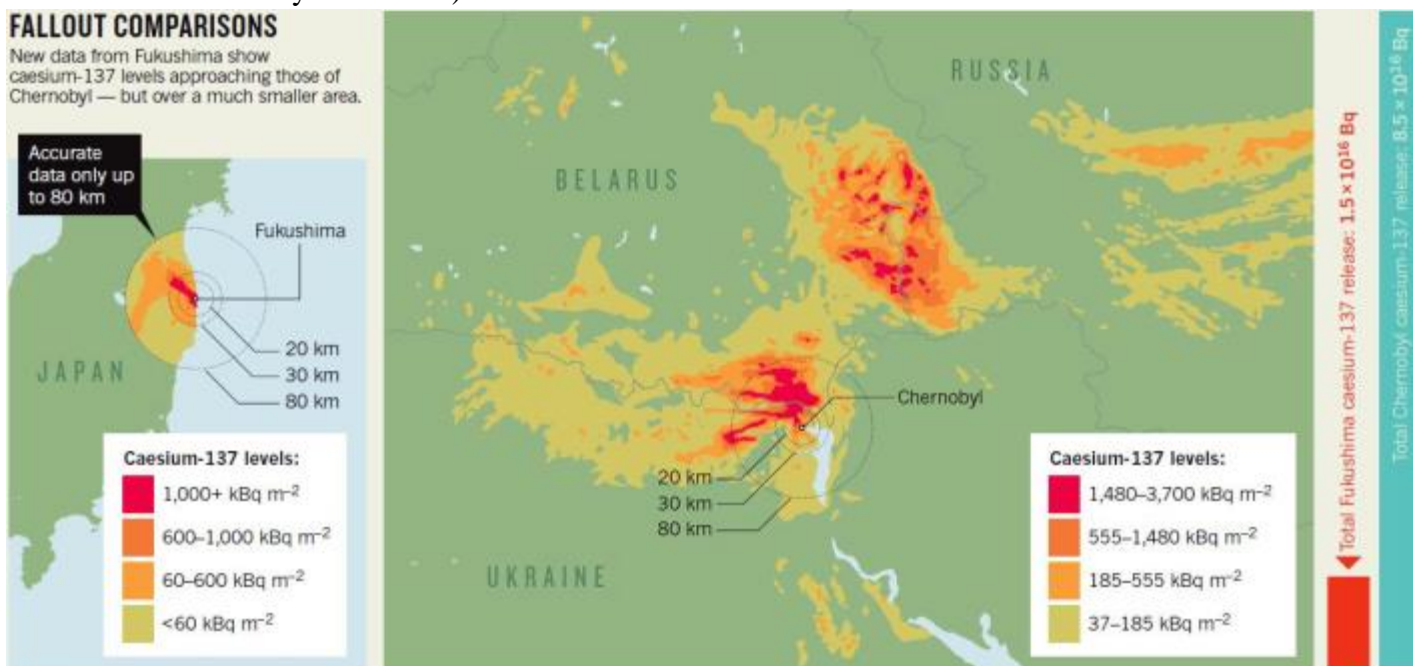
Zoom out to view Chernobyl's radiation over Fukushima.

Rotate to the Ukraine to see Chernobyl in context.

Download file (source: UNSCEAR/MEXT)

This embedded version of Google Earth may have limited functionality on some browsers.

With the new Cs-137 data, we can now directly compare the fallout from Chernobyl to Fukushima. Check out the Google Earth mashup above (zoom out to see Chernobyl on top of Fukushima, and rotate over to the Ukraine to see Chernobyl in context).





The first thing that you can see is that Chernobyl is indeed quite a bit bigger. In fact, the permanent exclusion zone (red) encompasses most of the Fukushima fallout map (download the .kmz to toggle the overlay on and off). If Fukushima had been a Chernobyl-scale crisis, significant amounts of radiation would have spread all the way up to Iwate Prefecture, and depending on the winds, it's not inconceivable that Tokyo might have been hit with serious levels of fallout.

But that's not the whole story. If Chernobyl had happened over Japan, much of its Cs-137 contamination would have ended up in the Pacific. Similarly, a good deal of the Fukushima fallout isn't seen here because it has blown out into the ocean. Indeed, the total estimate delivered to the International Atomic Energy Agency in June states that Fukushima has released  $1.5 \times 10^{16}$  becquerels (Bq) of Cs-137—about a fifth of the Cs-137 from Chernobyl. The total radioactive release from Fukushima is currently estimated at about 5.5% of Chernobyl, which spewed an incredible  $14 \times 10^{19}$  Bq.

The Fukushima fallout is notable for what it doesn't contain. Some very nasty contaminants like strontium-90, americium-241, and various plutonium isotopes are all absent in any significant quantity because the concrete vessels around the reactors appear to be largely intact. In Chernobyl, the explosion and subsequent fire spewed these extremely dangerous isotopes far and wide.

The bottom line here is that Fukushima and Chernobyl are comparable, and a comparison really helps underscore the differences. Fukushima's heavy containment vessels limited the spread of some dangerous isotopes, but the coastal location makes marine contamination a much bigger issue than it ever was for Chernobyl. The latest maps suggest that there will be a permanent exclusion zone to the northwest of Fukushima, but it will likely be quite a bit smaller than the one at Chernobyl.

<http://www.bbc.co.uk/news/health-15693508>

### **Social gene spotted in 20 seconds, say researchers**

***It is well known that first impressions count, but they may also be enough to give insights into a person's genes.***

Researchers say people can spot whether a complete stranger has a certain "social gene" in just 20 seconds.

People judging the empathy of strangers - by studying the way they listened to people - predicted the genetic variant, a University of Toronto study showed.

The hormone oxytocin has a role in birth, production of milk and bonding between mother and baby. It also seems to have a role in social skills and has variously been called the "love" or "cuddle" chemical.

Two variants of the oxytocin receptor gene - termed G and A - have been linked to social behaviour. Studies have shown that people with two copies of G, compared with one of each or two of A, are at lower risk of autism and report higher levels of empathy, positive emotions and said they were more social.

#### **Silent movie**

Twenty three couples were filmed for the Proceedings of the National Academy of Sciences study. One described a moment of personal suffering while their partner listened. Strangers then watched a 20 second silent recording of the exchange and scored the listener for their "prosocial traits", such as a caring nature or empathy. GG people were found to be more prosocial than AG or AA people.

In the top 10 most trusted people, six were GG. In the 10 least trusted people, nine had at least one copy of A.

One of the researchers, Dr Aleksandr Kogan from the University of Toronto, said: "Our findings suggest even slight genetic variation may have tangible impact on people's behaviour, and that these behavioural differences are quickly noticed by others. "Our study asked the question of whether these differences manifest themselves in behaviours that are quickly detectable by strangers, and it turns out they did."

Prof Sarina Rodrigues Saturn, from Oregon State University, said: "It was amazing to see how the data aligned so strongly by genotype. "It makes sense that a gene crucial for social processing would yield these findings; other studies have shown that people are good at judging people at a distance and first impressions really make an impact."

<http://www.bbc.co.uk/news/health-15718454>

### **Midwives told to involve fathers in maternity care**

***Midwives are being asked to make more of an effort to involve fathers-to-be in maternity care.***

**By Michelle Roberts Health reporter, BBC News**

The Royal College of Midwives (RCM) says too often the dad is left out of the process. It suggests top tips to help include the father, like offering him a chair as well as his partner, during antenatal appointments. And staff should prepare the man to be a helpful birth partner, so he knows what to do in the labour room. The 16-page guide Reaching Out: Involving Fathers in Maternity Care is a joint publication produced by the RCM, the Department of Health, the Royal College of Obstetricians and Gynaecologists and the Fatherhood Institute.

## Male friendly

To address the issue of fathers being the "invisible parent", maternity wards should provide men's lifestyle magazines to help make fathers feel comfortable, the guidance suggests, and antenatal classes should be arranged around their work commitments and even football fixtures, it says.

Launching the guidance, Public Health Minister Anne Milton said: "Becoming a parent is hugely exciting but it can be a challenging time. Fathers want to feel involved throughout their partner's pregnancy and this guide is a step to making that happen."

The guide criticises the way maternity care is organised in many units in the UK, saying services tend to exclude fathers. And many mothers feel their male partners receive little or no support.

Cathy Warwick, general secretary of the RCM, said: "A father's role should not begin and end at conception. There is now substantial evidence of the benefits resulting from fathers being involved in their partner's maternity care. "Most women want their partners to be involved in their pregnancy."

She said encouraging men to engage in the experience helped strengthen the bond between the father and his child. It is also an opportunity to spot stress or depression among new dads.

## Daddy care

Trusts that have already introduced measures to involve fathers have reported reduced workloads for midwives.

At the maternity centre at University Hospital of North Staffordshire NHS trust, antenatal classes have been held on Sunday afternoons to fit around fathers' jobs and football matches. The trust says it has led to a reduction in women being admitted to hospital before labour is in full swing.

The Princess Anne wing at the Royal United hospital in Bath, run by Great Western Hospitals NHS foundation trust, now provides reclining chairs for fathers to sleep in.

Ed McKenzie, 32, a financial adviser from Bath, stayed overnight on a chair in the Princess Anne wing to help care for his wife, Emily, 32, and their son Jack, who is now five months old. He said: "Emily said it was fantastic to have me there. It allowed her to concentrate on the breast-feeding and me to concentrate on nappy changing and getting food and drink."

Rob Williams, from the Fatherhood Institute, said some men might not want to be cajoled by midwives into taking a more active role. But he said the benefits of taking a front seat far outweighed any short-term stress incurred. "We are keen for fathers to be as well informed as possible."

[http://www.eurekalert.org/pub\\_releases/2011-11/w-tat111511.php](http://www.eurekalert.org/pub_releases/2011-11/w-tat111511.php)

## **Trees adapt to poor levels of sunlight to effectively process carbon, study shows** ***Tree canopies more effective during cloudy conditions than sunny days***

In Europe forests appear evergreen even in the cloudiest conditions, while the lush interiors of Asian jungles are typically overshadowed by a dense canopy. The ability of trees to adapt to light conditions, and even increase their intake of carbon for photosynthesis in poor light, has been explored by Czech researchers and published in the British Ecological Society's Functional Ecology.

The research centers around the impact of cloud cover on photosynthesis, the process through which plants and trees take in carbon and utilise the solar energy to produce oxygen, a process which is dependent on sunlight. The sun's energy reaches the earth's surface directly, or it can be diffused through the atmosphere by factors including cloud cover.

"Cloud cover has a direct impact on ecosystems by influencing temperature and light, so the conditions of the sky are just as important to photosynthesis as sunlight itself," said lead author Dr Otmar Urban, from the Global Change Research Centre in Brno, Czech Republic. "Surprisingly however studies show that an increase in cloud cover and the resulting diffusion of light can actually enhance the photosynthesis of forest canopies, but the mechanism behind this has remained unknown."

The idea that greater cloud cover can increase an ecosystem's exchange of carbon through photosynthesis may appear counterintuitive, but Dr Urban's team believe the process is due to the even distribution of light among leaves throughout the many levels of a forest canopy.

To test the theory the team analysed the net carbon intake of a spruce forest in the Beskydy Mountains of the Czech Republic under both cloudy and sunny skies. This was coupled with a study of the leaf chlorophyll within different sections of the canopy to gauge the resulting levels of photosynthesis.

The results showed that the higher diffusion of sunlight during cloudy days did result in a higher uptake of carbon across the ecosystem when compared to the same levels of light on sunny days.

Analysis of tree shoots also revealed that shoots from deep within the canopy contributed substantially to the overall carbon balance of the forest during cloudy days. However the contribution of middle or shaded parts of the canopy was marginal, or even negative, on sunny days. Shoots at the top of the canopy contributed 78% of

the total carbon intake during a sunny day, but only 43% during a cloudy day when light was more evenly distributed.

"This research shows that diffuse light, caused by cloud cover, has an important impact on the productivity of vegetation," concluded Urban. "The ability of forests to not only adapt to the levels of light they regularly receive, but make effective use of those conditions, helps us to understand how individual trees can maintain such a high intake of carbon despite being overshadowed by the tops of the canopy."

[http://www.eurekalert.org/pub\\_releases/2011-11/cu-c-mda111411.php](http://www.eurekalert.org/pub_releases/2011-11/cu-c-mda111411.php)

### **Moderate drinking and cardiovascular health: here comes the beer**

#### ***A study conducted by research laboratories at Fondazione 'Giovanni Paolo II' in Italy shows that beer, like wine, can reduce the risk of cardiovascular disease***

Beer could stand up alongside wine regarding positive effects on cardiovascular health. This is the conclusion of a study conducted by Research Laboratories at the Fondazione di Ricerca e Cura "Giovanni Paolo II", in Campobasso, Italy. Both for wine and beer the key is moderate and regular drinking.

The research, published today on line by the European Journal of Epidemiology, using the statistic approach of meta-analysis, pooled different scientific studies conducted worldwide in previous years to achieve a general result. This way it has been possible to examine data concerning over 200,000 people, for whom alcohol drinking habits were associated with cardiovascular disease.

Results confirm what was already known about wine: a moderate consumption (approximately two glasses per day for men and one for women) can lower the risk of cardiovascular disease, up to 31% less when comparing to non drinkers. What this research adds are new data on beer. For the first time, in fact, evidence about dose-dependent effect is shown for this beverage. Maximum protection is observed, for a beer containing 5% of alcohol, with a consumption of slightly more than an English pint a day.

"In our research – explains Simona Costanzo, first author of the paper - we considered wine and beer separately: you first observe a reduction in cardiovascular risk with low to moderate drinking. Then, with an increasing consumption, you can see that the advantage disappears, until the risk gets higher. The interesting part of our research is that, among the studies selected for this meta-analysis, there were 12 in which wine and beer consumption could be compared directly. Using these data we were able to observe that the risk curves for the two beverages are closely overlapping".

**But** beer as well as wine, drinkers, should be cautious before toasting too much at these results. "What we are talking about – says Augusto Di Castelnuovo, head of the Statistic Unit of Research Laboratories and a pioneer in alcohol epidemiological studies - is moderate and regular drinking. I think we will never stress enough this concept. Wine or beer are part of a lifestyle. One glass can pair with healthy foods, eaten at proper time, maybe together with family or friends. There is no place for binge drinking or any other form of heavy consumption.

"The data reported in our meta-analysis – Di Castelnuovo emphasizes- cannot be extrapolated to everybody. In young women still in their fertile age, as an example, alcohol can slightly raise the risk for some kind of cancer. This could counterbalance the positive effect on cardiovascular disease and reduce the overall benefit of alcoholic beverages on health".

In the similarity between wine and beer regarding positive effects on cardiovascular health there is a still unanswered question: the evidence we are observing derives from alcohol alone or from other substances contained in beverages? Wine and beer are different in composition, except for alcohol, so we could think this is the main player. But they both contain polyphenols, albeit different ones. Researchers at Fondazione "Giovanni Paolo II" underline how this is something to look at more closely in the future.

"A research like this - comments Giovanni de Gaetano, director of Research Laboratories at Fondazione "Giovanni Paolo II" – is part of a concept that our group strongly pursues: to look at people's real life. Health and disease are conditions deriving from our lifestyle. New therapies, new drugs, are extremely important. But a healthy life, with a strong attitude toward prevention, is the key element of the medicine in the years to come".  
*This research was partially supported by Cervisia Consulenze*

[http://www.eurekalert.org/pub\\_releases/2011-11/bmj-dcc111511.php](http://www.eurekalert.org/pub_releases/2011-11/bmj-dcc111511.php)

### **Delayed cord clamping protects newborn babies from iron deficiency**

#### ***Research: Effect of delayed versus early umbilical cord clamping on neonatal outcomes and iron status at 4 months: A randomized controlled trial***

Waiting for at least three minutes before clamping the umbilical cord in healthy newborns improves their iron levels at four months, according to research published on bmj.com today.

Delaying cord clamping is not linked to neonatal jaundice or other adverse health effects and should be standard care after uncomplicated pregnancies, adds the study.



Iron deficiency and iron deficiency anaemia are major public health problems in young children around the world and are associated with poor neurodevelopment. Young children are at particular risk due to their high iron requirements during rapid growth.

While established research indicates that delayed cord clamping could prevent iron deficiency there are conflicting results regarding the risk of neonatal jaundice and other health problems. So the authors led by Ola Andersson, consultant in neonatology at the Hospital of Halland in Sweden, and Magnus Domellöf, associate professor of paediatrics at Umeå University, investigated the effects of delayed cord clamping, compared to early clamping, on the iron status of infants at four months of age in a Swedish county hospital.

Four hundred full term infants born after low-risk pregnancies were involved in the study. Some had their umbilical cords clamped after at least three minutes and others had them clamped in less than ten seconds after delivery. The results show that babies who experienced delayed clamping had better iron levels at four months of age and there were fewer cases of neonatal anaemia. The researchers estimated that, for every 20 babies having delayed clamping, one case of iron deficiency would be prevented, regardless of whether the baby also had anaemia. Furthermore, delayed cord clamping was not associated with any adverse health effects.

The authors conclude that delayed cord clamping "should be considered as standard care for full term deliveries after uncomplicated pregnancies."

In an accompanying editorial, Dr Patrick van Rheenen, consultant paediatrician at the University of Groningen in the Netherlands, says that enough evidence now exists to encourage delayed cord clamping.

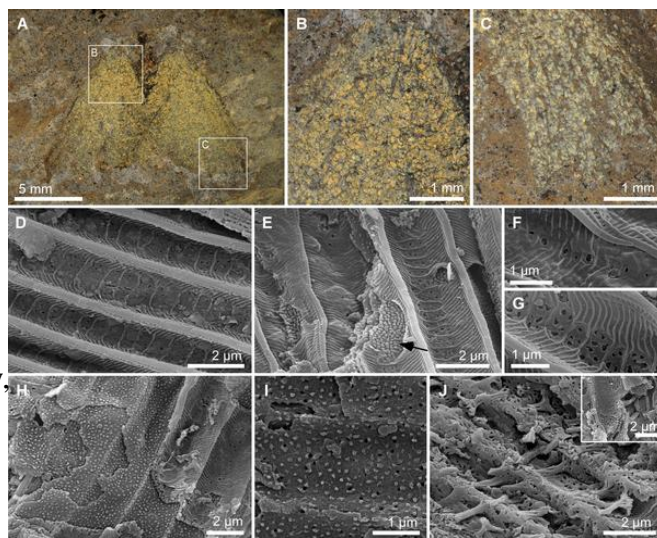
He says: "The balance of maternal risks and infant benefits of delayed cord clamping now clearly favours the child. How much more evidence is needed to convince obstetricians and midwives that it is worthwhile to wait for three minutes to allow for placental transfusion, even in developed countries?"

[http://www.eurekalert.org/pub\\_releases/2011-11/plos-fms111111.php](http://www.eurekalert.org/pub_releases/2011-11/plos-fms111111.php)

### Fossil moths show their true colors

#### ***The brightest hues in nature are produced by tiny patterns in, say, feathers or scales rather than pigments.***

These so-called "structural colors" are widespread, giving opals their fire, people their blue eyes, and peacocks their brilliant feathers. Many animals use this type of color for communication, notably butterflies and moths (Lepidoptera), which display the biggest range of structural colors and put them to uses from advertising their toxicity to choosing the best mates. But despite the importance of structural colors in their lives, little is known about how lepidopterans developed these key social signals. Now, in the Nov. 15 issue of PLoS Biology, palaeobiologist Maria McNamara (Yale University) and colleagues bring us closer to the origins of structural colors by reconstructing them in fossil moths that are 47 million years old.



**2-D Fourier analysis and reflectance microspectrophotometry of structurally colored scales from the basal part of the dorsal forewing.** (A–C) Light micrographs of specimen MeI12269 with details of areas indicated (B, C). (D–J) Scanning electron micrographs of scales. (D) Surface showing longitudinal ridges and transverse crossribs and microribs. (E) Two overlapping scales showing windows, perforations, and internal laminae of the upper, fractured, scale. Arrow indicates densely packed bead- to rod-like spacers in the uppermost internal lamina. (F, G) Windows and perforations in proximal (F) and distal (G) parts of a scale. (H) Oblique fracture through scale showing successive internal laminae. (I) Surface of internal lamina showing perforations and bead-like spacers. (J) Horizontally fractured scale showing trabeculae (fractured and lying parallel to the scale surface) and reticulate basal lamina with, inset, intact vertically orientated trabeculae. Scale bars: (A), 5 mm; (B, C), 1 mm; (D, E, H, J) (including inset), 2  $\mu$ m; (F, G, I), 1  $\mu$ m.

This is the first evidence of structurally colored scales in fossil lepidopterans. The fossil moths came from the Messel oil shale in Germany, a site famous for exquisite fossil preservation.

Although the original colors of the fossil moths were not preserved, the researchers were able to reconstruct them because the tiny color-producing patterns in the moth scales were intact. "The level of detail preserved in the scales of the fossil moths is just spectacular", said McNamara. The fossil moths owe their color to a stack of layers inside the scales. These layers form a fossil multilayer reflector, which usually produces iridescent colour that changes depending on viewing angle. But other details of the fossil scales suppressed this effect, producing

instead muted colors. "The moths basically wanted to appear the same colour from different angles – they didn't want flashy iridescence" said McNamara.

Today, the front wings of the ancient moths look mostly blue, presumably because the chemistry of the cuticle was altered during the process of fossilization. The researchers reconstructed the original colors via mathematical analysis of the scale ultrastructure, revealing that the wings had actually been yellow-green when the moths were alive. Modern butterflies and moths use bright, contrasting colors to communicate with each other, and muted greens to camouflage themselves in leafy habitats. This makes it likely that the fossil moths used their yellow-green wings to blend in with leaves, suggesting that this strategy for hiding in plain sight had evolved as early as 47 million years ago amongst lepidopterans.



***Reconstruction of the original colors of the dorsal surface of the fossil lepidopterans.***

The fossils are thought to be from extinct relatives of today's forester moths, which feed on flower nectar. If this was also true of these ancient moths, their yellow-green wings would have stood out while feeding. The researchers suggest that being easy to see on flowers could have served as a warning to predators. Modern forester moths can synthesize cyanide, making them taste bad, and their ancestors may have already developed this capability.

These findings shed light on the evolution of tactics for predator avoidance and deterrence in forester moths. In addition, by showing that the original structural colors of fossil moths can be reconstructed, this work leads the way toward finding the origins of the many ways butterfly and moth species use this type of color to communicate amongst each other as well as with predators. "Reconstructing the original colors of ancient animals gives us really good insights into their behaviour" said McNamara. "These moth fossils hint that we can even do this for fossils that don't have obvious color".

*Funding: The research was funded by an IRCSET-Marie Curie International Mobility Fellowship (<http://www.ircset.ie>, <http://ec.europa.eu/research/mariecurieactions>) awarded to MEM and by NSF (<http://www.nsf.gov>) to HC (PHY-0957680). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. Competing interests: The authors have declared that no competing interests exist.*

*Citation: McNamara ME, Briggs DEG, Orr PJ, Wedmann S, Noh H, et al. (2011) Fossilized Biophotonic Nanostructures Reveal the Original Colors of 47-Million-Year-Old Moths. PLoS Biol 9(11): e1001200. doi:10.1371/journal.pbio.1001200*

[http://www.eurekalert.org/pub\\_releases/2011-11/uocd-mte111511.php](http://www.eurekalert.org/pub_releases/2011-11/uocd-mte111511.php)

**Milk thistle extract stops lung cancer in mice**  
***Silibinin stops production of COX2 and iNOS***

Tissue with wound-like conditions allows tumors to grow and spread. In mouse lung cancer cells, treatment with silibinin, a major component of milk thistle, removed the molecular billboards that signal these wound-like conditions and so stopped the spread of these lung cancers, according to a recent study published in the journal *Molecular Carcinogenesis*. Though the natural extract has been used for more than 2,000 years, mostly to treat disorders of the liver and gallbladder, this is one of the first carefully controlled and reported studies to find benefit. Here is how it works:

Basically, in a cell there can be a chain of signals, one leading to the next, to the next, and eventually to an end product. And so if you would like to eliminate an end product, you may look to break a link in the signaling chain that leads to it. The end products COX2 and iNOS are enzymes involved with the inflammatory response to perceived wounds – both can aid tumor growth. Far upstream in the signaling chain that leads to these unwanted enzymes are STAT1 and STAT3. These transcription factors allow the blueprint of DNA to bind with proteins that continue the signal cascade, eventually leading to the production of harmful COX2 and iNOS.

Stop STAT1 and STAT3 and you break the chain that leads to COX2 and iNOS – and the growth of lung tumors along with them.

"This relatively nontoxic substance – a derivative of milk thistle, called silibinin – was able to inhibit the upstream signals that lead to the expression of COX2 and iNOS," says Alpna Tyagi, PhD, investigator at the University of Colorado Cancer Center and member of the Agarwal Lab at the Skaggs School of Pharmacy and Pharmaceutical Sciences.

In addition, Tyagi and collaborators compared the effects of silibinin to drugs currently in clinical trials for lung cancer. Would drugs that target other signaling pathways – other linked chains – similarly cut into the production of COX2 and iNOS?

It turned out that inhibiting the chains of JAK1/2 and MEK in combination and also inhibiting the signaling pathways of EGFR and NF- $\kappa$ B in combination blocked the ability of STAT1 and STAT3 to trap the energy they needed to eventually signal COX2 and iNOS production.

Compared to these multi-million dollar drugs, naturally-occurring silibinin blocked not only the expression of COX2 and iNOS, but also the migration of existing lung cancer cells.

"What we showed is that STAT1 and STAT3 may be promising therapeutic targets in the treatment of lung cancer, no matter how you target them," Tyagi says. "And also that naturally-derived products like silibinin may be as effective as today's best treatments."

<http://www.wired.com/wiredscience/2011/11/branching-tree-physics/>

### Leonardo's Formula Explains Why Trees Don't Splinter

***A tree almost always grows so that the total thickness of the branches at a particular height is equal to the thickness of the trunk. Until now, no one has been able to explain why trees obey this rule***

**By Kim Krieger, ScienceNOW**

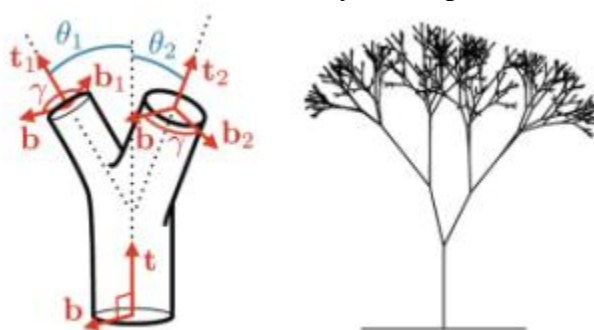
The graceful taper of a tree trunk into branches, boughs, and twigs is so familiar that few people notice what Leonardo da Vinci observed: A tree almost always grows so that the total thickness of the branches at a particular height is equal to the thickness of the trunk. Until now, no one has been able to explain why trees obey this rule. But a new study may have the answer.

Leonardo's rule holds true for almost all species of trees, and graphic artists routinely use it to create realistic computer-generated trees. The rule says that when a tree's trunk splits into two branches, the total cross section of those secondary branches will equal the cross section of the trunk. If those two branches in turn each split into two branches, the area of the cross sections of the four additional branches together will equal the area of the cross section of the trunk. And so on.

Expressed mathematically, Leonardo's rule says that if a branch with diameter ( $D$ ) splits into an arbitrary number ( $n$ ) of secondary branches of diameters ( $d_1, d_2$ , et cetera), the sum of the secondary branches' diameters squared equals the square of the original branch's diameter. Or, in formula terms:  $D^2 = \sum d_i^2$ , where  $i = 1, 2, \dots, n$ . For real trees, the exponent in the equation that describes Leonardo's hypothesis is not always equal to 2 but rather varies between 1.8 and 2.3 depending on the geometry of the specific species of tree. But the general equation is still pretty close and holds for almost all trees.

Botanists have hypothesized that Leonardo's observation has something to do with how a tree pumps water from its roots to leaves. The idea being that the tree needs the same total vein diameter from top to bottom to properly irrigate the leaves. But this didn't sound right to Christophe Eloy, a visiting physicist at the University of California, San Diego, who is also affiliated with University of Provence in France. Eloy, a specialist in fluid mechanics, agreed that the equation had something to do with a tree's leaves, not in how they took up water, and the force of the wind caught by the leaves as it blew.

Eloy used some insightful mathematics to find the wind-force connection. He modeled a tree as cantilevered beams assembled to form a fractal network. A cantilevered beam is anchored at only one end; a fractal is a shape that can be split into parts, each of which is a smaller, though sometimes not exact, copy of the larger structure. For Eloy's model, this meant that every time a larger branch split into smaller branches, it split into the same number of branches, at approximately the same angles and orientations. Most natural trees grow in a fairly fractal fashion.



***The image on the left shows the variables Eloy's numerical model used to calculate trees to test his wind-force hypothesis. The image on the right shows a skeleton of a tree before the simulation calculates diameters of the branches (C. Eloy et al./Phys. Rev. Letters)***

Because the leaves on a tree branch all grow at the same end of the branch, Eloy modeled the force of wind blowing on a tree's leaves as a force pressing on the unanchored end of a cantilevered beam. When he plugged that wind-force equation into his model and assumed that the probability of a branch breaking due to wind stress is constant, he came up with Leonardo's rule. He then tested it with a numerical computer simulation that comes at the problem from a different direction, calculating forces on branches and then using those forces to figure out how thick the branches must be to resist breakage (see illustration). The numerical simulation accurately predicts the branch diameters and the 1.8-to-2.3 range of Leonardo's exponent, Eloy reveals in a paper soon to be published in Physical Review Letters.



“Trees are very diverse organisms, and Christophe seems to have arrived at a simple and elegant physical principle that explains how branches taper in size as you go from the trunk, through the boughs, up to the twigs,” says Marcus Roper, a mathematician at UC Berkeley. “It’s surprising and wonderful that no one thought of [the wind explanation] sooner.”

“This study brings trees up to par with manmade structures that have been primarily designed taking into account wind-loading considerations, the Eiffel Tower being perhaps the most well-known example,” says Pedro Reis, an engineer at the Massachusetts Institute of Technology in Cambridge. The results of this research could “impact our understanding of wind-based damage, such as the destruction by the recent Hurricane Irene,” he says, which toppled trees across a large swath of the northeastern United States in September.

*This story provided by ScienceNOW, the daily online news service of the journal Science.*

<http://medicalxpress.com/news/2011-11-magnetic-treatment-patients-ability.html>

### **Magnetic treatment improves stroke patients' ability to communicate**

***Magnetic stimulation of the brain could help improve language skills of stroke survivors with aphasia, according to research by The University of Queensland.***

(Medical Xpress) -- Dr. Caroline Barwood, who recently completed her PhD at UQ's School of Health and Rehabilitation Sciences, conducted the research and found significant improvement in the language skills of stroke patients after they underwent Transcranial Magnetic Stimulation (TMS). TMS is a non-invasive method that seeks to target brain activity, with the intention to facilitate the reorganisation of brain regions with the purpose to alter language behaviours. The treatment involves placing a coil on the head of the participant which uses electromagnetic induction to induce weak electric currents through a changing magnetic field.

Twelve patients who experienced strokes between one and six years prior to the study were recruited for participation and treated at the UQ Center for Neurogenic Communication Disorders Research.

“Eighty percent of patients who were treated with TMS showed improvements in language skills, most notably in expressive language, which includes naming, repetition, and discourse. No language improvements were seen for those patients treated with placebo TMS,” Dr. Barwood said.

Guided by a state-of-the-art neuronavigational system, magnetic resonance imaging (MRI) was used to pinpoint the stimulation site for two sets of five-day treatments.

Dr. Barwood said changes in patients' language scores were measured on standardised speech pathology tests. “The research strongly demonstrates that TMS may be a very useful and safe treatment method. Overall it has generated exciting discussion regarding the direction of treatment and the considerable impact this may have in the future to decrease the cost of rehabilitation,” she said. Dr. Barwood explains the technique differs to traditional language therapy, which uses behavioural methods, and said in the future the two methods may be used together.

Dr. Barwood's PhD has been reviewed by a number of journals across fields of neurology and speech pathology and was published in peer-reviewed journals; The European Journal of Neurology; Brain and Language; Brain Stimulation; and Neurorehabilitation. Dr. Barwood said in light of the very positive results, she is seeking to continue and extend the current methodology to include a larger sample as a clinical trial.

*Provided by University of Queensland*

<http://medicalxpress.com/news/2011-11-virus-memories-cellist-music.html>

### **Virus takes memories from cellist but leaves music**

***A man has lost most of his memories prior to 2005 however he seems to be able to remember music, showing that music memory may be stored independently.***

(Medical Xpress) -- At a recent meeting at the Society for Neuroscience in Washington DC, researchers revealed a case of herpesviral encephalitis that had destroyed areas of a 71-year-old cellist's brain. The man, known only as PM, had lost most of his memories prior to 2005 however he seems to be able to remember music, showing the researchers that music memory may be stored independently.

Herpesviral encephalitis is caused by the same virus that causes cold sores. It is a rare infection and occurs when this virus travels along nerves to the brain. In the case of PM, the virus wiped out large sections of his medial temporal lobes which have been linked to memories of events and facts. PM was left with no memory of personal or professional events he had done and the only people he recognized were his brother and a care worker.

Doctors began testing PM's abilities after they discovered that he was able to identify musical scales and recall music that was played for him.

Neurologist Carsten Finke from Charite University Hospital in Berlin decided to take these tests further. Working with a team of professional musicians, Finke designed a series of tests that were designed to look at just how PM's musical memory worked.

One test, PM was presented with a piece of music that was composed before he was struck with illness. He was then played a similar piece composed after his illness. When he was asked which piece he knew better, 93 percent of the time he chose the older piece.

In addition to amnesia, PM has had difficulty learning new things. For example, he is unable to remember the layout of his home or which medications he is supposed to take on a daily basis. However, in another test the doctors conducted, PM was able to identify pieces of music that were played to him earlier in the day 77 percent of the time.

Doctors are hoping this case will help to better understand how memories are stored in the brain. In the case of PM, they are also hoping to use music to help in his rehabilitation. They plan to try using musical notes and connect them to different people and tasks. © 2011 Medical Xpress

<http://www.bbc.co.uk/news/health-15744176>

### **Liver implant gives boy 'another chance of life'**

***Doctors in London say they have cured a baby boy of a life-threatening disease which was destroying his liver. They implanted cells which acted like a temporary liver, allowing the damaged organ to recover.***

**Fergus Walsh By Fergus Walsh Medical correspondent, BBC News**

The team at King's College Hospital in south London say the technique is a world first. Eight-month-old Iyaad Syed now looks the picture of health - but six months ago he was close to death. A virus had damaged his liver causing it to fail. Instead of going on a waiting list for a transplant, doctors injected donor liver cells into his abdomen. These processed toxins and produced vital proteins - acting rather like a temporary liver.

The cells were coated with a chemical found in algae which prevented them from being attacked by the immune system. After two weeks his own liver had begun to recover.

Professor Anil Dhawan, a liver specialist at King's College Hospital, says the whole team at the hospital is delighted: "This is the first time this treatment has been used to treat a child with acute liver failure. It's only a few months back when I first saw this child who was so sick requiring support on dialysis and a breathing machine. "We think we have given him another chance of life and seeing him now six months down the road with nearly normal liver function is remarkable."

Dr Ragai Mitry, Head of Liver Processing at King's, who helped in developing the technique, said:

"We are very pleased the transplanted liver cells have helped in supporting and delivering the missing metabolic functions of Iyaad's failing liver."

Iyaad's father, Jahangeer, said his son was "a miracle boy". He added: "Once he had the treatment after 48 hours he started to get better and hope came back. It is brilliant and we are very proud of him."

### **Clinical trials**

The question now is whether the technique could be used to benefit other patients with acute liver failure. The team at King's is urging caution - a large clinical trial is needed to test the effectiveness of the technique. A key benefit over a liver transplant is that Iyaad will not need to take anti-rejection drugs known as immunosuppressants.

Andrew Langford, Chief Executive of the British Liver Trust, said: "The principle of this new technique is certainly ground-breaking and we would welcome the results of further clinical trials to see if it could become a standard treatment for both adults and children. "Sadly, we have reached a breaking point with our transplant list in the UK, where approximately 100 people die waiting for a donor liver to become available each year." *King's College Hospital is part of King's Health Partners Academic Health Sciences Centre (AHSC), a collaboration between King's College Hospital; Guy's and St Thomas'; and South London and Maudsley NHS Foundation Trusts, with King's College London university. The partnership aims to accelerate the transition of research from bench to bedside.*

[http://www.eurekalert.org/pub\\_releases/2011-11/uota-sfe111511.php](http://www.eurekalert.org/pub_releases/2011-11/uota-sfe111511.php)

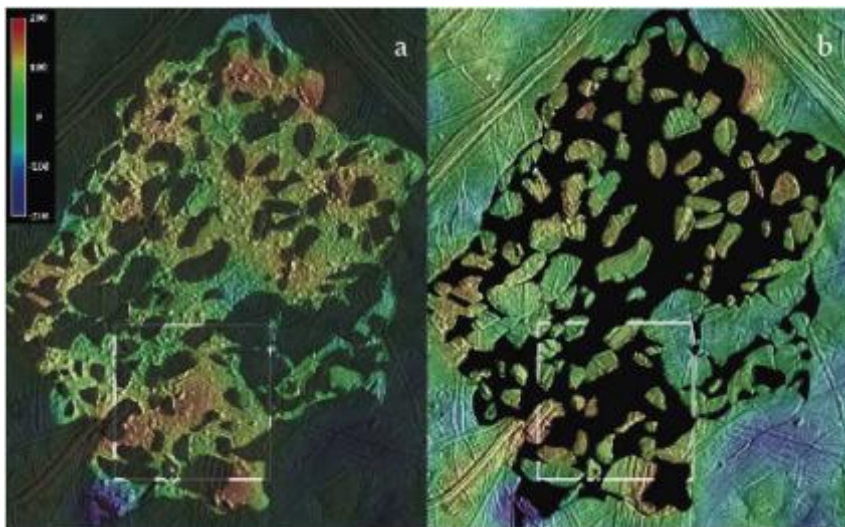
**Scientists find evidence for 'great lake' on Europa and potential new habitat for life**  
***Scientists have discovered what appears to be a body of liquid water the volume of the Great Lakes locked inside the icy shell of Jupiter's moon Europa***

In a significant finding in the search for life beyond Earth, scientists from The University of Texas at Austin and elsewhere have discovered what appears to be a body of liquid water the volume of the North American Great Lakes locked inside the icy shell of Jupiter's moon Europa.

The water could represent a potential habitat for life, and many more such lakes might exist throughout the shallow regions of Europa's shell, lead author Britney Schmidt, a postdoctoral fellow at The University of Texas at Austin's Institute for Geophysics, writes in the journal *Nature*.

Further increasing the potential for life, the newly discovered lake is covered by floating ice shelves that seem to be collapsing, providing a mechanism for transferring nutrients and energy between the surface and a vast ocean already inferred to exist below the thick ice shell.

"One opinion in the scientific community has been, 'If the ice shell is thick, that's bad for biology - that it might mean the surface isn't communicating with the underlying ocean,'" said Schmidt. "Now we see evidence that even though the ice shell is thick, it can mix vigorously. That could make Europa and its ocean more habitable."



**Figure S1:** The distribution of heights on Conamara Chaos indicates that the majority of topographic highs are located within the matrix material. In (a), we show the DEM from Fig. 1 demonstrating the heights of matrix material by overprinting the map of major block positions from Spaun, et al 1998. In (b), matrix material as mapped by Spaun et al 1998 is blacked out to show the heights of ice blocks. The tallest blocks are either small or are tipped, and are related to matrix domes, consistent with being affected by the rising domes.

The scientists focused on Galileo spacecraft images of two roughly circular, bumpy features on Europa's surface called chaos terrains. Based on similar processes seen here on Earth - on ice shelves and under glaciers overlaying volcanoes - the researchers developed a four-step model to explain how the features form on Europa. It resolves several conflicting observations, some of which seemed to suggest that the ice shell is thick and others that it is thin.

"I read the paper and immediately thought, yes, that's it, that makes sense," said Robert Pappalardo, senior research scientist at NASA's Planetary Science Section who did not participate in the study. "It's the only convincing model that fits the full range of observations. To me, that says yes, that's the right answer."

The scientists have good reason to believe their model is correct, based on observations of Europa from the Galileo spacecraft and of Earth. Still, because the inferred lakes are several kilometers below the surface, the only true confirmation of their presence would come from a future spacecraft mission designed to probe the ice shell. Such a mission was rated as the second-highest priority flagship mission by the National Research Council's recent Planetary Science Decadal Survey and is currently being studied by NASA. On Earth, radar instruments are used to image similar features within the ice, and are among the instruments being considered for a future Europa mission.

"This new understanding of processes on Europa would not have been possible without the foundation of the last 20 years of observations over Earth's ice sheets and floating ice shelves," said Don Blankenship, a co-author and senior research scientist at the Institute for Geophysics, where he leads airborne radar studies of Earth's ice sheets.

Schmidt and Blankenship's co-authors are Wes Patterson, planetary scientist at the Johns Hopkins University Applied Physics Laboratory, and Paul Schenk, planetary scientist at the Lunar and Planetary Institute in Houston.

The research was funded by the Institute for Geophysics at The University of Texas at Austin's Jackson School of Geosciences, the Vetlesen Foundation and NASA.

The paper, "Active formation of 'chaos terrain' over shallow subsurface water on Europa," will appear as an advance online publication of the journal *Nature* on Nov. 16.

<http://www.sciencedaily.com/releases/2011/11/111116045657.htm>

## **New Mouthwash Targeting Harmful Bacteria May Render Tooth Decay a Thing of the Past**

***A new mouthwash developed by a microbiologist at the UCLA School of Dentistry is highly successful in targeting the harmful *Streptococcus mutans* bacteria that is the principal cause tooth decay and cavities.***

ScienceDaily (Nov. 16, 2011) - In a recent clinical study, 12 subjects who rinsed just one time with the experimental mouthwash experienced a nearly complete elimination of the *S. mutans* bacteria over the entire four-day testing



period. The findings from the small-scale study are published in the current edition of the international dental journal *Caries Research*.

Dental caries, commonly known as tooth decay or cavities, is one of the most common and costly infectious diseases in the United States, affecting more than 50 percent of children and the vast majority of adults aged 18 and older. Americans spend more than \$70 billion each year on dental services, with the majority of that amount going toward the treatment of dental caries.

This new mouthwash is the product of nearly a decade of research conducted by Wenyuan Shi, chair of the oral biology section at the UCLA School of Dentistry. Shi developed a new antimicrobial technology called STAMP (specifically targeted anti-microbial peptides) with support from Colgate-Palmolive and from C3-Jian Inc., a company he founded around patent rights he developed at UCLA; the patents were exclusively licensed by UCLA to C3-Jian. The mouthwash uses a STAMP known as C16G2.

The human body is home to millions of different bacteria, some of which cause diseases such as dental caries but many of which are vital for optimum health. Most common broad-spectrum antibiotics, like conventional mouthwash, indiscriminately kill both benign and harmful pathogenic organisms and only do so for a 12-hour time period.

The overuse of broad-spectrum antibiotics can seriously disrupt the body's normal ecological balance, rendering humans more susceptible to bacterial, yeast and parasitic infections.

Shi's Sm STAMP C16G2 investigational drug, tested in the clinical study, acts as a sort of "smart bomb," eliminating only the harmful bacteria and remaining effective for an extended period.

Based on the success of this limited clinical trial, C3-Jian Inc. has filed a New Investigational Drug application with the U.S. Food and Drug Administration, which is expected to begin more extensive clinical trials in March 2012. If the FDA ultimately approves Sm STAMP C16G2 for general use, it will be the first such anti-dental caries drug since fluoride was licensed nearly 60 years ago.

"With this new antimicrobial technology, we have the prospect of actually wiping out tooth decay in our lifetime," said Shi, who noted that this work may lay the foundation for developing additional target-specific "smart bomb" antimicrobials to combat other diseases.

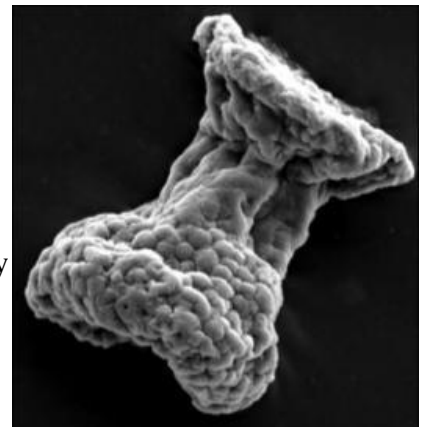
"The work conducted by Dr. Shi's laboratory will help transform the concept of targeted antimicrobial therapy into a reality," said Dr. No-Hee Park, dean of the UCLA School of Dentistry. "We are proud that UCLA will become known as the birthplace of this significant treatment innovation."

<http://www.physorg.com/news/2011-11-hairy-microbes-fossils-reveal-oldest.html>

### **The first hairy microbes: New fossils reveal oldest known ciliates**

***Geologists have unearthed rare, flask-shaped microfossils dating back 635 to 715 million years, representing the oldest known ciliates in the fossil record***

Anyone who has taken high school biology has likely come into contact with a ciliate. The much-studied paramecium is one of 7,000 species of ciliates, a vast group of microorganisms that share a common morphology: single-celled blobs covered in tiny hairs, or cilia. These cilia - Greek for "eyelash" - are used to propel a microbe through water and catch prey. Today these hairy microbes are ubiquitous in marine environments. However, it's unclear how long ciliates have inhabited Earth: After they die, members of most species simply disintegrate in their watery environs, leaving behind no fossilized remains.



***MIT researchers have found hundreds of tiny fossils of the first known ciliates. The ciliates, named tintinnids, resided in hard, flask-shaped shells with bubbled exteriors that likely help them float. Image: Tanja Bosak***

Now, geologists at MIT and Harvard University have unearthed rare, flask-shaped microfossils dating back 635 to 715 million years, representing the oldest known ciliates in the fossil record. The remains are more than 100 million years older than any previously identified ciliate fossils, and the researchers say the discovery suggests early life on Earth may have been more complex than previously thought. What's more, they say such prehistoric microbes may have helped trigger multicellular life, and the evolution of the first animals.

"These massive changes in biology and chemistry during this time led to the evolution of animals," says Tanja Bosak, the Cecil and Ida Green Career Development Assistant Professor in MIT's Department of Earth, Atmospheric and Planetary Sciences. "We don't know how fast these changes occurred, and now we are finding evidence of an increase in complexity." Bosak and her colleagues have reported their findings in a paper posted online this week in the journal *Geology*.

## Life's rocky road

The group discovered the fossils in rocks from southwestern Mongolia. In 2008, Francis Macdonald, an assistant professor of geology at Harvard and the paper's co-author, hiked through the Tsagaan Oloom Formation, a rocky terrain full of glacial deposits. These deposits are remnants from the two most severe ice ages, or "Snowball Earth" events, during the Cryogenian period, 635 to 715 million years ago. Relatively few fossils have been found from this time, making it difficult for geologists to pinpoint exactly what lived during this period.

Macdonald brought rock samples back to Cambridge, where Bosak and her colleagues began a meticulous hunt for tiny fossils. The team dissolved sections of rock in acid, then combed through the residue, looking for interesting shapes under the microscope. The team soon uncovered hundreds of "beautifully preserved" fossils resembling miniature flasks, Bosak says, with constricted necks and flaring collars. Each fossil was covered in bubble-like structures. Bosak compared the fossils with modern organisms, finding a nearly perfect match in a group of ciliates called tintinnids.

## Shell life

Unlike most ciliates, tintinnids have a tough, vase-like shell that's both resistant and flexible. A tintinnid lives within this shell, reaching out through the opening with hair-like appendages to draw food in. The bubbles on the shell's surface serve as flotation devices, keeping the microbe afloat as its cilia propel it through water.

Because of their thick shells, tintinnids are rare ciliates that fossilize. While most unprotected ciliates simply dissolve away, the resistant organic shells of tintinnids can sink to the ocean bottom. Bosak says it's this deposition of carbon that may have contributed to the evolution of the first animals.

"You have this resistant material that sinks to anaerobic oceans, where it takes longer to degrade," Bosak says. "As a result, you could sequester more carbon ... that in turn releases more oxygen."

More oxygen in the atmosphere would foster complex, oxygen-breathing life. According to Bosak, the geologic timing is consistent with this theory: The ciliate fossils date to the period between the two ice ages; soon after the second ice age, fossils of the first animal embryos were identified.

The appearance of tintinnids as early as the Cryogenian period suggests other organisms may have existed as well, possibly setting the stage for animal evolution.

"Having found this, we know other things should have been there, possibly not leaving a fossil record," Bosak says. "And this really shows there could have been much more going on than we thought."

Nicholas Butterfield, a lecturer in paleobiology at the University of Cambridge in the U.K., says the group's findings provide convincing evidence for ancient organisms that are "significantly similar" to modern ciliates. However, in his view, the fossils mark a minimum date for the evolutionary appearance of tintinnids — the hairy organisms could have been floating about hundreds of millions of years earlier.

"It's conceivable that they only evolved, or became ecologically important, at this time," says Butterfield, who was not involved in the research. "Ciliates probably do play an important role in how the oceans work, but there's no reason to believe that that role wasn't defined much earlier."

The team plans to examine the shells of tintinnids more closely, and will perform chemical analyses to understand what kinds of conditions might have prompted such shells to evolve. The researchers will also measure the carbon composition of individual fossils from different strata to identify exactly how carbon might have cycled, and what changes might have occurred leading up to the first animals.

"This provides some hope that we can actually start looking at biological changes," Bosak says. "There is a record of these changes, and that's what we're showing by finding these fossils."

*This story is republished courtesy of MIT News (<http://web.mit.edu/newsoffice/>), a popular site that covers news about MIT research, innovation and teaching. Provided by Massachusetts Institute of Technology*

<http://medicalxpress.com/news/2011-11-garlic-oil-component-treatment-heart.html>

## **Garlic oil component may form treatment to protect heart**

***A component of garlic oil may help release protective compounds to the heart after heart attack, during cardiac surgery, or as a treatment for heart failure.***

At low concentrations, hydrogen sulfide gas has been found to protect the heart from damage. However, this unstable and volatile compound has been difficult to deliver as therapy.

Now researchers at Emory University School of Medicine have turned to diallyl trisulfide, a garlic oil component, as a way to deliver the benefits of hydrogen sulfide to the heart. Their findings suggest that doctors could use diallyl trisulfide in many of the situations where researchers have proposed using hydrogen sulfide.

The data are being presented Wednesday, Nov. 16 at the American Heart Association (AHA) Scientific Sessions conference in Orlando.

"We are now performing studies with orally active drugs that release hydrogen sulfide," says David Lefer, PhD, professor of surgery at Emory University School of Medicine and director of the Cardiothoracic Surgery Research Laboratory at Emory University Hospital, Midtown. "This could avoid the need to inject sulfide-delivery drugs outside of an emergency situation."

Working with Lefer, postdoctoral fellow Benjamin Predmore blocked the coronary arteries of mice for 45 minutes, simulating a heart attack, and gave them diallyl sulfide just before blood flow was restored. The compound reduced the proportion of damaged heart tissue in the area at risk by 61 percent, compared with untreated animals. "Interruption of oxygen and blood flow damages mitochondria, and loss of mitochondrial integrity can lead to cell death," he says. "We see that diallyl sulfide can temporarily turn down the function of mitochondria, preserving them and lowering the production of reactive oxygen species."

Additional data on diallyl trisulfide in a mouse model of heart failure is being presented by a member of Lefer's team, postdoctoral fellow Kazuhisa Kondo Wednesday at 11:30 a.m. Transverse aortic constriction results in enlargement of the heart and is a model of heart failure. Diallyl sulfide twice daily, given after aortic constriction, could reduce heart enlargement, Kondo found. Also at the meeting, Lefer's team is presenting additional data on mice deficient in the enzyme that generates hydrogen sulfide.

*More information: More information on abstracts here: <http://bit.ly/ty16hl> <http://bit.ly/v7B6VU>*

*Previous publication: <http://www.pnas.org/content/104/39/15560.full>*

[http://www.eurekalert.org/pub\\_releases/2011-11/uoo-sac111711.php](http://www.eurekalert.org/pub_releases/2011-11/uoo-sac111711.php)

### **Soybean adoption came early by many cultures, archaeologists say** ***Domestication occurred beyond China's borders and may provide a roadmap to making better crops***

EUGENE, Ore. -- Human domestication of soybeans is thought to have first occurred in central China some 3,000 years ago, but archaeologists now suggest that cultures in even earlier times and in other locations adopted the legume (*Glycine max*).

Comparisons of 949 charred soybean samples from 22 sites in northern China, Japan and South Korea -- found in ancient households including hearths, flooring and dumping pits -- with 180 modern charred and unburned samples were detailed in the Nov. 4 edition of the online journal PLoS ONE, a publication of the Public Library of Science. The findings, say lead author Gyoung-Ah Lee, an archaeologist at the University of Oregon, add a new view to long-running assumptions about soybean domestication that had been based on genetic and historical records.

"Preserved beans have been carbonized, and that distorts the sizes," Lee said. "So we experimented with modern soybeans, charring them to compare them with historical samples. All the different sizes and shapes of soybeans may indicate different efforts in different times by different cultural groups in different areas."

Experts argue that larger beans reflect domestication, but the transition zone between smaller wild-type soybeans and larger hybridized versions is not understood, Lee said. Small-seeded soybeans indicating wild-type soybeans date to 9,000 years ago. Historical evidence to date shows a close relationship between soybeans and use in China during the Zhou Dynasty, about 2,000 years ago. The new study moves domestication back to perhaps 5,500 years ago.

"Soybeans appeared to be linked to humans almost as soon as villages were established in northern China," said co-author Gary Crawford, a professor of anthropology at the University of Toronto Mississauga, in a news release. "Soybean seems to be a plant that does well in human-impacted habitats. In turn, humans began to learn how tasty soybean was and how useful it was." Today, of course, soybeans are used as livestock feed and to make cooking oil, tofu, tempeh, edamame and protein powder for human consumption.

The new archaeological evidence, Lee says, should be a springboard for archaeologists, crop scientists and plant geneticists to collaborate on understanding cultural contributions, which may lead them to better soybean characteristics. Cultural knowledge, she said, could fill in gaps that relate to domestication and genetic changes of the legume. "I think one contribution that archaeologists can make is how peoples in ancient times contributed to our heritage of this viable crop and how we can trace their efforts and the methods to help guide us to make even better crops today," Lee said.

In Lee's homeland of South Korea, the research team uncovered evidence for a cultural selection for larger sized soybeans at 3,000 years ago. The evidence for such dating, which also surfaced in Japan, indicates that the farming of soybeans was much more widespread in times much earlier than previously assumed, researchers concluded.

Co-authors with Lee and Crawford were Li Liu of the Stanford University Archaeology Center, Yuka Sasaki of Paleo Labo Co. in Japan, and Xuexiang Chen of Shandong University in China.



The Australian Research Council, Social Sciences and Humanities Research Council of Canada, National Science Foundation of China and the National Science Foundation in the United States supported the research through various grants to the co-authors.

Sources: Gyoung-Ah Lee, assistant professor, anthropology department, 541- 346-4442, galee@uoregon.edu; Gary Crawford, professor, anthropology department, University of Toronto Mississauga, 905-569-4656, g.crawford@utoronto.ca

<http://bit.ly/tjHihF>

## **Neanderthals Vanished Because of Their Own Success, Suggests Study**

**Researchers used archaeology and complex computer modeling to develop new insights into the extinction of Neanderthals and the behavior of other human hunter-gatherers during the last Ice Age.**

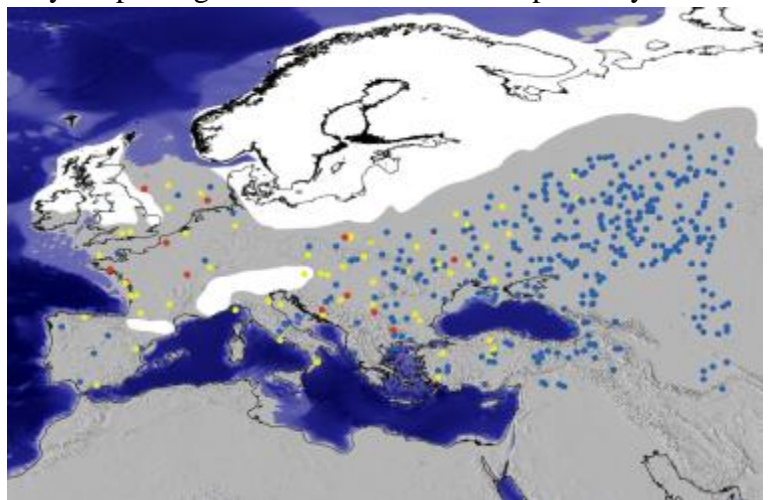
Using data obtained from the archaeological record, a team of researchers at Arizona State University and the University of Colorado, Denver, conducted experiments using complex computer modeling to analyze evidence of how human hunter-gatherers responded culturally and biologically to the dramatic changes that took place during the last Ice Age. The results showed, among other things, that the Neanderthals, thought by many scientists to have become extinct at least in part because of their inadaptability and inability to compete with the expanding presence of modern humans, may have actually been victims of their own success.

The researchers used the archeological record to track human behavioral changes in Late Pleistocene (126,000 - 10,000 B.P.) Western Eurasia over a period of 100,000 years and across the equivalent of 1,500 generations of human hunter-gatherers. They applied computer modeling to determine the evolutionary consequences of cultural and biological changes, which included how changes in the movements of modern humans and Neanderthals caused them to interact and interbreed with each other. The results showed that human mobility during the environmental changes associated with the Ice Age increased over time, likely in response to those environmental changes. The modeling suggested that the last Ice Age caused the ancestors of modern humans -- and Neanderthals -- to widen their ranges across Western Eurasia in search of new resources as the climate shifted.

According to study co-author Julien Riel-Salvatore of the University of Colorado, Denver, this provided new evidence that Neanderthals were more adaptable and resourceful than previously thought. Moreover, the study results suggested that the Neanderthals were gradually absorbed within the expanding modern human populations until they eventually disappeared as a distinctly separate human population and phenotype.

Says Riel-Salvatore, "It's been long believed that Neanderthals were outcompeted by fitter modern humans and they could not adapt. We are changing the main narrative. Neanderthals were just as adaptable and in many ways, simply victims of their own success. Neanderthals had proven that they could roll with the punches and when they met the more numerous modern humans, they adapted again. But modern humans probably saw the Neanderthals as possible mates. As a result, over time, the Neanderthals died out as a physically recognizable population."

Michael Barton, study co-author and expert on archaeological applications to computer modeling at Arizona State University, agrees. "We tested the modeling results against the empirical archaeological record and found that there is evidence that Neanderthals, and moderns, did adapt their behaviors in the way in which we modeled," said Barton. "Moreover, the modeling predicts the kind of low-level genetic admixture of Neanderthal genes that are being found in the newest genetic studies just now being published.



**Computer agents (colored dots) simulating prehistoric hunter-gatherer groups are superimposed over a map of Late Pleistocene western Eurasia. Gray shows Pleistocene land area with lowered sea levels, black lines show modern coastlines, white areas show ice sheets. The blue dots represent groups of "modern" humans, red dots represent groups of Neanderthals, and yellow dots represent groups with biological mixtures of modern and Neanderthal genes.**

**This is a snapshot of the simulation after hundreds of cycles in which the hunter-gather groups have higher mobility in response to changing glacial climate. Credit: Michael Barton/Arizona State University**

Continued Barton, "In other words, successful behavioral adaptations to severe environmental conditions made Neanderthals, and other non-moderns about whom we know little, vulnerable to biological extinction, but at the same time, ensured they made a genetic contribution to modern populations."

*The research was funded by the National Science Foundation, a Fulbright Senior Research Fellowship and a Fulbright Graduate Student Fellowship. The paper is published in the December issue of Human Ecology as Modeling Human Ecodynamics and Biocultural Interactions in the Late Pleistocene of Western Eurasia, available online on November 17, 2011. It is co-authored by Michael Barton, Arizona State University; Julien Riel-Salvatore, assistant professor of anthropology at the University of Colorado Denver; John Martin Anderies, associate professor of computational social science at ASU in the School of Human Evolution and Social Change and the School of Sustainability; and Gabriel Popescu, anthropology doctoral student at the School of Human Evolution and Social Change, Arizona State University.*

<http://www.bbc.co.uk/news/health-15744352>

## **Ban smoking in cars, says British Medical Association**

***All smoking in cars should be banned across the UK to protect people from second-hand smoke, doctors say.***

**By Nick Triggle Health correspondent, BBC News**

The British Medical Association called for the extension of the current ban on smoking in public places after reviewing evidence of the dangers.

It highlighted research showing the levels of toxins in a car can be up to 23 times higher than in a smoky bar.

But a report by a cross-party group of MPs and peers said non-legislative options should be considered as well. The All-Party Parliamentary Group on Smoking and Health even said calling for an immediate ban could be "counterproductive" as consensus needed to be built across society before taking such a step.

The group said there should be a consultation on tackling smoking in cars which could look at whether it would be better to have an outright ban, or if more could be achieved by raising awareness about the dangers through education campaigns. It pointed out that policing a ban on smoking in cars could be difficult.

No part of the UK has yet implemented a ban, although ministers in Northern Ireland have said they will launch a consultation on the issue.

Meanwhile, in Wales a public awareness campaign has begun highlighting the dangers of smoking in cars. Officials have said if that does not succeed over the next three years, a ban will be introduced.

Neither England or Scotland are currently considering introducing legislation at the moment.

But the BMA believes tougher action is needed. The doctors' union said an outright ban - even if there were no passengers - would be the best way of protecting children as well as non-smoking adults.

It said the young were particularly vulnerable from second-hand smoke as they absorbed more pollutants and their immune systems were less developed.

Research has shown that second-hand smoke can increase the risk of a range of conditions, including sudden infant death syndrome and asthma, as well as impairing lung function.

Dr Vivienne Nathanson, head of science at the BMA, admitted introducing a ban would be a "bold and courageous" move. She added: "The evidence for extending smoke-free legislation is compelling."

### **International action**

While no part of the UK has yet taken such a step, countries elsewhere in the world have.

Some states in Canada, the US and Australia, as well as the whole of South Africa, have introduced legislation, but in each case it has been focused on stopping smoking where children are present.

Instead, the BMA said a complete ban would be better as it would be easier to police. It would also have the added benefit of potentially improving safety as smoking could be a distraction for the driver, the report said.

The recommendation, which was produced after doctors' voted at their annual conference in the summer in favour of their union lobbying for a ban, received some support from other health groups.

However, the likes of Asthma UK and the British Heart Foundation said any ban should only cover children.

But smokers' lobby group Forest said there was "no justification" for a ban at all.

Director Simon Clark said: "Legislation is a gross overreaction. What next, a ban on smoking in the home?"

A spokesman for the Department of Health in England said: "We do not believe that legislation is the most effective way to encourage people to change their behaviour."

He said instead a marketing campaign would be launched in the spring which would focus on the dangers of smoking in the home and car.

The BMA issued a correction on Thursday retracting the claim that research showed the levels of toxins in a car can be up to 23 times higher than in a smoky bar. Instead it said the risk in a car was 11 times greater. A spokeswoman said the mistake was due to human error, and it had made the amendment after becoming aware there was other research that disputed their original figure.

## **New Class of Antimalarial Compounds Discovered**

***An international team has discovered a family of chemical compounds that could lead to a new generation of antimalarial drugs capable of not only alleviating symptoms but also preventing the deadly disease.***

ScienceDaily - A international team led by scientists from the Genomics Institute of the Novartis Research Foundation (GNF) and The Scripps Research Institute has discovered a family of chemical compounds that could lead to a new generation of antimalarial drugs capable of not only alleviating symptoms but also preventing the deadly disease.

In a study published November 17, 2011, in Science Express, the advance online publication of the journal Science, Elizabeth Winzeler, PhD, a Scripps Research associate professor and member of the GNF, and colleagues demonstrated that the class of compounds was more effective against malaria than some commercially available drugs.

Most antimalarial drugs are only effective during the blood stage, and those that do work in the liver have notable side effects. However, the new class of compounds identified by the team is highly effective against the parasite in both the blood and the liver.

"Because the parasite blood stages are more amenable to high-throughput screening, much research has focused on that area," said Stephan Meister, PhD, a research associate in the Winzeler lab and first author of the new paper. "We're excited to have found a class of compounds that appears to target a novel gene and is highly active against the liver stage parasites in mice. This compound class provided us with a lead for the development of novel anti-malaria drugs."

### **A Complicated Lifecycle**

Despite long-standing efforts to control malaria globally, the disease remains endemic in many parts of the world. According to the World Health Organization, malaria affected about 225 million people in 2009, and killed nearly 800,000. The disease, which tends to strike the poorest and most vulnerable populations in Asia, Africa, and the Americas, is caused by Plasmodium parasites transmitted through the bites of infected mosquitoes.

The Plasmodium parasite has a complicated lifecycle in two hosts -- mosquitoes and humans (or other vertebrate). When a malaria-infected mosquito feeds on a person, the parasite enters the human body. Within 30 minutes, the parasite has infected liver cells, where it develops for about eight days without causing noticeable symptoms. In some cases it can even go into hiding in the liver and persist for several months to years.

When this period is over, however, the parasite (now in a different form) leaves the liver and enters red blood cells, where it grows and multiplies. When the infected red blood cells eventually burst, the parasite and Plasmodium toxins are released into the bloodstream, and the person feels sick. Symptoms include fever, chills, headache, and other flulike symptoms; in severe cases, patients can experience convulsions, coma, and liver and kidney failure, which can be fatal.

If a mosquito bites the infected person at this point, the parasite will enter the mosquito, where it will continue the cycle by maturing into a form that can infect the next human host.

### **Mining the Data**

To find compounds to act against the parasite in more than one stage of its lifecycle, the team screened thousands of candidates that were already known to act against malaria parasites in the blood. Only 15 percent looked as if they might also work in the liver -- a strong indication, Winzeler said, that "a lot of compounds that are active against blood stages probably aren't going to do anything about eliminating malaria."

The group then identified the strongest candidates for drug development by mining the data for groups of related compounds that all showed activity in the liver. In the end, they settled on a cluster related to the chemical imidazolopiperazine. "When we analyzed all of the data, we saw that multiple members of this imidazolopiperazine family were active in blood and liver stages," Winzeler said.

The imidazolopiperazine family of compounds was especially attractive because it was chemically unrelated to existing antimalarial drugs, and therefore less likely to run into problems with existing resistance. "I wouldn't want to base a multimillion dollar clinical trial on compounds for which there may be pre-existing resistance," said Winzeler. "Ultimately, we want to have something that will still be effective in 10 years."

The group used an automated system of their own design to see how these new compounds fared against malaria parasites incubated in liver cells in the lab. An imaging apparatus took multiple images of each collection of cells over time, and a computer script analyzed those images to see how well the various compounds inhibited the growth of the parasites.



In the end, the team was able to develop compounds that could be taken orally and would stay in the blood long enough to be a viable candidate for drug development. When it was given to mice, the compound provided complete protection against the parasite in the liver, and worked better in the blood than some commercially available drugs.

### **Spurring Drug Discovery**

To better understand how the compound works, the team exposed successive generations of infected mosquitoes to low levels of the compound to produce resistant strains of parasites. They then sequenced the parasites' whole genomes and looked for genetic changes. "Every [resistant] strain we looked at had a mutation in the same gene," she said.

By offering a target for other new antimalarial drugs that can act in both the liver and the blood, that gene will provide other researchers fresh ammunition in the fight to eradicate the disease. So, too, will the decision by the team to make all of their data available online.

"We have been making all of our data available to the community to spur drug development," Winzeler said. "The data on all of the compounds that were tested will eventually be released, and this will allow people at universities and research institutes around the world to mine this data, and to use it to guide their own drug discovery efforts."

*In addition to Winzeler and Meister, the authors of the Science paper, titled "Exploring Plasmodium Hepatic Stages to Find Next Generation Antimalarial Drugs," include Selina E Bopp, A. Taylor Bright, and Neekesh V. Dharia, of Scripps Research; David M Plouffe, Kelli L Kuhen, Ghislain MC Bonamy, and S. Whitney Barnes, of the Genomics Institute of the Novartis Research Foundation; and researchers at Columbia University Medical Center, UC San Diego, the Novartis Institute for Tropical Diseases and the Swiss Tropical and Public Health Institute.*

*Support for the study came from the Wellcome Trust, the Medicines for Malaria Venture, the Genomics Institute of the Novartis Research Foundation, the Swiss Tropical and Public Health Institute, and the Novartis Institute for Tropical Diseases.*

<http://www.physorg.com/news/2011-11-date-earth-extreme-extinction.html>

### **Researchers pinpoint date and rate of Earth's most extreme extinction**

***It's well known that Earth's most severe mass extinction occurred about 250 million years ago.***

What's not well known is the specific time when the extinctions occurred. A team of researchers from North America and China have published a paper in Science this week which explicitly provides the date and rate of extinction.

"This is the first paper to provide rates of such massive extinction," says Dr. Charles Henderson, professor in the Department of Geoscience at the University of Calgary and co-author of the paper: Calibrating the end-Permian mass extinction. "Our information narrows down the possibilities of what triggered the massive extinction and any potential kill mechanism must coincide with this time."

About 95 percent of marine life and 70 percent of terrestrial life became extinct during what is known as the end-Permian, a time when continents were all one land mass called Pangea. The environment ranged from desert to lush forest. Four-limbed vertebrates were becoming diverse and among them were primitive amphibians, reptiles and a group that would, one day, include mammals.

Through the analysis of various types of dating techniques on well-preserved sedimentary sections from South China to Tibet, researchers determined that the mass extinction peaked about 252.28 million years ago and lasted less than 200,000 years, with most of the extinction lasting about 20,000 years.

"These dates are important as it will allow us to understand the physical and biological changes that took place," says Henderson. "We do not discuss modern climate change, but obviously global warming is a biodiversity concern today. The geologic record tells us that 'change' happens all the time, and from this great extinction life did recover."

There is ongoing debate over whether the death of both marine and terrestrial life coincided, as well as over kill mechanisms, which may include rapid global warming, hypercapnia (a condition where there is too much CO<sub>2</sub> in the blood stream), continental aridity and massive wildfires. The conclusion of this study says extinctions of most marine and terrestrial life took place at the same time. And the trigger, as suggested by these researchers and others, was the massive release of CO<sub>2</sub> from volcanic flows known as the Siberian traps, now found in northern Russia.

Henderson's conodont research was integrated with other data to establish the study's findings. Conodonts are extinct, soft-bodied eel-like creatures with numerous tiny teeth that provide critical information on hydrocarbon deposits to global extinctions.

*More information: Calibrating the End-Permian Mass Extinction, Published Online November 17 2011. Science DOI: 10.1126/science.1213454 Provided by University of Calgary*



## **Study explains how heart attack can lead to heart rupture**

***For people who initially survive a heart attack, a significant cause of death in the next few days is cardiac rupture -- literally, bursting of the heart wall.***

A new study by University of Iowa researchers pinpoints a single protein as the key player in the biochemical cascade that leads to cardiac rupture. The findings, published Nov. 13 as an Advance Online Publication (AOP) of the journal *Nature Medicine*, suggest that blocking the action of this protein, known as CaM kinase, may help prevent cardiac rupture and reduce the risk of death.

After a heart attack, the body produces a range of chemicals that trigger biological processes involved in healing and repair. Unfortunately, many of these chemical signals can become "too much of a good thing" and end up causing further damage often leading to heart failure and sudden death.

"Two of the medicines that are most effective for heart failure are beta-blockers, which block the action of adrenaline, and drugs that block the angiotensin receptor," explains Mark E. Anderson, M.D., Ph.D., UI professor and head of internal medicine and senior study author. "The third tier of therapy is medication that blocks the action of aldosterone."

Aldosterone levels increase in patients following a heart attack, and higher levels of the hormone are clearly associated with greater risk of death in the days immediately following a heart attack.

Increased aldosterone levels also are associated with a burst of oxidation in heart muscle, and in 2008, Anderson's team showed that oxidation activates CaM kinase. Anderson's research has also shown that CaM kinase is a lynchpin in the beta-blocker and angiotensin pathways.

"We wondered if aldosterone might somehow work through CaM kinase and, if it did, could some of the benefits of aldosterone blockers be attributed to effects on CaM kinase?" Anderson says.

Anderson's team, including co-first authors Julie He, a student in the UI Medical Scientist Training Program; Mei-Ling Joiner, Ph.D.; Madhu Singh, Ph.D.; Elizabeth Luczak, Ph.D.; and Paari Swaminathan, M.D., devised a series of experiments in mice to investigate how elevated levels of aldosterone damage heart muscle after a heart attack and how Cam kinase is involved.

The experiments confirmed that aldosterone increases the amount of oxidized, and therefore, activated CaM kinase in heart muscle. Mice given excess aldosterone, mimicking levels seen in human patients, were twice as likely to die after a heart attack as mice that were not given extra aldosterone (70 percent vs. 35 percent), and the cause of death was heart rupture.

Importantly, any treatment that reduced the amount of oxidized CaM kinase or otherwise inhibited CaM kinase activity lowered the risk of cardiac rupture and death in the mice.

Interestingly, the researchers found that activated CaM kinase prompted heart muscle cells to produce an enzyme called MMP9 that is implicated in heart rupture.

"Although there are many sources of this enzyme, our study showed that heart muscle itself is actually making this protein too and is acting against its own self-interest in doing so," Anderson says. "We don't know why it happens, but inhibiting CaM kinase can prevent it."

The MMP9 enzyme is involved in remodeling the "matrix" that surrounds heart cells. This matrix, which acts like mortar between cells, is constantly being broken down and rebuilt. In hearts that rupture after heart attack this remodeling process becomes excessive, weakening the matrix to the point that it ruptures.

Because matrix remodeling plays a role in other diseases, including cancer, Anderson notes that the CaM kinase findings may have clinical implications beyond heart disease.

Overall, the UI study suggests that blocking the biochemical processes triggered by aldosterone might help prevent cardiac rupture following a heart attack.

Anderson notes that a multi-center study currently underway in France is poised to determine if patients would benefit from getting aldosterone blockers right away rather than waiting several weeks.

"We think our study provides experimental evidence for why that should work," he says.

"We have now identified CaM kinase as a critical component for the disease effects of the three core therapeutic pathways in heart, and we are closer to understanding fundamental elements of these signaling pathways," Anderson says. "The findings enhance excitement that CaM kinase might be an important therapeutic target in heart disease, and developing Cam kinase inhibitors is a major goal for us so that we can move this from experimental findings to clinical testing." *Provided by University of Iowa Health Care*

<http://www.sciencedaily.com/releases/2011/11/111117154635.htm>

## **Ozone from Rock Fracture Could Serve as Earthquake Early Warning**

***Researchers the world over are seeking reliable ways to predict earthquakes, focusing on identifying seismic precursors that, if detected early enough, could serve as early warnings.***

ScienceDaily - New research, published this week in the journal Applied Physics Letters, suggests that ozone gas emitted from fracturing rocks could serve as an indicator of impending earthquakes. Ozone is a natural gas, a byproduct of electrical discharges into the air from several sources, such as from lightning, or, according to the new research, from rocks breaking under pressure.

Scientists in the lab of Raúl A. Baragiola, a professor of engineering physics in the University of Virginia School of Engineering and Applied Science set up experiments to measure ozone produced by crushing or drilling into different igneous and metamorphic rocks, including granite, basalt, gneiss, rhyolite and quartz. Different rocks produced different amounts of ozone, with rhyolite producing the strongest ozone emission.

Some time prior to an earthquake, pressures begin to build in underground faults. These pressures fracture rocks, and presumably, would produce detectable ozone.

To distinguish whether the ozone was coming from the rocks or from reactions in the atmosphere, the researchers conducted experiments in pure oxygen, nitrogen, helium and carbon dioxide. They found that ozone was produced by fracturing rocks only in conditions containing oxygen atoms, such as air, carbon dioxide and pure oxygen molecules, indicating that it came from reactions in the gas. This suggests that rock fractures may be detectable by measuring ozone.

Baragiola began the study by wondering if animals, which seem - at least anecdotally - to be capable of anticipating earthquakes, may be sensitive to changing levels of ozone, and therefore able to react in advance to an earthquake. It occurred to him that if fracturing rocks create ozone, then ozone detectors might be used as warning devices in the same way that animal behavioral changes might be indicators of seismic activity.

He said the research has several implications.

"If future research shows a positive correlation between ground-level ozone near geological faults and earthquakes, an array of interconnected ozone detectors could monitor anomalous patterns when rock fracture induces the release of ozone from underground and surface cracks," he said.

"Such an array, located away from areas with high levels of ground ozone, could be useful for giving early warning to earthquakes." He added that detection of an increase of ground ozone might also be useful in anticipating disasters in tunnel excavation, landslides and underground mines.

Baragiola's co-authors are U.Va. research scientist Catherine Dukes and visiting student Dawn Hedges.

*Story Source: The above story is reprinted from materials provided by University of Virginia.*

<http://www.physorg.com/news/2011-11-radioactive-iodine-france-atmosphere.html>

## **Radioactive iodine: Now France detects traces in atmosphere**

***France's nuclear watchdog on Tuesday said it had detected traces of radioactive iodine in the air last week after similarly low contamination was reported by the Czech Republic, Poland, Slovakia and Austria.***

Concentrations of iodine 131 measuring a few microbecquerels per cubic metre were detected last week at four monitoring stations in northern and eastern France, the Institute for Radiological Protection and Nuclear Safety (IRSN) said.

"Although the presence of iodine 131 over national territory is quite exceptional... the level of concentrations that have been observed are of no risk for public health," it said in a press release.

"The source and date of the radioactive emissions which caused this pollution are currently unknown," the IRSN said.

Iodine is a very short-lived isotope that decays to half of its radioactivity in only eight days.

For this reason, the source is unlikely to be Japan's crippled nuclear power plant at Fukushima, where iodine was released in March but later stopped, the agency said.

A possible source could be a reactor used for electricity or research or a plant using iodine 131 to make medical devices, the IRSN speculated.

The International Atomic Energy Agency (IAEA) in Vienna said last Friday that "very low levels" of iodine 131 had been detected in the air in the Czech Republic.

Poland, Slovakia and Austria also reported abnormal but still very low levels. Poland's atomic energy agency said local readings of iodine 131 had been a hundred times higher in March after the Fukushima accident.

(c) 2011 AFP

<http://www.physorg.com/news/2011-11-hungary-source-elevated-radioactivity-iaea.html>

### **Hungary likely source of elevated radioactivity levels: IAEA**

***Elevated levels of the radioactive element iodine-131 that were detected in several nations have been identified as likely originating at a Hungarian research institute, nuclear authorities said Thursday.***

Hungarian officials said the leak probably came from the Budapest-based Institute of Isotopes, the International Atomic Energy Agency said in a statement. The institute has acknowledged emitting higher quantities of iodine-131 than normal but denies being the source of any elevated radiation.

"Radiation levels in Hungary were only a little higher in Budapest than elsewhere," said Institute of Isotopes director Mihaly Lakatos. "If the source of heightened radioactivity had been Budapest, the levels measured here should have been much higher."

On November 11, several countries including Poland, Slovakia, Austria, Hungary and the Czech republic warned the IAEA that they had detected an increase in iodine-131. France's nuclear watchdog also reported on November 15 that very small concentrations of iodine 131 had been detected in the air.

The international agency said the levels detected were low and that there was no risk to human health.

Officials said the amount of the radioactive element released was equivalent to 0.01 microsieverts. The average person is exposed to 2,400 microsieverts annually through background radiation. (c) 2011 AFP

[http://www.eurekalert.org/pub\\_releases/2011-11/uond-wtd111811.php](http://www.eurekalert.org/pub_releases/2011-11/uond-wtd111811.php)

### **Walking through doorways causes forgetting, new research shows**

***We've all experienced it: The frustration of entering a room and forgetting what we were going to do. Or get. Or find.***

New research from University of Notre Dame Psychology Professor Gabriel Radvansky suggests that passing through doorways is the cause of these memory lapses. "Entering or exiting through a doorway serves as an 'event boundary' in the mind, which separates episodes of activity and files them away," Radvansky explains. "Recalling the decision or activity that was made in a different room is difficult because it has been compartmentalized." The study was published recently in the Quarterly Journal of Experimental Psychology.

Conducting three experiments in both real and virtual environments, Radvansky's subjects – all college students – performed memory tasks while crossing a room and while exiting a doorway.

In the first experiment, subjects used a virtual environment and moved from one room to another, selecting an object on a table and exchanging it for an object at a different table. They did the same thing while simply moving across a room but not crossing through a doorway.

Radvansky found that the subjects forgot more after walking through a doorway compared to moving the same distance across a room, suggesting that the doorway or "event boundary" impedes one's ability to retrieve thoughts or decisions made in a different room.

The second experiment in a real-world setting required subjects to conceal in boxes the objects chosen from the table and move either across a room or travel the same distance and walk through a doorway. The results in the real-world environment replicated those in the virtual world: walking through a doorway diminished subjects' memories.

The final experiment was designed to test whether doorways actually served as event boundaries or if one's ability to remember is linked to the environment in which a decision – in this case, the selection of an object – was created. Previous research has shown that environmental factors affect memory and that information learned in one environment is retrieved better when the retrieval occurs in the same context. Subjects in this leg of the study passed through several doorways, leading back to the room in which they started. The results showed no improvements in memory, suggesting that the act of passing through a doorway serves as a way the mind files away memories.

[http://www.eurekalert.org/pub\\_releases/2011-11/src-csc111811.php](http://www.eurekalert.org/pub_releases/2011-11/src-csc111811.php)

### **Chalmers scientists create light from vacuum**

***Scientists at Chalmers University of Technology have succeeded in creating light from vacuum***

Scientists at Chalmers University of Technology have succeeded in creating light from vacuum – observing an effect first predicted over 40 years ago. The results is published tomorrow (Wednesday) in the journal Nature. In an innovative experiment, the scientists have managed to capture some of the photons that are constantly appearing and disappearing in the vacuum.

The experiment is based on one of the most counterintuitive, yet, one of the most important principles in quantum mechanics: that vacuum is by no means empty nothingness. In fact, the vacuum is full of various



particles that are continuously fluctuating in and out of existence. They appear, exist for a brief moment and then disappear again. Since their existence is so fleeting, they are usually referred to as virtual particles.

Chalmers scientist, Christopher Wilson and his co-workers have succeeded in getting photons to leave their virtual state and become real photons, i.e. measurable light. The physicist Moore predicted way back in 1970 that this should happen if the virtual photons are allowed to bounce off a mirror that is moving at a speed that is almost as high as the speed of light. The phenomenon, known as the dynamical Casimir effect, has now been observed for the first time in a brilliant experiment conducted by the Chalmers scientists.

"Since it's not possible to get a mirror to move fast enough, we've developed another method for achieving the same effect," explains Per Delsing, Professor of Experimental Physics at Chalmers. "Instead of varying the physical distance to a mirror, we've varied the electrical distance to an electrical short circuit that acts as a mirror for microwaves.

The "mirror" consists of a quantum electronic component referred to as a SQUID (Superconducting quantum interference device), which is extremely sensitive to magnetic fields. By changing the direction of the magnetic field several billions of times a second the scientists were able to make the "mirror" vibrate at a speed of up to 25 percent of the speed of light.

"The result was that photons appeared in pairs from the vacuum, which we were able to measure in the form of microwave radiation," says Per Delsing. "We were also able to establish that the radiation had precisely the same properties that quantum theory says it should have when photons appear in pairs in this way."

What happens during the experiment is that the "mirror" transfers some of its kinetic energy to virtual photons, which helps them to materialise. According to quantum mechanics, there are many different types of virtual particles in vacuum, as mentioned earlier. Göran Johansson, Associate Professor of Theoretical Physics, explains that the reason why photons appear in the experiment is that they lack mass.

"Relatively little energy is therefore required in order to excite them out of their virtual state. In principle, one could also create other particles from vacuum, such as electrons or protons, but that would require a lot more energy."

The scientists find the photons that appear in pairs in the experiment interesting to study in closer detail. They can perhaps be of use in the research field of quantum information, which includes the development of quantum computers.

However, the main value of the experiment is that it increases our understanding of basic physical concepts, such as vacuum fluctuations – the constant appearance and disappearance of virtual particles in vacuum. It is believed that vacuum fluctuations may have a connection with "dark energy" which drives the accelerated expansion of the universe. The discovery of this acceleration was recognised this year with the awarding of the Nobel Prize in Physics.

*Full bibliographic information: "Observation of the dynamical Casimir effect in a superconducting circuit", C. M. Wilson, G. Johansson, A. Pourkabirian, M. Simoen, J. R. Johansson, T. Duty, F. Nori, & P. Delsing, Nature 479, 376 (17 November 2011), doi:10.1038/nature10561*

<http://news.discovery.com/animals/north-pole-dinosaurs-111118.html>

## **North Pole Dinosaurs Lived Short, Hard Lives**

***Arctic life was tough on dinosaurs, with many not making it to their 20th birthday.***

**By Jennifer Viegas | Fri Nov 18, 2011 07:00 AM ET**

The winter holiday season often portrays the North Pole as a cozy fantasyland, but new research on dinosaurs that lived there shows that Arctic life has been tough for millions of years, with North Pole dinos finding it hard to reach their 20th birthday. The findings, published in the journal *Historical Biology*, offer a rare look at dinosaur life stages. Fossils from high latitudes better express growth bands that reveal how these animals grew up. Scientists can then analyze them similar to how they study tree rings.

"We determine growth rates by looking at the number and spacing of the growth bands in a cross section of a femur," co-author Patrick Druckenmiller explained to Discovery News. "We measure the distance of each band from the center of the bone as a proxy for body size. In this case, it's presented as a percentage of total length. Growth banding becomes narrower as the growth rate progressively tapers off later in life."

Following this process, the researchers determined some polar dinosaurs grew rapidly as juveniles, became sexually mature at about age 9, and died at around age 19 (assuming they didn't bite the dust due to disease, an accident, or for some other reason).

Druckenmiller, curator of Earth Sciences at the University of Alaska Museum, and colleague Gregory Erickson focused their research on *Pachyrhinosaurus* femur bones excavated from the early Maastrichtian (about 65 to 70 million years ago) of Prince Creek Formation in Northern Alaska.

"Pachyrhinosaurus is a member of the horned dinosaur family Ceratopsidae," Druckenmiller said. "It was a large, probably gregarious, herbivore. Instead of having thick horns over the eyes and nose area (think of the iconic Triceratops) it had large 'bosses,' which are bony growths that give the skull a very thick appearance."

This explains the dinosaur's name: Pachy, meaning "thick and heavy," and rhino, meaning "nose."

This dinosaur was far from being alone in the Arctic, however. The North Slope of Alaska was home to numerous other plant-eating and carnivorous dinosaurs. The most common was a duck-billed dino very similar to Edmontosaurus. The region was also home to a large tyrannosaurid, a few dromaeosaurs, and the human-sized Troodon. Pachyrhinosaurus would have been preyed upon by the carnivores, but because of its size -- about 26 feet long and weighing around 4 tons -- Druckenmiller suspects few hunters "took on an adult-sized healthy animal."

Animals that would be expected from this area, such as lizards, crocodylians and turtles, have never been found. One reason could be that they had trouble getting to Alaska.

Hendrik Poinar, a McMaster University anthropologist who has also studied North Pole animals, told Discovery News that the Bering Land Bridge, which joined Alaska to eastern Siberia, may have been more of a barrier than a gateway. "I think it is increasingly clear that the bridge was indeed a filter more than a bridge," Poinar said. "It certainly was not a freeway, and it makes us think about what ecological function it clearly played over the last several millennia."



*A reconstruction of the North Pole dinosaur Troodon. Bill Parsons*

Somehow dinosaurs did make it to Alaska, but they faced "annually freezing winter temperatures," according to Druckenmiller, who explained that scientists determine past climates based on plant remains. The Arctic, however, was somewhat warmer than it is today at certain latitudes.

Nevertheless, he said, "Long, dark winters were probably a major influence on anything that lived there."

Druckenmiller and other researchers hope future studies on North Pole dinosaurs might reveal information about migratory behaviors, overwintering strategies, and dinosaur physiology. The world's largest collection of Arctic dinosaurs is housed within the Earth Science Collection at the University of Alaska Museum in Fairbanks.

<http://medicalxpress.com/news/2011-11-tool-diabetes.html>

**Researchers develop tool that saves time, eliminates mistakes in diabetes care**  
***Researchers developed a tool that allows doctors to view electronic information about patients' health conditions related to diabetes on a single computer screen***

In the fast-paced world of health care, doctors are often pressed for time during patient visits. Researchers at the University of Missouri have developed a tool that allows doctors to view electronic information about patients' health conditions related to diabetes on a single computer screen. A new study shows that this tool, the diabetes dashboard, saves time, improves accuracy and enhances patient care.

The diabetes dashboard provides information about patients' vital signs, health conditions, current medications, and laboratory tests that may need to be performed. The study showed that physicians who used the dashboard were able to correctly identify data they were searching for 100 percent of the time, compared with 94 percent using traditional electronic medical records. Further, the number of mouse clicks needed to find the information was reduced from 60 to three when using the diabetes dashboard.

Richelle Koopman, associate professor of family and community medicine in the School of Medicine, says diabetes care is complex because there are so many other health conditions associated with the disease; thus coordination of treatments is required. The goal of the diabetes dashboard is to make it easier for doctors to make the right decision about treatments.

"The diabetes dashboard is so intuitive that it makes it hard for physicians not to do the right thing," Koopman said. "Doctors can see, at a glance, everything that might affect their decision. This frees up their minds and helps them make better decisions about patients' care."

According to Koopman, the research has important implications for patient safety and costs. For example, the dashboard shows doctors a list of tests that are standard for diabetes patients and indicates whether patients have recently had the tests or need to have them. This eliminates the potential for physicians to order costly tests that are not necessary.

"It is difficult to quantify how much money the dashboard saves, but in terms of time and accuracy, the savings are substantial," Koopman said. "Doctors are still going to spend 15 minutes with each patient, but instead of using a large portion of that time to search through charts for information, they can have interactive conversations with patients about lifestyle and diet changes that are important for diabetes care."

The researchers say the dashboard was well received by doctors who tested it because it was designed by physicians familiar with their needs. The study, published in *Annals of Family Medicine*, was a collaboration among the MU School of Medicine, The Informatics Institute, the School of Information Science and Learning Technologies in the College of Education, the Center for Health Care Quality and the Sinclair School of Nursing. *Provided by University of Missouri-Columbia*

<http://medicalxpress.com/news/2011-11-spinal-cord-treatment.html>

### **Spinal cord treatment offers hope**

***Queensland University of Technology (QUT) researchers have developed a promising new treatment for spinal cord injury in animals, which could eventually prevent paralysis in thousands of people worldwide every year.***

Dr Ben Goss, from the Institute for Health and Biomedical Innovation (IHBI) at QUT, is part of a research team investigating how to prevent the spinal cord from degenerating after an injury.

"The initial injury to the spinal cord is much like a bruise," he said. "However, unlike ordinary bruises the spinal cord has a persistent inflammatory response that leads to further damage.

"Our research is looking at the effects of adding proteins, also known as growth factors, to the spinal cord to reduce or switch off the inflammation and prevent secondary neurological damage."

The treatment, which combined vascular endothelial and platelet-derived proteins, was applied to animals immediately after a spinal cord injury and evaluated after one and three month periods.

Dr Goss said researchers, including from Griffith University, found the size of the lesion caused by the spinal cord injury was significantly smaller in the treated group compared to animals that did not receive treatment. He said there was also significantly less damage to tissue around the spinal cord injury after the new treatment. "This study has demonstrated for the first time a treatment can reduce or eliminate secondary degeneration after traumatic injury to the spinal cord," Dr Goss said.

"At present spinal cord injury is permanent and irreversible, but I believe our research has the potential to improve outcomes and this might be the first step to achieving a cure."

The research, published in the *Journal of Neurotrauma*, could help 30,000 people worldwide, including about 400 Australians, who sustain spinal cord injuries every year. About 9000 Australians live with disabilities caused by spinal cord damage, with road accidents causing nearly half of such injuries in Australia.

Dr Goss said The Walk Again Society, which funds spinal cord injury research, is raising money to support the project, which is eventually hoped to include clinical trials. *Provided by Queensland University of Technology*

<http://www.bbc.co.uk/news/world-us-canada-15800907>

### **Cancer drug Avastin loses US approval**

***US drug regulators have rescinded approval of a breast cancer drug, saying it is not effective enough to justify the risks of taking it.***

The drug, Avastin, was approved for US use in 2008, but UK officials have also rejected claims that it prolongs life. Further research showed it did not help patients live longer or improve quality of life, Food and Drug Administration commissioner Margaret Hamburg said.

Avastin will still be used to treat other kinds of cancer. The drug is used to treat breast cancer that has spread to other parts of the body. It works by starving cancer cells of a blood supply. However, its side-effects include severe high blood pressure, massive bleeding, heart attack or heart failure and tears in the stomach and intestines, FDA studies have found.

FDA approval of the drug had initially been given under a special programme that allows patients to start using promising treatments while the manufacturer finishes the studies to prove the medicine works as well as expected. The decision to withdraw the approval - which can happen if results of the research do not match predictions - was not easy, the FDA said.

### **Stalling cancer growth**

"With so much at stake, patients and their doctors count on the FDA to ensure the drugs they use have been shown to be safe and effective for their intended use. Sometimes, the results of rigorous testing can be disappointing," Ms Hamburg told the Associated Press news agency.

US health insurance companies could remove the drug, which can cost as much as \$100,000 (£63,342) per year, from their coverage - although doctors would still be permitted to administer the drug.



But the government-backed Medicaid programme has said it has no immediate plans to change its policy of paying for it.

Some advocates of the drug disagree with the watchdog's decision.

"The bottom line is that they are throwing out the baby with the bathwater. There absolutely may be subsets of carefully chosen breast cancer patients who benefit from Avastin," said Dr Elisa Port, co-director of the Dubin Breast Center of Mount Sinai Hospital in New York.

Roche, the Swiss manufacturer of the drug, has said it will undertake further study of the treatment, especially with the chemotherapy drug paclitaxel, to try to identify which patients might be best suited to benefit from use of the drug. The company says it expects the medicine will generate \$7.6bn (£4.8m) of revenue annually, despite the FDA decision.

The drug was approved on the basis of a study that showed Avastin was able to stall the growth of breast cancer by five-and-a-half months, when used together with a standard chemotherapy treatment.

But subsequent studies revised the period of delay to between one and three months, and there was no evidence to show that the drug extended patients' lives.

### **International problems**

The US decision comes after Avastin fell foul of health authorities in the UK and in Europe. In February 2011, the UK's National Institute for Health and Clinical Excellence (NICE), the NHS drugs advisory body, said Avastin should not be used to treat secondary breast cancers. NICE, which issues guidance for NHS in England and Wales, said there was insufficient evidence that the drug prolonged life.

This guidance followed a recommendation by the European Medicines Agency (EMA) that doctors only prescribe the drug in combination with the taxane drug, paclitaxel.

<http://www.scientificamerican.com/podcast/episode.cfm?id=glucose-test-swaps-tears-for-blood-11-11-19>

### **Glucose Test Swaps Tears For Blood**

***Tears have much lower glucose levels than blood but, as the ratio is consistent, they could serve for diabetes glucose monitoring. Sophie Bushwick reports.***

People with diabetes may have to endure multiple, painful finger sticks every day to get blood samples for testing. But a new glucose test may do away with the pain even as it brings on the tears. Because the test uses tears instead of blood to measure glucose levels. The report is in the journal Analytical Chemistry. [Qinyi Yan et al, Measurement of Tear Glucose Levels with Amperometric Glucose Biosensor/Capillary Tube Configuration]

Researchers at the University of Michigan studied glucose in rabbits. They found that glucose levels are much lower in tears than in blood, but the difference is consistent. They thus aim to develop a sensitive enough system to detect sugar levels in tears.

But why are researchers going to all this trouble just so people with diabetes can avoid a pinprick?

In order to best control their glucose levels and prevent complications like kidney failure or limb amputation, some diabetics should be testing their blood multiple times a day. But the pain of jabbing a finger with a needle over and over keeps some patients from the frequent testing they need. With a pain-free test, that deterrent would vanish, making blood sugar tests a lot sweeter.

<http://www.scientificamerican.com/podcast/episode.cfm?id=protein-might-ward-off-afternoon-sn-11-11-19>

### **Protein Might Ward Off Afternoon Snooze**

***Glucose can block brain cell secretion of orexin, which keeps us alert. But amino acids can stop that block. Christie Nicholson reports.***

The other afternoon I hit a classic mid-afternoon slump. Sleepy and sluggish, I grabbed for a bit of chocolate. But I probably should have had egg whites or maybe a piece of steak. Because a recent study in mice has found that it's protein, not sugar, that provides the perk.

Brain cells called orexin cells secrete a stimulant that makes us energetic and tells the body to burn calories. If the cells' activity decreases, narcolepsy or sudden sleepiness, is the result. The work is published in the journal Neuron. [Mahesh M. Karnani et al, Activation of Central Orexin/Hypocretin Neurons by Dietary Amino Acids]

Scientists marked orexin cells in mice brains so they would fluoresce. Then they tracked the cells' activity after feeding the mice different kinds of food.

Turns out that glucose blocks the function of the orexin cells. This effect might be the main reason for the desired post-lunch siesta. But the researchers also found that amino acids stop the glucose action, keeping the cells active and the mice alert. So next time I get that 3 p.m. slow down, I'll have an egg. If I'm alert enough to remember.