Don't forget to eat your greens

Leafy greens can prevent the ill-effects of toxins in foods like peanut butter

The age old reminder to always eat your greens isn't just for kids anymore.

Not only are the vitamins and minerals good for you, but eating greens could also save your life, according to a recent study involving scientists from Lawrence Livermore National Laboratory (LLNL).

LLNL researchers Graham Bench and Ken Turteltaub found that giving someone a small dose of chlorophyll (Chla) or chlorophyllin (CHL) - found in green leafy vegetables such as spinach, broccoli and kale - could reverse the effects of aflatoxin poisoning.

Aflatoxin is a potent, naturally occurring carcinogenic mycotoxin that is associated with the growth of two types of mold: Aspergillus flavus and Aspergillus parasiticus. Food and food crops most prone to aflatoxin contamination include corn and corn products, cottonseed, peanuts and peanut products, tree nuts and milk.

Bench and Turteltaub, working with colleagues from Oregon State University and an industry partner, Cephalon Inc., found that greens have chemopreventive potential.

Aflatoxins can invade the food supply at anytime during production, processing, transport and storage. Evidence of acute aflatoxicosis in humans has been reported primarily in developing countries lacking the resources to effectively screen aflatoxin contamination from the food supply. Because aflatoxins, particularly aflatoxin B1 (AFB1), are potent carcinogens in some animals, there is interest in the effects of long-term exposure to low levels of these important mycotoxins on humans.

The study used AMS to provide aflatoxin pharmacokinetic parameters previously unavailable for humans, and suggest that chlorophyll and chlorophyllin co-consumption may limit the bioavailability of ingested aflatoxin in humans, as they do in animal models, according to Bench.

Exposure to environmental carcinogens has been estimated to contribute to a majority of human cancers, especially through lifestyle factors related to tobacco use and diet. Notable examples are the tobacco-related carcinogens; heterocyclic amines produced from sustained, high-temperature cooking of meats; and the fungal food contaminants aflatoxins.

The team initially gave each of three volunteers a small dose of carbon 14 labeled aflatoxin (less than the amount that would be found in a peanut butter sandwich.) In subsequent experiments the patients were given a small amount of Chla or CHL concomitantly with the same dose of carbon 14 labeled aflatoxin.

By using LLNL's Center for Accelerator Mass Spectrometry, the team was able to measure the amount of aflatoxin in each volunteer after each dosing regimen and determine whether the Chla or CHL reduced the amount of aflatoxin absorbed into the volunteers.

"The Chla and CHL treatment each significantly reduced aflatoxin absorption and bioavailability," Bench said.

"What makes this study unique among prevention trials is, that we were able to administer a microdose of radio-labeled aflatoxin to assess the actions of the carcinogen directly in people. There was no extrapolation from animal models which often are wrong," Turteltaub said.

The research, which is co-funded by the National Institutes of Health's National Resource for Biomedical Accelerator Mass Spectrometry, appeared in the December issue of the journal, Cancer Prevention Research.

Evidence of Stone Age amputation forces rethink over history of surgery

The surgeon was dressed in a goat or sheep skin and used a sharpened stone to amputate the arm of his patient.

The operating theatre was not exactly Harley Street - more probably a wooden shelter - but the intervention was a success, and it has shed light on the medical talents of our Stone Age ancestors.

Scientists unearthed evidence of the surgery during work on an Early Neolithic tomb discovered at Buthiers-Boulancourt, about 40 miles (65km) south of Paris. They found that a remarkable degree of medical knowledge had been used to remove the left forearm of an elderly man about 6,900 years ago - suggesting that the true Flintstones were more developed than previously thought.

The amputation is evidence of medical knowledge in the Stone Age

The patient seems to have been anaesthetised, the conditions were aseptic, the cut was clean and the wound was treated, according to the French National Institute for Preventive Archaeological Research (Inrap).

The revelation could force a reassessment of the history of surgery, especially because researchers have recently reported signs of two other Neolithic amputations in Germany and the Czech Republic. It was known that Stone Age doctors performed trephinations, cutting through the skull, but not amputations. "The first European farmers were therefore capable of quite sophisticated surgical acts," Inrap said. The discovery was

made by Cécile Buquet-Marcon and Anaick Samzun, both archaeologists, and Philippe Charlier, a forensic scientist.

It followed research on the tomb of an elderly man who lived in the Linearbandkeramik period, when European hunter-gatherers settled down to agriculture, stock-breeding and pottery. The patient was important: his grave was 2m (6.5ft) long - bigger than most - and contained a schist axe, a flint pick and the remains of a young animal, which are evidence of high status.

The excavation where the stone age amputation was found

The most intriguing aspect, however, was the absence of forearm and hand bones. A battery of biological, radiological and other tests showed that the humerus bone had been cut above the trochlea indent at the end "in an intentional and successful amputation". Mrs Buquet-Marcon said that the patient, who is likely to have been a warrior, might have damaged his arm in a fall, animal attack or battle.

"I don't think you could say that those who carried out the operation were doctors in the modern sense that they did only that, but they obviously had medical knowledge," she said.

A flintstone almost certainly served as a scalpel. Mrs Buquet-Marcon said that pain-killing plants were likely to have been used, perhaps the hallucinogenic Datura. "We don't know for sure, but they would have had to find some way of keeping him still during the operation," she said.

Other plants, possibly sage, were probably used to clean the wound. "The macroscopic examination has not revealed any infection in contact with this amputation, suggesting that it was conducted in relatively aseptic conditions," said the scientists in an article for the journal Antiquity.

The patient survived the operation and, although he suffered from osteoarthritis, he lived for months, perhaps years, afterwards, tests revealed. Despite the loss of his forearm, the contents of his grave showed that he remained part of the community. "His disability did not exclude him from the group," the researchers said.

The discovery demonstrates that advanced medical knowledge and complex social rules were present in Europe in about 4900BC, and that major surgery was likely to have been more common than we realised, Mrs Buquet-Marcon said.

Mixed-handed children more likely to have mental health, language and scholastic problems

Children who are mixed-handed, or ambidextrous, are more likely to have mental health, language and scholastic problems in childhood than right- or left-handed children, according to a new study published today in the journal Pediatrics.

The researchers behind the study, from Imperial College London and other European institutions, suggest that their findings may help teachers and health professionals to identify children who are particularly at risk of developing certain problems.

Around one in every 100 people is mixed-handed. The study looked at nearly 8,000 children, 87 of whom were mixed-handed, and found that mixed-handed 7 and 8-year old children were twice as likely as their right-handed peers to have difficulties with language and to perform poorly in school.

When they reached 15 or 16, mixed-handed adolescents were also at twice the risk of having symptoms of attention deficit/hyperactivity disorder (ADHD). They were also likely to have more severe symptoms of ADHD than their right-handed counterparts. It is estimated that ADHD affects between 3 to 9 percent of school-aged children and young people.

The adolescents also reported having greater difficulties with language than those who were left- or right-handed. This is in line with earlier studies that have linked mixed-handedness with dyslexia.

Little is known about what makes people mixed-handed but it is known that handedness is linked to the hemispheres in the brain. Previous research has shown that where a person's natural preference is for using their right hand, the left hemisphere of their brain is more dominant.

Some researchers have suggested that mixed-handedness indicates that the pattern of dominance is not that which is typically seen in most people, i.e. it is less clear that one hemisphere is dominant over the other. One study has suggested that ADHD is linked to having a weaker function in the right hemisphere of the brain, which could help explain why some of the mixed-handed students in today's study had symptoms of ADHD.

Dr Alina Rodriguez, the lead researcher on the study from the School of Public Health at Imperial College London, said: "Mixed-handedness is intriguing – we don't know why some people prefer to make use of both hands when most people use only one. Our study is interesting because it suggests that some children who are mixed handed experience greater difficulties in school than their left- and right-handed friends. We think that there are differences in the brain that might explain these difficulties, but there needs to be more research.

"Because mixed-handedness is such a rare condition, the number of mixed-handed children we were able to study was relatively small, but our results are statistically and clinically significant. That said, our results should not be taken to mean that all children who are mixed-handed will have problems at school or develop ADHD. We found that mixed-handed children and adolescents were at a higher risk of having certain problems, but we'd like to stress that most of the mixed-handed children we followed didn't have any of these difficulties," added Dr Rodriguez.

To study the effects of mixed-handedness, Dr Rodriguez and her colleagues looked at prospective data from a cohort of 7,871 children from Northern Finland. Using questionnaires, the researchers assessed the children when they reached 7 to 8 years of age and again at 15 to 16 years of age.

When the children were aged 8, the researchers asked parents and teachers to assess their linguistic abilities, scholastic performance and behaviour. The teachers reported whether children had difficulties in reading, writing or mathematics and rated the children's academic performance as below average, average or above average.

The adolescents' parents and the adolescents themselves completed follow-up questionnaires when they were 15-16 years of age, with the children evaluating their school performance in relation to their peers and the parents assessing their children's behaviour, on a questionnaire that is widely used to identify ADHD symptoms.

The research was funded by the Academy of Finland; Sigrid Juselius Foundation, Finland; Thule Institute, University of Oulu, Finland; and the National Institute of Mental Health. Dr Rodriguez received support from VINNMER.

Everybody laughs, everybody cries: Researchers identify universal emotions

Here's a piece of research that might leave you tickled: laughter is a universal language, according to new research. The study, conducted with people from Britain and Namibia, suggests that basic emotions such as amusement, anger, fear and sadness are shared by all humans.

Everybody shares the vast majority of their genetic makeup with each other, meaning that most of our physical characteristics are similar. We all share other attributes, too, such as having complex systems of communication to convey our thoughts, feelings and the intentions of those around us, and we are all able to express a wide range of emotions through language, sounds, facial expressions and posture. However, the way that we communicate is not always the same – for example, people from different cultures may not understand the same words and phrases or body language.

In an attempt to find out if certain emotions are universal, researchers led by Professor Sophie Scott from UCL (University College London) have studied whether the sounds associated with emotions such as happiness, anger, fear, sadness, disgust and surprise are shared amongst different cultures. The results of their study, funded by the Wellcome Trust, Economic and Social Research Council, University of London Central Research Fund and UCL, are published today in the Proceedings of the National Academy of Sciences. They provide further evidence that such emotions form a set of basic, evolved functions that are shared by all humans.

Dr Disa Sauter, studied people from Britain and from the Himba, a group of over 20,000 people living in small settlements in northern Namibia as part of her PhD research at UCL. In the very remote settlements, where the data for the present study were collected, the individuals live completely traditional lives, with no electricity, running water, formal education, or any contact with people from other groups.

Participants in the study listened to a short story based around a particular emotion, for example, how a person is very sad because a relative of theirs had died recently. At the end of the story they heard two sounds – such as crying and of laughter – and were asked to identify which of the two sounds reflected the emotion being expressed in the story. The British group heard sounds from the Himba and vice versa.

"People from both groups seemed to find the basic emotions – anger, fear, disgust, amusement, sadness and surprise – the most easily recognisable," says Professor Scott, a Wellcome Trust Senior Research Fellow. "This suggests that these emotions – and their vocalisations – are similar across all human cultures."

The findings support previous research which showed that facial expressions of these basic emotions are recognised across a wide range of cultures. Despite the considerable variation in human facial musculature, the facial muscles that are essential to produce the basic emotions are constant across individuals, suggesting that specific facial muscle structures have likely evolved to allow individuals to produce universally recognisable emotional expressions.

One positive sound was particularly well recognised by both groups of participants: laughter. Listeners from both cultures agreed that laughter signified amusement, exemplified as the feeling of being tickled.

"Tickling makes everyone laugh – and not just humans," says Dr Disa Sauter, who tested the Himba and English participants. "We see this happen in other primates such as chimpanzees, as well as other mammals. This suggests that laughter has deep evolutionary roots, possibly originating as part of playful communication between young infants and mothers.

"Our study supports the idea that laughter is universally associated with being tickled and reflects the feeling of enjoyment of physical play."

Previous studies have shown that smiling is universally recognised as a signal of happiness, raising the possibility that laughter is the auditory equivalent of smiles, both communicating a state of enjoyment. However, explains Professor Scott, it is possible that laughter and smiles are in fact quite different types of signals, with smiles functioning as a signal of generally positive social intent, whereas laughter may be a more specific emotional signal, originating in play.

Not all positive sounds were easily recognisable to both cultures, however. Some, such as the sound of pleasure or achievement appear not to be shared across cultures, but are instead specific to a particular group or region. The researchers believe this may be due to the function of positive emotions, which facilitate social cohesion between group members. Such bonding behaviour may be restricted to in-group members with whom social connections are built and maintained. However, it may not be desirable to share such signals with individuals who are not members of one's own cultural group.

Researchers of microraptor shed light on ancient origin of bird flight

The scientists argue that flight originated above, in the trees; such animals would have been gliders

LAWRENCE, Kan. - A joint team from the University of Kansas and Northeastern University in China says that it has settled the long-standing question of how bird flight began.

In the Jan. 25 issue of Proceedings of the National Academy of Sciences, the KU-China researchers push their research into the origins of bird flight and the early evolution of birds with decisive flight tests of a model of the four-winged gliding raptor, called microraptor.

Scientists from the University of Kansas have created a model of a microraptor to show its gliding capabilities.
University of Kansas

The team is led by David Alexander, KU assistant professor of biology and an expert on modern animal flight. Alexander is joined by KU colleagues Larry Martin, David Burnham and Amanda Falk, along with Enpu Gong from Northeastern University in China, who are engaged in a comprehensive study of the functional morphology and ecology of early birds from China.

"We've done the scientific work and flight tests to show that microraptor was a very successful glider," said Burnham. "In 2003, they found one that was so well-preserved that you could count the feathers on its wings."

A debate involving the KU scientists, recently documented by the PBS program "NOVA," had flared over the question of whether evidence supported the theory that animals developed flight as ground dwellers, as a majority of paleontologists had asserted. But Martin and Burnham argue that flight originated above, in the trees. Such animals would have been gliders. The researchers say that fossils of the hawk-sized microraptor shore up their theory.

"The controversy was that these animals couldn't spread their hind-wings to glide," said Burnham. "But we've been able to articulate the bones in their hip socket to show that they could fly."

The new flight model created by Martin and Burnham comes directly from a skeleton composed of casts of the original bones of a microraptor and the preserved impressions of feathers from specimens in Chinese museums.

These astonishingly preserved fossils give a detailed image of the plumage in the gliding raptor and make possible the construction of an accurate model.

The fossils also show that an essentially sprawling posture was a plausible hind-limb wing position to provide stable flight with gliding parameters better than those of modern "flying lemurs."

The competing "biplane posture" advanced by other researchers suggested that an upright stance provided for successful glides. But the KU-China team argues that this stance required an impossibly heavy head to maintain a proper center of gravity. Furthermore, the presence of seven-inch-long flight feathers on the feet would prohibit any extended stay on the ground. Thus, microraptor must have been completely arboreal.

"We decided that we would take the skeleton we had, put wings on it from the feather pattern and show that it could fly," said Burnham. "If others think that it was a terrestrial runner, they should make a model and put it on a treadmill and show that it could run with those long feathers on its hind legs."

Successful flight tests were conducted in the open air and under more controlled conditions in the Anschutz Sports Pavilion at KU. A video of some of the tests is available at http://www.features.ku.edu/microraptors.

Indeed, the KU-China team's work provides such strong support for the trees-down model for the origin of avian flight that the alternative terrestrial (ground up) origin now may be abandoned.

Researchers Martin, Burnham and Falk, along with Gong, recently made headlines for their discovery of a venom-delivery system in sinornithosaurus, a cousin of microraptor. A paper detailing that finding was published in PNAS last month.

Doctors develop life-saving, low-cost ventilators for emergency, rural and military use

A group of UK anaesthetists have designed and tested three prototype low-cost ventilators that could provide vital support during major healthcare emergencies involving large numbers of patients or casualties. The devices, detailed in a paper published online by Anaesthesia, could also be used where resources are limited, such as in developing countries, remote locations or by the military.

"Our research has demonstrated that it is possible to make a gas-efficient ventilator costing less than £200, for use where 2-4 bar oxygen is available, with no pressurised air or electrical requirements" says consultant anaesthetist Dr John Dingley from Morriston Hospital, Swansea. "Such a device could be mass-produced for crises where there is an overwhelming demand for mechanical ventilation and a limited oxygen supply."

Problems with limited oxygen supply date back to the First World War when medical professionals had to deal with the large numbers of casualties affected by poison gas.

"The physiologist J S Haldane developed a delivery system that provided a high flow of oxygen from a modest fresh gas flow" says Dr Dingley, who is also a Reader in Anaesthetics at Swansea University.

"Modern equipment has become so sophisticated that we have, in some ways, lost sight of the basic principles that can be adopted in emergency healthcare situations. "So our aim was to extend Haldane's concept of maximally efficient oxygen delivery to include pneumatic gas-powered ventilator designs.

"The initial design was envisaged as a ventilator for difficult environments, especially military scenarios, where large oxygen cylinders would be impractical, or in short supply, and electrical power would be unavailable. "This led to two variants that are suited to emergency construction in bulk for mass deployment prior to a respiratory failure pandemic or other major healthcare situation."

All three designs operate on the principle that the energy is taken from approximately 1 l.min-1 compressed oxygen at a supply pressure of 2-4 bar to provide the motive force to ventilate the lungs.

"After the stored energy has been used to provide motive power in this way, the waste oxygen – which is now at atmospheric pressure – is then re-used to enrich the air being drawn into the ventilator before it is delivered to the lungs" explains Dr Dingley. "In this way, most of the breathable oxygen is obtained from ambient air."

A mechanical test lung was used to test the three devices and this showed that they would provide effective ventilation for patients who were unable to breathe unaided. The devices were also tested over a range of lung volumes and compliances, which indicated that the oxygen consumption was considerably lower than that of the commercially available gas powered ventilators currently on the market.

This means that even if the devices had to be used over an extended period of time, they would use less than conventional units. They would also provide a viable and financially attractive alternative to buying extra critical care ventilators, which are expensive, complex microprocessor-driven devices.

"These devices could be used anywhere that 2-4 bar oxygen is available, such as a converted ward with no piped air or electricity" says Dr Dingley. "In extreme circumstances, they could even run on hospital compressed air, using very little air from the hospital's compressor reservoir.

"The concept, although unconventional, also allows an attending staff member to take over manual ventilation of the patient, with air if necessary, if a hospital's pneumatic mechanism or gas supply fails. "The mechanism could possibly be made as a single-use device and stockpiled for crises where there is an overwhelming demand for mechanical ventilation, such as a pandemic."

Dr Dingley points out that major healthcare emergencies can call for creative solutions and that these can often be unorthodox. For example during the 1952 Copenhagen polio epidemic, relays of medical students manually ventilated the lungs of patients with tracheostomies under the guidance of the anaesthetist. And in Beijing in 2003, trainees from unrelated specialties found themselves managing a sealed intensive therapy unit filled with avian flu victims, while receiving clinical guidance from overseas experts via a mobile phone.

"Health services are not designed to cope with the most extreme situations and fast, easy solutions can quite literally save lives" says Dr Dingley. "We feel that the low oxygen consumption pneumatic ventilators we have designed and tested could provide a low-cost, speedy solution in a crisis. They could also be used for a wide range of applications, such as rural healthcare and armed conflicts."

The paper, which is available online, contains full technical details of the three devices and the testing process, together with photographs and diagrams.

Note to editors *A low oxygen consumption pneumatic ventilator for emergency construction during a respiratory failure pandemic. Williams et al. Anaesthesia. Publication online ahead of print. (January 2010). DOI: 10.1111/j.1365-2044.2009.06207.x*

Technique for preserving pre-transplant livers improves outcomes and organ pool

Machine perfusion outperforms standard cold-storage liver preservation, according to first-ever clinical study comparing the 2 methods in human liver transplantation

NEW YORK - Preserving organs on ice prior to transplantation, an approach known as cold storage or CS, has been the standard practice in liver transplant for 20 years. Now there is new evidence that a technique called hypothermic machine perfusion (HMP) may offer an improvement, according to the first-ever study comparing the impact of the two techniques on transplant outcomes.

The phase I study was carried out by Dr. James V. Guarrera and his colleagues at NewYork-Presbyterian Hospital/Columbia University Medical Center. The researchers found that HMP is at least as good as CS in preserving donor livers -- and that it most likely constitutes an advance over the traditional method. Improving preservation, they emphasize, could expand the availability of organs for transplantation.

Unlike cold storage, which Dr. Guarrera describes as a static technique, HMP dynamically simulates "aliveness" by providing a continuous flow of oxygen and key nutrients to the liver while diluting and removing toxins and waste products.

"Cold storage is the easy way to preserve vital organs for transplant. Generally, it has been a fairly effective way to keep a liver healthy en route to transplant surgery. But today, we have the technology to do better," says Dr. Guarrera, surgical director of adult liver transplantation at NewYork-Presbyterian Hospital/Columbia University Medical Center and assistant professor of surgery at Columbia University College of Physicians and Surgeons. "And by better preserving donor livers and reducing preservation-related injury, we may be able to expand the pool of available organs, making liver transplantation available to more patients who need it."

The study compared 20 transplant patients who received HMP-preserved livers with 20 patients with CS-preserved livers, finding the first group experienced shorter hospital stays and fewer long-term complications. The HMP group also had lower levels of blood markers indicating injury to the liver that may have occurred during the preservation interval.

The findings are currently reported online in The American Journal of Transplantation and will be featured in the journal's February issue. The study was supported by a grant from the Health Resources and Services Administration, Division of Transplantation. A second grant is funding a phase II study.

Expanding Availability of Livers for Transplant

Improving organ preservation is especially important in light of major changes in the transplantation landscape, says Dr. Guarrera, and could broaden the availability of donor organs.

In the early days of liver transplantation, high-quality organs were plentiful for two reasons: First, liver transplantation had not yet become widespread, so demand was relatively low; and second, there was a greater supply of livers from young trauma victims. Thanks to a significant drop in violent crime and to public safety measures such as mandatory seat-belt use, the pool of young donors has shrunk -- and that's obviously a good thing, Dr. Guarrera notes. But there is no denying the stark fact that the age of the average liver donor is higher today, which means that the quality of available organs has deteriorated.

Dr. Guarrera goes on to describe the history and context of his interest in HMP, a technique that dates back to the 1960s, when it was introduced for kidney preservation. It was soon dropped in favor of cold storage, deemed the simpler way to go. But then, in the 1990s, HMP made a comeback in kidney transplantation, coinciding with greater reliance on "imperfect" kidneys from older donors.

"We strongly suspected that HMP could be adapted to the liver transplantation setting," he says. "Our first challenge was to work with a manufacturer to make an HMP device more portable and more specific to the liver, an organ that is inherently more vulnerable to injury than the kidney. We've been using a pump produced by Medtronic, originally designed for use in cardiopulmonary bypass, combined with a preservation solution called Vasosol.

"Thus far, our results have been extremely encouraging. We just received FDA approval for a phase II study, focusing specifically on the effects of HMP in livers from 'extended criteria donors,' a group that makes up a growing proportion of the total number of donors today. Organs from these older, sicker donors are the ones most likely to benefit from machine perfusion."

Molecular and mechanistic studies also are under way. Establishing the benefits of HMP over CS will depend on the results of larger clinical studies, says Dr. Guarrera, but it is equally important to clarify the way the two techniques play out at a cellular and molecular level.

"We aim to show that even imperfect livers can be maintained in peak condition via HMP during the critical period when they are in transit from donor to recipient. It's the kind of 'quality improvement' that will translate into long-term benefits for patients."

Research at UCSB points to potential treatment for kidney disease

Santa Barbara, Calif. - Research performed at UC Santa Barbara points to the drug rapamycin as a potential treatment for kidney disease. The study builds on past research and shows that studies performed on mice are more likely to translate to humans than previously thought. The results are published in the current online issue of the Journal of the American Society of Nephrology.

Over 600,000 people in the U.S., and 12 million worldwide, are affected by the inherited kidney disease known as ADPKD, short for autosomal-dominant polycystic kidney disease. In the U.S., the number of individuals affected by ADPKD is greater than the number affected by cystic fibrosis, muscular dystrophy, hemophilia, Down's syndrome, and sickle cell anemia combined. The disease is characterized by the proliferation of cysts that eventually debilitate the kidney, causing kidney failure in half of all patients by the time they reach age 50.

Currently, no treatment exists to prevent or slow cyst formation, and most ADPKD patients require kidney transplants or lifelong dialysis for survival, explained Thomas Weimbs, director of the laboratory where the discovery was made. Weimbs is an associate professor in the Department of Molecular, Cellular and Developmental Biology and the Neuroscience Research Institute at UCSB.

The drug rapamycin, also called sirolimus, is currently used as an immunosuppressant, to help prevent rejection of a new, transplanted kidney.

"While we had previously shown that rapamycin is highly effective in mouse models of polycystic kidney disease, the problem had been that these mice had different genes affected than human patients," said Weimbs. "Therefore, the question always remained whether rapamycin would be effective in patients, too. Our new study now is the first to show that rapamycin is also highly effective in a new mouse model in which the same gene is affected as in most human patients."

Currently, there are several clinical trials ongoing internationally to test the safety and efficacy of rapamycin and related drugs in polycystic kidney disease, explained Jonathan Shillingford, UCSB project scientist in the Department of Molecular, Cellular and Developmental Biology, and first author on the paper. First results from these studies are expected to appear this year. The scientists hope that these drugs will prove to be beneficial. "But it will be critical to balance any benefits against the expected side effects to judge whether these drugs should be recommended for the treatment of polycystic kidney disease," he said.

The Weimbs lab has studied rapamycin in mice for several years. "To our surprise, treatment of our polycystic kidney mice with rapamycin resulted not only in a halt of further cyst growth but also appeared to partially reverse the already existing kidney deterioration," said Weimbs. "We had seen this previously in a different mouse model but were very positively surprised that this effect can be replicated in our new model."

Two scientists from Johns Hopkins University were co-authors of the article: Klaus B. Piontek and Gregory Germino.

Why humans outlive apes

Genetic adaption to meat-rich diets may also lead to high rates of Alzheimer's and heart disease

The same evolutionary genetic advantages that have helped increase human lifespans also make us uniquely susceptible to diseases of aging such as cancer, heart disease and dementia, reveals a study to be published in a special PNAS collection on "Evolution in Health and Medicine" on Tuesday, Jan. 26.

Comparing the life spans of humans with other primates, Caleb Finch, ARCO & William F. Kieschnick Professor in the Neurobiology of Aging in the USC Davis School of Gerontology, explains that slight differences in DNA sequencing in humans have enabled us to better respond to infection and inflammation, the leading cause of mortality in wild chimpanzees and in early human populations with limited access to modern medicine.

Specifically, humans have evolved what Finch calls "a meat-adaptive gene" that has increased the human lifespan by regulating the effects of meat-rich diets. ApoE3 is unique to humans and is a variant of the cholesterol transporting gene, apolipoprotein E, which regulates inflammation and many aspects of aging in the brain and arteries.

"Over time, ingestion of red meat, particularly raw meat infected with parasites in the era before cooking, stimulates chronic inflammation that leads to some of the common diseases of aging," Finch said.

However, another expression of apolipoprotein E in humans -- the minor allele, apoE4 -- can increase the risk of heart disease and Alzheimer's disease by several-fold, Finch explained. ApoE4 carriers have higher totals of blood cholesterol, more oxidized blood lipids and higher rates of early onset coronary heart disease and Alzheimer's disease.

"The chimpanzee apoE functions more like the "good" apoE3, which contributes to low levels of heart disease and Alzheimer's," Finch said. Chimpanzees in captivity have unusually low levels of heart disease and Alzheimer-like changes during aging when compared to humans.

Finch hypothesizes that the expression of ApoE4 in humans could be the result of the "antagonistic pleiotropy theory" of aging, in which genes selected to fight diseases in early life have adverse affects in later life.

"ApoeE may be a prototype for other genes that enabled the huge changes in human lifespan, as well as brain size, despite our very unape-like meat-rich diets," Finch said. "Drugs being developed to alter activities of apoE4 may also enhance lifespan of apoE4 carriers."

In spite of their genetic similarity to humans, chimpanzees and great apes have maximum lifespans that rarely exceed 50 years. Even in high-mortality modern hunter-forager populations, human life expectancy at birth is still twice that of wild chimpanzees.

Support was provided by the National Institute on Aging and the Ellison Medical Foundation.

Sniffing out lung cancer at early stages

Changes in body fluid odors indicate presence of lung cancer tumors

PHILADELPHIA – New animal research from scientists at the Monell Center and collaborators demonstrates that body fluid odors can be used to identify animals with lung cancer tumors. The findings set the stage for studies to identify potential diagnostic biomarkers in the urine of human lung cancer patients.

Lung cancer is the leading cause of cancer-related deaths worldwide, responsible for 1.3 million deaths annually. Effective techniques for early diagnosis are urgently needed, as the disease often has no early signs or symptoms.

"Cancer tumors result in a change in body-related odors that can be detected both by trained animal sensors and by sophisticated chemical techniques," said Monell biologist Gary K. Beauchamp, Ph.D., a senior author on the study. "These findings indicate that odor sensing has the potential to improve early diagnostic and prognostic approaches to lung cancer treatment."

Anecdotal reports have suggested that odor changes might be used to identify individuals affected with cancer, but experimental work in this area has not been conclusive. The current study, reported in the online journal PLoS One, used a rigorously controlled animal model to eliminate many confounding factors frequently found in human patient studies.

In behavioral studies, sensor mice were first trained to recognize the scent of urine from animals bearing lung cancer tumors. The trained sensor mice were then able to use urine odor to distinguish tumor-bearing from healthy animals.

Chemical analyses of urine compounds revealed that the amounts of several chemical compounds differed dramatically between tumor-bearing and healthy mice. Surprisingly, the levels of many of these compounds were decreased in tumor-bearing mice rather than increased, which is what often is expected.

In subsequent experiments, the researchers were able to identify tumor-bearing from control mice simply by measuring the amounts of these biomarker chemicals in mouse urine and then constructing chemical profiles. This chemical classification was sensitive enough to accurately identify 47 out of 50 mice as tumor-bearing or healthy.

The findings indicate that lung cancers produce changes in odorous compounds secreted in urine and that these changes can be detected and used as a diagnostic tool.

"Finding new ways to screen for early lung cancers in patients at risk, such as smokers, is one of the best ways we have to reduce the high death rate from this disease," said Steven M. Albelda, M.D., William Maul Measey Professor of Medicine, University of Pennsylvania School of Medicine, also a senior author on the paper. "Using the same chemical approaches as in this paper, we hope to be able to detect odors in urine of smokers that could be used to identify lung cancer at a very early stage."

Also contributing to the study were first author Koichi Matsumura, Maryanne Opiekun, and Kunio Yamazaki from Monell; Hiroaki Oka from Panasonic Corporation; and Anil Vachani from the University of Pennsylvania School of Medicine. The study was funded by Panasonic Corporation

Trapped Mars rover's driving days are over

*** 22:34 26 January 2010 by Rachel Courtland**

After six years of roaming the Red Planet, the Mars rover Spirit's travelling days are over. But if it survives the upcoming Martian winter, it could be used as a stationary research lab to help study the planet's interior.

Spirit has been stuck in a patch of soft, sandy soil since April 2009. After months of testing escape manoeuvres with two mock rovers on Earth, NASA began attempts to extricate Spirit in November 2009.

But progress has been painfully slow. The rover's three left wheels are almost entirely buried and have little traction, and two of its right wheels are broken and must be dragged or pushed.

Now, NASA has given up hope of freeing the rover. "We do not believe it is extractible," said Doug McCuistion, director of NASA's Mars exploration programme, at a press briefing on Tuesday.

Stationary platform

The rover's useful life may not be over, however. NASA has designated Spirit a 'stationary research platform', and if it survives the six-month winter, which will peak in May, its first priority will be to transmit radio signals that can be used to pinpoint its location in space.

Over time, these signals could help researchers discern subtle wobbles in Mars's rotation, which could help reveal whether the planet has a solid or liquid core. The rover could also track how Martian winds transport dust across the planet and could perform more detailed measurements of its sand trap, which may once have been part of a hot, watery landscape filled with steam vents.

But it is far from clear whether Spirit will make it through the southern hemisphere's fast-approaching winter. In past winters, the rover has driven onto north-facing slopes to maximise the sunlight falling on its solar panels. But Spirit is currently tilted in the opposite direction – some 9° to the south.

Waning sunlight

That orientation may not be enough to power the rover through winter, so NASA is working to tilt the rover northwards by rotating and turning its wheels. But waning sunlight means the solar-powered rover may have just three weeks to attempt the manoeuvres.

If it can't tilt itself northward, Spirit will likely enter a state of hibernation, turning on briefly each day to check the status of its batteries before powering down. "We have to be prepared to go through a period where we're not hearing from the rover for an extended length of time," said John Callas, rover project manager at NASA's Jet Propulsion Laboratory in Pasadena, California.

Spirit's survival will depend on its ability to stay warm. The team estimates that temperatures in the area will descend to some -45 °C during the winter. That may be warm enough for the rover's sensitive electronics, which were designed to operate down to a temperature of -55 °C. The electronics will also be warmed in part by small heaters that run off the decay of radioactive elements.

But after years on Mars and "thousands of gruelling temperature cycles", there is no guarantee that the rover will be able to survive the winter cold, Callas said. If Spirit does, it may be August or September before it has sufficient power to communicate regularly with Earth, Callas said.

US babies mysteriously shrinking

*** 16:15 26 January 2010 by Ewen Callaway**

Birthweights in the US are falling but no one knows why, according to a study of 36.8 million infants born between 1990 and 2005.

A 52-gram drop in the weight of full-term singletons – from an average of 3.441 to 3.389 kilograms – has left Emily Oken's team at Harvard Medical School scratching their heads. It can't be accounted for by an increase in caesarean sections or induced labours, which shorten gestation. What's more, women in the US now smoke less and gain more weight during pregnancy, which should make babies heavier. Oken suggests that unmeasured factors, such as diet or exercise, could explain why babies are being born lighter.

"For your average baby, 50 grams probably makes no difference at all," she stresses. But those born substantially lighter could be at increased risk of heart disease and diabetes later in life.

Journal reference: Obstetrics & Gynecology, DOI: 10.1097/aog.0b013e3181cbd5f5

Is the Hobbit's brain unfeasibly small?

These are the skulls of Homo floresiensis (left) and Homo sapiens (right). **Professor Peter Brown, University of New England**

Homo floresiensis, a pygmy-sized small-brained hominin popularly known as 'the Hobbit' was discovered five years ago, but controversy continues over whether the small brain is actually due to a pathological condition. How can its tiny brain size be explained? Researchers writing in the open access journal BMC Biology have tackled this question in the context of a comprehensive assessment of the evolution of brain and body size throughout the larger primate family.

Nick Mundy and Stephen Montgomery, from the Department of Zoology at Cambridge University, UK, and colleagues from Durham University used previously published data from living and extinct species to reconstruct the pattern of brain and body mass evolution in primates. According to Nick Mundy, "Our results provide robust confirmation for the suggestion that strong evolutionary trends have governed the expansion of the primate brain. In contrast, body size evolution has not tended to increase in primates, implying brain and body mass have been subject to separate selection pressures and supporting the findings of previous studies in

other taxonomic groups that these two highly correlated traits can show differences in their patterns of evolution".

Brain expansion began early in primate evolution and has occurred in all major groups, suggesting a strong selective advantage to increased brainpower in most primate lineages. Despite this overall trend, however, Mundy and his colleagues have identified several branches/lineages within each major group that have shown decreasing brain and body mass as they evolve, for example in marmosets and mouse lemurs. According to Mundy, "We find that, under reasonable assumptions, the reduction in brain size during the evolution of Homo floresiensis is not unusual in comparison to these other primates. Along with other recent studies on the effects of 'island dwarfism' in other mammals, these results support the hypothesis that the small brain of Homo floresiensis was adapted to local ecological conditions on Flores."

Notes to Editors

1. Reconstructing the ups and downs of primate brain evolution: implications for adaptive hypotheses and Homo floresiensis Stephen H Montgomery, Isabella Capellini, Robert A Barton and Nicholas I MundyBMC Biology (in press

Top-rated hospitals don't always have superior outcomes

Journal of the American College of Surgeons study shows patients can benefit from choosing high-volume hospitals for cardiovascular procedures even if facilities do not have high ratings

CHICAGO – New research published in the January issue of the Journal of the American College of Surgeons finds that while popular hospital rating systems can help identify high-quality hospitals for cardiovascular operations, patients can achieve similar outcomes by seeking care at high-volume hospitals closer to home.

Hospital quality ratings have become a source of bragging rights for many hospitals, and they receive substantial attention from both the public and media. Two of the most recognized ratings are the U.S. News and World Report's "America's Best Hospitals" and HealthGrades' "America's 50 Best Hospitals." Although patients and caregivers increasingly use these quality ratings to choose hospitals, the relationship between ratings and outcomes remains unclear. This research is the first of its kind that addresses the important question of whether surgical outcomes at the highly rated hospitals are better than surgical outcomes at other hospitals in the United States.

"Both the U.S. News and World Report and HealthGrades quality rating systems are frequently used for hospital marketing. Our study shows that current hospital ratings systems are no better in judging the quality of hospitals than are procedural volumes," according to Nicholas Osborne, MD, Robert Wood Johnson Clinical Scholar, University of Michigan, Ann Arbor.

"These quality ratings are marketed as a tool to help consumers choose the best hospitals. However, the best hospitals are hard to define," Dr. Osborne said. "Procedural volume may represent a good proxy for hospital quality for some high-risk procedures, but continued research is necessary to develop better measures of surgical quality for the public. One promising approach is the American College of Surgeon's National Surgical Quality Improvement Program (ACS NSQIP), a quality initiative aimed at measuring and improving surgical outcomes. ACS NSQIP uses clinical data from patient charts rather than relying on billing data from insurance claims, as most quality rating efforts do. As national and regional quality initiatives like ACS NSQIP expand and develop, these efforts will provide detailed and robust data to help us measure and improve the surgical quality of participating hospitals."

Using 2005-2006 Medicare data, researchers compared 30-day mortality in 2008's 50 top-ranked cardiovascular hospitals from the U.S. News and World Report's "America's Best Hospitals" and HealthGrades' "America's 50 Best Hospitals" with that of 4,445 hospitals nationwide for patients undergoing one of four cardiovascular procedures: (1) abdominal aortic aneurysm repair; (2) coronary artery bypass; (3) aortic valve repair; and (4) mitral valve repair.

Primary outcomes included risk-adjusted mortality, adjusting for patient characteristics and surgical acuity. Researchers adjusted for hospital volume to determine whether hospital experience accounts for the differences in mortality. After accounting for hospital volume, the U.S. News and World Report hospitals no longer had a significantly lower 30-day mortality rate for any of the four procedures compared with that of other hospitals. While the HealthGrades hospitals had lower 30-day mortality rates for aortic valve repair and coronary artery bypass operation following these adjustments, volume accounted for the largest proportion of difference in outcomes between hospitals.

Researchers concluded that hospital volume accounts for as much as 79 percent of observed differences in hospital quality. Although current ratings systems can identify high-quality hospitals, over-reliance on such ratings may cause patients and their families to choose facilities more distant from their homes rather than equally performing high-volume hospitals in a closer geographic area.

Play, Then Eat: Shift May Bring Gains at School

By TARA PARKER-POPE

Can something as simple as the timing of recess make a difference in a child's health and behavior?

Some experts think it can, and now some schools are rescheduling recess - sending students out to play before they sit down for lunch. The switch appears to have led to some surprising changes in both cafeteria and classroom.

Schools that have tried it report that when children play before lunch, there is less food waste and higher consumption of milk, fruit and vegetables. And some teachers say there are fewer behavior problems.

"Kids are calmer after they've had recess first," said Janet Sinkewicz, principal of Sharon Elementary School in Robbinsville, N.J., which made the change last fall. "They feel like they have more time to eat and they don't have to rush."

One recent weekday at Sharon, I watched as gaggles of second graders chased one another around the playground and climbed on monkey bars. When the whistle blew, the bustling playground emptied almost instantly, and the children lined up to drop off their coats and mittens and file quietly into the cafeteria for lunch.

"All the wiggles are out," Ms. Sinkewicz said.

One of the earliest schools to adopt the idea was North Ranch Elementary in Scottsdale, Ariz. About nine years ago, the school nurse suggested the change, and the school conducted a pilot study, tracking food waste and visits to the nurse along with anecdotal reports on student behavior.

By the end of the year, nurse visits had dropped 40 percent, with fewer headaches and stomachaches. One child told school workers that he was happy he didn't throw up anymore at recess.

Other children had been rushing through lunch to get to the playground sooner, leaving much uneaten. After the switch, food waste declined and children were less likely to become hungry or feel sick later in the day. And to the surprise of school officials, moving recess before lunch ended up adding about 15 minutes of classroom instruction.

In the Arizona heat, "kids needed a cool-down period before they could start academic work," said the principal, Sarah Hartley. "We saved 15 minutes every day," Dr. Hartley continued, "because kids could play, then go into the cafeteria and eat and cool down, and come back to the classroom and start academic work immediately."

Since that pilot program, 18 of the district's 31 schools have adopted "recess before lunch."

The switch did pose some challenges. Because children were coming straight from the playground, the school had to install hand sanitizers in the lunchroom. And until the lunch system was computerized, the school had to distribute children's lunch cards as they returned from recess.

In Montana, state school officials were looking for ways to improve children's eating habits and physical activity, and conducted a four-school pilot study of "recess before lunch" in 2002. According to a report from the Montana Team Nutrition program, children who played before lunch wasted less food, drank more milk and asked for more water. And as in Arizona, students were calmer when they returned to classrooms, resulting in about 10 minutes of extra teaching time.

One challenge of the program was teaching children to eat slower. In the past, children often finished lunch in five minutes so they could get to recess. With the scheduling change, cafeteria workers had to encourage them to slow down, chew their food and use all the available time to finish their lunch.

Today, about one-third of Montana schools have adopted "recess before lunch," and state officials say more schools are being encouraged. "The pilot projects that are going on have been demonstrating that students are wasting less food, they have a more relaxed eating environment and improved behavior because they're not rushing to get outside," said Denise Juneau, superintendent of the Office of Public Instruction. "It's something our office will promote to schools across the state as a best practice."

Children's health experts note that such a switch might not work in many urban school districts, where lower-income children may start the day hungry.

"It's a great idea, but first we've got to give them a decent breakfast," said Dr. David Ludwig, director of the obesity program at Children's Hospital Boston. "A lot of kids skip breakfast and arrive at lunch ravenous."

And for a seemingly simple scheduling change, it can create some daunting logistical problems. Children often have to return to hallways and classrooms after recess for bathroom breaks and hand washing and to pick up lunch bags. The North Ranch Elementary School regularly fields calls from schools in colder climates with questions on how to deal with coats, hats, galoshes and mittens. "In Arizona, we don't have to deal with that," said Dr. Hartley, the principal.

Many school districts say such problems make them reluctant to switch. A 2006 study in The Journal of Childhood Nutrition & Management reported that fewer than 5 percent of the nation's elementary schools were scheduling recess before lunch.

But at the Sharon Elementary School, the principal, Ms. Sinkewicz, says the challenges have been worth it. In the past, children took coats, hats and mittens with them to the lunchroom, then headed outside. Now they have time to return coats to lockers so they don't have to carry them to the lunchroom. "For some reason, kids aren't losing things outside," Ms. Sinkewicz said. "The lost-and-found mound has gone down."

UCF professor's vaccine could be lethal weapon against malaria, cholera

Mankind may finally have a weapon to fight two of the world's deadliest diseases. A University of Central Florida biomedical researcher has developed what promises to be the first low-cost dual vaccine against malaria and cholera.

There is no FDA approved vaccine to prevent malaria, a mosquito-borne illness that kills more than 1 million people annually. Only one vaccine exists to fight cholera, a diarrheal illness that is common in developing countries and can be fatal. The lone vaccine is too expensive to prevent outbreaks in developing countries after floods, and children lose immunity within three years of getting the current vaccine.

"I'm very encouraged because our technique works well and provides an affordable way to get vaccines to people who need them most and can least afford them," said lead scientist Henry Daniell.

Daniell's team genetically engineered tobacco and lettuce plants to produce the vaccine. Researchers gave mice freeze-dried plant cells (orally or by injection) containing the vaccine. They then challenged the mice with either the cholera toxin or malarial parasite. The malaria parasite studies were completed in fellow UCF professor Debopam Chakrabarti's lab.

Untreated rodents contracted diseases quickly, but the mice who received the plant-grown vaccines showed long-lasting immunity for more than 300 days (equivalent to 50 human years).

Results from the National Institutes of Health-funded research are published in this month's Plant Biotechnology, the top-ranked journal in the field.

Clinical trials are needed, and Daniell is hopeful that the results with mice will translate to humans. It could be yet another example of plants delivering life-saving medicines.

The dual vaccine follows a string of other "green" vaccines developed in Daniell's lab. He's created vaccines against anthrax and black plague that generated a congratulatory call from the top U.S. homeland security official and was featured on the Discovery Channel. He's also successfully grown insulin in plants to find what could be a long-lasting cure for diabetes. Daniell's team continues to research these vaccines and is looking for investors to help fund clinical trials.

Producing vaccines in plants is less expensive than traditional methods because it requires less labor and technology, Daniell said. "We're talking about producing mass quantities for pennies on the dollar," he said. "And distribution to mass populations would be easy because it could be made into a simple pill, like a vitamin, which many people routinely take now. There is no need for expensive purification, cold storage, transportation or sterile delivery via injections."

For Daniell, his research is more than his day job. His passion to find vaccines for the world's top 10 diseases as defined by the World Health Organization comes from growing up in India. He watched many of his childhood friends contract malaria, cholera and other diseases.

Daniell, a father of two, joined UCF's Burnett School of Biomedical Sciences in the College of Medicine in 1998. His research led to the formation of the university's first biotechnology company. Daniell also became only the 14th American in the last 222 years to be elected the Italian National Academy of Sciences. In 2007 he was named a Fellow of the American Association for the Advancement of Sciences.

"I'm not done yet," he said. "I still have more diseases to attack."

Other researchers working on the dual vaccine project include Abdoreza Davoodi-Semiromi, Melissa Schreiber, Samson Nallapali, Dheeraj Verma, Nameirakpam D. Singh and Robert K. Banks.

Really?

The Claim: Coughing Can Blunt the Pain of a Doctor's Needle

By ANAHAD O'CONNOR

THE FACTS Sometimes there are no words that can comfort a patient who fears an injection or the drawing of blood. But there may be one cheap and easy way to ease the needle's sting.

In the medical literature, it is known as the cough trick. Patients cough moderately just before a shot and then once during it.

How this works is unclear. It could simply be a matter of distraction. Or, as a report in the journal BMJ pointed out, it may have something to do with a brief, cough-induced rise in blood pressure that reduces the perception of pain.

Whatever the mechanism, studies have found intriguing evidence. Two were conducted in 2004, including one three-week study in which doctors measured variables like pain intensity, hand withdrawal and palm

sweating as subjects had intravenous needles inserted in their hands - on one occasion while coughing, and on another with no coughing. Coughing, they found, reduced the pain.

In another study, published this month in the journal Pediatrics, scientists at the Mayo Clinic tried the coughing trick on 68 children, ages 4 to 11, receiving immunizations. They found that it eased pain in Hispanic and white children, but not in black children - a finding they could not explain.

And like any method, it has its obvious flaws: coughing too vigorously, for example, could cause doctors to miss their mark.

THE BOTTOM LINE Studies suggest that a moderate cough during an injection may forestall pain.

Recognition of facial expressions is not universal

Universite de Montreal study reveals that Asians and Caucasians view faces differently

Montreal – Caucasians and Asians don't examine faces in the same way, according to new research. PhD student Caroline Blais, of the Université de Montréal Department of Psychology, has published two studies on the subject: one in Current Biology and the other in PLoS One.

Previous studies have shown that people collect information by mostly studying the eyes as well as the mouth of a face. "The problem is that these studies always used Caucasian test subjects," says Blais.

Questioning the universality of facial recognition began after studies showed that Asians study faces in an overall fashion, while Caucasians break down faces into distinct parts.

Blais used a camera designed to track eye movements to study 14 Caucasian and 14 Asian participants. As part of the experiment, subjects were shown 112 Caucasian and Asian faces and asked to report if they had seen the face before and to name the dominating trait. The study confirmed that Caucasians study the triangle of the eyes and mouth, while Asians focus on the nose.

Caucasian and Asian subjects excelled at recognizing someone of their race, yet both had the same level of difficulty in identifying someone of another ethnic group. According to Blais, this says more about the analytical approach of Caucasians and the holistic approach of Asians.

In a second experiment, test subjects had to pinpoint an emotion: surprise, fear, disgust or joy. Asians mostly focused on the eyes and not enough on the mouth, which meant some emotions were wrongly identified.

"Asians had particular problems with negative emotions. They confused fear and surprise as well as disgust and anger," says Blais. "This is because they avoided looking at the mouth which provides a lot of information about these emotions."

Cultural or biological causes, Blais says, might explain why humans don't read faces in a universal fashion.

A New Way to Look for Diseases' Genetic Roots

By NICHOLAS WADE

The hunt for the genetic roots of common diseases has hit a blank wall.

The genetic variants found so far account in most cases for a small fraction of the genetic risk of the major killers. So where is the missing heritability and why has it not showed up?

A Duke geneticist now suggests that the standard method of gene hunting had a theoretical flaw and should proceed on a different basis. The purpose of the $3 billion project to decode the human genome, completed in 2003, was to discover the genetic roots of common diseases like diabetes, cancer and Alzheimer's. The diseases are called complex, meaning that several mutated genes are probably implicated in each.

A principal theory has long been that these variant genes have become common in the population because the diseases strike late in life, after a person has had children. Bad genes would not be eliminated by natural selection at that age, as they would if the diseases struck before the child-bearing years.

So to find disease genes, the thinking went, do not decode the entire genome of every patient - just look at the few sites where genetic variations are common, defined as being present in at least 1 percent of the population.

These sites of common variation are called SNPs (pronounced "snips"), and biotech companies have developed ingenious devices to recognize up to 500,000 SNPs at a time. The SNP chips made possible genomewide association studies in which the genomes of many patients are compared with those of healthy people to see which SNPs are correlated with the disease.

The SNP chips worked well, the studies were well designed, though enormously expensive, and some 2,000 disease-associated SNPs have been identified by university consortiums in the United States and Europe.

But this mountainous labor produced something of a mouse.

In each disease, with few exceptions, the SNPs accounted for small percentage of the genetic risk. A second puzzling feature was that many of the disease-linked SNPs did not occur in the DNA that codes for genes, but rather in the so-called junk regions of the genome. Biologists speculated that these SNPs must play an as-yet-undefined role in deranging the regulation of nearby genes. In an article this week in the journal PLoS Biology, the Duke geneticist David B. Goldstein PhD and his colleagues propose an explanation for both findings.

They argue that the common disease-common variant idea is largely incorrect: natural selection has in fact done far better than expected in eliminating disease-causing variants from the population. It follows that the major burden of disease is carried by a multitude of rare variants - ones too rare to have been programmed into the SNP chips.

So why have the genomewide association studies linked some SNPs to disease, if in fact it is the rare variants that cause it?

In Dr. Goldstein's view, the SNPs could simply be acting as surrogate markers for the rare variants. Until now, geneticists have assumed a disease-linked SNP was either itself a cause or was a marker for a disease variant nearby. But Dr. Goldstein's team calculated that the rare variants associated with a SNP can occur up to two million units of DNA away from it. This means that the disease-associated SNPs do not necessarily point to anything useful and that it is dangerous to assume the nearest gene is the cause of the disease. If SNPs are indeed rather indirect markers of disease, that would explain why many have turned up in junk DNA.
But why do the SNPs get implicated in the genomewide association studies if in fact it is the rare variants that cause disease? Most of the SNPs are ancient, which is how they got to be common, whereas the disease-causing rare variants are mostly recent, because natural selection is always sweeping them away. After a SNP is created, some of the population has it and the rest continue to carry the standard DNA unit at that site in their genome.

When the rare disease-causing variants build up much later, Dr. Goldstein suggests, some will be on stretches of DNA containing the SNP and others on stretches of DNA with the standard unit. Since the allocation is random, more rare variants will be sometimes lie on the DNA with the SNP, and the SNP will appear as statistically associated with the disease even if it is not. The association is not exactly spurious - Dr. Goldstein calls it "synthetic" - but it is indirect, so much so as to make many SNPs useless for identifying the genes that cause disease.

Geneticists have long been aware of this possibility, but Dr. Goldstein's team has shown theoretically that this could happen more often than expected. He has also examined the question in reverse by doing a genomewide association study of sickle cell anemia.

Though the disease is known to be caused by a variant in a single gene, the Duke geneticists found a statistically significant association with 179 SNPs, spread across a stretch of DNA two and a half million units in length and containing dozens of genes. Most of these SNPs were clearly pointing at the wrong thing.

Genomewide association studies, conducted with hundreds of patients, can each cost in the range of $10 million or more. Though the studies may have led researchers up a blind alley in many cases, they were not a mistake, Dr. Goldstein believes.

"I think most people now view genomewide association studies as something we absolutely had to do and have now done," he said. "It's fair to say that for many common diseases nothing of very great importance was discovered, but those studies have told us what to do next."

That next step, in his view, is to sequence, or decode, patients' entire genomes and then to look for likely mutations in the genes themselves. The cost of sequencing a human genome has been plummeting in recent years, and it may now be possible to sequence large numbers of patients.

Finding even a few of the rare variants that cause disease could point to genes that make suitable targets for drug makers. The SNPs statistically linked to disease have mostly failed to identify the right genes, but the rare variants may, Dr. Goldstein said.

The Icelandic gene-hunting firm deCODE genetics, which emerged last week from bankruptcy, has long led in detecting SNPs associated with common disease. Dr. Kari Stefansson, the company's founder and research director, agreed that whole genome sequencing would "give us a lot of extremely exciting data." But he disputed Dr. Goldstein's view that rare variants carried most of the missing heritability. Both deCODE genetics and scientists at the Broad Institute in Cambridge, Mass., have sequenced regions of the genome surrounding SNPs in search of rare variants, but have found very few, Dr. Stefansson said. "We can speculate till we are blue in our faces," he said, "but the fact of the matter is that there is no substitute for data."

Groundbreaking research shows platelets can reproduce in circulation

Discovery challenges understanding of blood cell development

SALT LAKE CITY – University of Utah researchers led an international team of scientists that is the first to report on the previously undescribed ability of platelets to reproduce themselves in the circulation. Their revolutionary findings were published online Jan. 19, 2010, in the journal Blood.

Platelets develop from precursor cells found in the bone marrow, a process that is called thrombopoiesis. During the final stages of thrombopoiesis, platelets are shed from the cytoplasm of their precursors and then enter the bloodstream. Because they lack nuclei, circulating platelets are often referred to as "cytoplasts."

Because DNA resides in the nucleus, platelets were previously considered incapable of reproducing themselves. However, according to this new study led by Hansjörg Schwertz, M.D., and Andrew S. Weyrich, Ph.D., both of the U of U School of Medicine, platelets are actually capable of giving rise to new platelets.

"Cells with nuclei typically split into two uniform daughter cells that share identical genetic information," says Schwertz, research assistant professor of surgery and lead author of the study. "In our experiments, we found that platelets increase in number by generating beaded extensions that resemble a pearl necklace. Development of these extensions, which contain two or more new platelets, does not require a nucleus."

Schwertz and his colleagues found that the newly formed platelets are structurally and functionally indistinguishable from normal platelets and are similar in size, shape, and metabolic activity. Importantly, the group also demonstrated that platelets produce progeny in human whole blood cultures. This suggests that new treatments may be devised to increase circulating platelet numbers in patients whose platelet counts are abnormally low because of a medical condition.

Platelets are one of the most abundant cells in the bloodstream and their primary function is to halt bleeding. Decreased platelet counts can increase a person's risk for bleeding complications. Conversely, if platelet counts are too high or platelets inappropriately stick to one another, individuals may be at increased risk for vascular disorders such as heart attacks.

In additional studies conducted in cooperation with Robert C. Blaylock, M.D., medical director of transfusion services at the University of Utah and professor of pathology, the group found that platelets used for transfusion are also capable of generating new platelets, even after they are stored in bags for five days. This suggests that platelet numbers may be expanded after they are removed from the body, a finding that could have a significant impact on transfusion medicine.

"More research is needed to understand how platelets reproduce themselves and whether newly formed platelets are identical to, or distinct from, the platelets that are formed directly from their bone marrow precursors," says Weyrich, professor of internal and molecular medicine at the University of Utah's Eccles Institute of Human Genetics and corresponding author of the study. "Nevertheless, our findings identify a new function of platelets that has important bench-to-bedside implications."

Magnesium supplement helps boost brainpower

Supplement enhances learning abilities, memory in rats

CAMBRIDGE, Mass. - Neuroscientists at MIT and Tsinghua University in Beijing show that increasing brain magnesium with a new compound enhanced learning abilities, working memory, and short- and long-term memory in rats. The dietary supplement also boosted older rats' ability to perform a variety of learning tests.

Magnesium, an essential element, is found in dark, leafy vegetables such as spinach and in some fruits. Those who get less than 400 milligrams daily are at risk for allergies, asthma and heart disease, among other conditions. In 2004, Guosong Liu and colleagues at MIT discovered that magnesium might have a positive influence on learning and memory. They followed up by developing a new magnesium compound - magnesium-L-threonate (MgT) - that is more effective than conventional oral supplements at boosting magnesium in the brain, and tested it on rats.

"We found that elevation of brain magnesium led to significant enhancement of spatial and associative memory in both young and aged rats," said Liu, now director of the Center for Learning and Memory at Tsinghua University. "If MgT is shown to be safe and effective in humans, these results may have a significant impact on public health." Liu is cofounder of Magceutics, a California-based company developing drugs for prevention and treatment of age-dependent memory decline and Alzheimer's disease.

"Half the population of the industrialized countries has a magnesium deficit, which increases with aging. If normal or even higher levels of magnesium can be maintained, we may be able to significantly slow age-related loss of cognitive function and perhaps prevent or treat diseases that affect cognitive function," Liu said.

HOW THEY DID IT: To understand the molecular mechanisms underlying this MgT-induced memory enhancement, the researchers studied the changes induced in functional and structural properties of synapses. They found that in young and aged rats, MgT increased plasticity among synapses, the connections among neurons, and boosted the density of synapses in the hippocampus, a critical brain region for learning and memory.

Susumu Tonegawa at MIT's Picower Institute for Learning and Memory helped carry out the initial behavioral experiments that showed that magnesium boosted memory in aged rats. Min Zhou's laboratory at the University of Toronto helped demonstrate the enhancement of synaptic plasticity in magnesium-treated rats.

NEXT STEPS: This study not only highlights the importance of a diet with sufficient daily magnesium, but also suggests the usefulness of magnesium-based treatments for aging-associated memory decline, Tonegawa

said. Clinical studies in Beijing are now investigating the relationship between body magnesium status and cognitive functions in older humans and Alzheimer's patients.

SOURCE: "Enhancement of Learning and Memory by Elevating Brain Magnesium," Inna Slutsky, Nashat Abumaria, Long-Jun Wu, Chao Huang, Ling Zhang, Bo Li, Xiang Zhao, Arvind Govindarajan, Ming-Gao Zhao, Min Zhuo, Susumu Tonegawa and Guosong Liu in Neuron, published Jan. 28, 2010.

A mind at rest strengthens memories, NYU researchers find

Our memories are strengthened during periods of rest while we are awake, researchers at New York University have found. The findings, which appear in the latest issue of the journal Neuron, expand our understanding of how memories are boosted - previous studies had shown this process occurs during sleep, but not during times of awake rest.

"Taking a coffee break after class can actually help you retain that information you just learned," explained Lila Davachi, an assistant professor in NYU's Department of Psychology and Center for Neural Science, in whose laboratory the study was conducted. "Your brain wants you to tune out other tasks so you can tune in to what you just learned."

The study, whose lead author was Arielle Tambini, a doctoral candidate in NYU's Graduate School of Arts and Science, focused on memory consolidation - the period when a memory is stabilized after it is initially created, or encoded. To determine if memory consolidation occurred during periods of awake rest, the researchers imaged the hippocampus, a brain structure known to play a significant role in memory, and cortical regions during periods of awake rest. Previous studies have demonstrated regions of the brain more active during periods of rest, but their function at these times had been unclear.

The NYU experiment tested subjects' associative memory by showing them pairs of images containing a human face and an object (e.g., a beach ball) or a human face and a scene (e.g., a beach) followed by periods of awake rest. Subjects were not informed their memory for these images would later be tested, but, rather, were instructed to rest and simply think about anything that they wanted, but to remain awake during the resting periods. The researchers used functional magnetic resonance imaging (fMRI) to gauge activity in the hippocampus and cortical regions during the task and during the ensuing rest period.

The experiment yielded two noteworthy results. First, the researchers found that during rest after the study experience (after the visuals were shown), there was a significant correlation between brain activity in the subjects' hippocampus and cortical regions that were active during the initial encoding of each stimulus pair. However, this boost in brain correlations was only seen following experiences that were later memorable suggesting these parts of the brain act in tandem for a purpose - to consolidate memories during rest. Second, when examining each subject individually, it was found that subjects who had greater resting correlations between the hippocampus and cortex, also exhibited better performance on a subsequent associative memory test and those whose brain correlations were weaker, had worse memory - in other words, the greater the activity in hippocampus and cortical regions, the stronger the memory.

"Your brain is working for you when you're resting, so rest is important for memory and cognitive function," Davachi observed. "This is something we don't appreciate much, especially when today's information technologies keep us working round-the-clock."

The study's other co-author was Nicholas Ketz, a researcher assistant in the Department of Psychology. The research was supported by a grant from the National Institute of Mental Health and Dart Neuroscience.

Flu in pregnancy changes fetal brain

THE brains of monkeys whose mothers had flu while pregnant resemble those of people with schizophrenia. The finding backs up studies in people that suggest flu in mothers-to-be affects the brain of the developing fetus.

Previous research had found that the children of women who caught flu while pregnant are more likely to develop schizophrenia later in life. To investigate further, Sarah Short and Chris Coe at the University of Wisconsin, Madison, infected 12 pregnant rhesus monkeys with mild flu.

Their 19 offspring seemed to develop normally. Yet MRI scans of the 1-year-old juveniles - equivalent in age to a 5 to 7-year-old human child - revealed that their brains had features similar to those seen in people with schizophrenia, including less grey matter in the cortex and enlarged ventricles. Monkeys whose mothers had not had flu did not have these features (Biological Psychiatry, DOI: 10.1016/j.biopsych.2009.11.026).

The team will now monitor the monkeys for behaviour similar to that seen in schizophrenia. In the meantime, Coe advises would-be mothers to get seasonal flu shots.

"The implication for people is that if women are planning to get pregnant it makes more sense being immunised in advance rather than risking having a bad flu infection when pregnant," Coe says.

The finding has impressed Alan Brown at Columbia University in New York, who studies the link between maternal flu and psychiatric illness in humans. He says that seeing schizophrenia-like anomalies in the brain of

a closely related primate "really enhances the plausibility" of previous research that links flu to fetal brain development in humans.

Drug could turn soldiers into super-survivors

*** 27 January 2010 by Linda Geddes**

A LUCKY few seem to be able to laugh in the face of death, surviving massive blood loss and injuries that would kill others. Now a drug has been found that might turn virtually any injured person into a "super-survivor", by preventing certain biological mechanisms from shutting down. The drug has so far only been tested in animals. If it has a similar effect in humans, it could vastly improve survival from horrific injuries, particularly in soldiers, by allowing them to live long enough to make it to a hospital.

Loss of blood is the main problem with many battlefield injuries, and a blood transfusion the best treatment, although replacing lost fluid with saline can help. But both are difficult to transport in sufficient quantities. "You can't carry a blood bank into the battlefield," says Hasan Alam of Massachusetts General Hospital in Boston. "What we're looking for is a pill or a shot that would keep a person alive for long enough to get to them to a hospital."

When the body loses a lot of blood, it tries to compensate by going into shock. This is a set of emergency measures to raise blood pressure and conserve energy, such as increasing heart rate and shutting down expression of some proteins. However, if the body stays in shock for more than a short time, it can lead to organ failure, and death soon follows.

Recent studies have suggested that around 6 or 7 per cent of genes change their expression in response to shock, via the removal of "epigenetic", chemical additions to the genome called acetylations. As histone deacetylase (HDAC) inhibitors can prevent the removal of such acetylations, Alam wondered if these drugs might improve survival after blood loss.

His team previously showed that valproic acid, an HDAC inhibitor already used to treat epilepsy, increased survival rates in rats that had lost a lot of blood. It seemed to be doing this by preventing acetylation, causing certain "survival pathways" to remain switched on.

Now Alam has repeated the study in pigs. He anaesthetised the animals, drained 60 per cent of their blood, and subjected them to other injuries before giving them a saline transfusion. He then injected some of the pigs with valproic acid, gave others a blood transfusion and left the remainder untreated.

Just 25 per cent of the pigs receiving only saline survived for 4 hours - the typical time it takes to get hospital treatment - while 86 per cent of those injected with valproic acid survived. All those that had a blood transfusion lived (Surgery, DOI: 10.1016/j.surg.2009.04.007).

Alam is currently repeating the trial to make sure valproic acid does not hinder survival in the longer term. If so, he will apply for permission to do human trials by the end of the year.

"It's exciting," says John Holcomb of the Center for Translational Injury Research at the University of Texas in Houston. "They're looking at resuscitation in a different way."

Earlier studies by Alam's team showed that rats that naturally survive traumatic blood loss also experience fewer changes in gene expression than those that die or suffer complications. He thinks the same might be true in humans. "Every person has this capacity to survive a huge insult, but most of the time it's dormant," he says. "That's why the same insult kills some people while others laugh and move on. What we're trying to do is make you super-resistant using the pathways and proteins that already exist."

However, Graham Packham of Southampton General Hospital, UK, who is investigating the use of HDAC inhibitors to treat cancer, says it isn't yet clear how valproic acid, which reacts with a wide range of molecules, is actually prolonging survival. "It's not clear whether this is driven by valproic acid's epigenetic activity," he says.

Fossil hints at fuzzy dinosaurs

By Victoria Gill Science reporter, BBC News

A discovery in China has prompted researchers to question the scaly image of dinosaurs.

Previously, experts thought the first feathered dinosaurs appeared about 150 million years ago, but the find suggests feathers evolved much earlier.

This has raised the question of whether many more of the creatures may have been covered with similar bristles, or "dino-fuzz". The team describe the fossil in the journal Nature.

Hai-Lu You, a researcher from the Institute of Geology in Beijing, was part of the team that discovered the fossil. He told BBC News he was "very excited" when he realised the significance of what his team had found.

He described the filaments seen on the body of the new dinosaur, which the team has named Tianyulong confuciusi , as "protofeathers" - the precursors of modern feathers.

"Their function was probably display, as well as to keep the body warm" he said.

Dr You's team noticed that the filaments on the base of their dinosaur's tail were extremely long.

These, they suggest, might have evolved for show, and may even have been coloured.

"The world of dinosaurs would [have been] more colourful and active than we previously imagined," he said.

Muddying the water

Dinosaurs can be categorised into two large families - the Saurischia and the Ornithischia. The Saurischia family includes the theropods - thought to be the ancestors of modern birds. Fossils of these dinosaurs have revealed that some of them were feathered. But the newly-discovered dinosaur is a member of the Ornithischia group - all previously thought to have reptilian scales.

Dinosaurs may have been more fuzzy than previously thought

Professor Lawrence Witmer, a paleontologist from Ohio University, says this "really muddies the waters" of what researchers know about the origin of feathers. It suggests that their origin might go right back to the earliest ancestors of all dinosaurs - more than 200 million years ago. "The bad news is that something we thought was neatly wrapped up is now not so neat," said Professor Witmer. "We now need to rethink what the coat of the ancestral dinosaurs actually was."

He added: "But the good news is that we can now look at existing evidence with new eyes - going back to old fossils and asking if there is evidence of any of these filaments."

The team, who named the dinosaur after the Tianyu Museum of Nature, where the fossil is housed, also dedicated part of its name to the philosopher Confucius to reflect how it has changed the modern view of dinosaurs.

"Maybe all dinosaurs, even the predominantly scaled ones, had fuzzy parts," added Professor Witmer.

The filaments or 'protofeathers' are clearly visible on the fossil

"And if they were covered in a fuzzy coat, what does that tell us about their physiology? Perhaps they were warm-blooded. "We now need to think completely differently about the evidence we already have."

Dinosaur had ginger feathers

By Victoria Gill Science reporter, BBC News

Meet Sinosauropteryx , a very spiky little dinosaur.

A team of scientists from China and the UK has now revealed that the bristles of this 125-million-year-old dinosaur were in fact ginger-coloured feathers. The researchers say that the diminutive carnivore had a "Mohican" of feathers running along its head and back. It also had a striped tail. The team revealed details of the dinosaur's coloured feathers in an article published on Nature's website.

The team began by studying the fossilised remains of a bird, Confuciusornis , which also lived during the early cretaceous period. Confuciusornis' feathers were preserved in extraordinarily complete fossils that were recently discovered in northern China.

Feathers could have evolved for insulation or display

Using a powerful electron microscope to look inside the feathers, researchers were able to see microscopic structures called melanosomes, which, in life, contain the pigment melanin. “Melanin is what gives colour to human hair and animal fur," said Professor Mike Benton from the University of Bristol, UK, who led this study. "They are also the most common way that colours are [produced] in feathers."

Professor Benton explained that differently shaped melanosomes produced different colours, with blacks or greys produced by "sausage-shaped" melanosomes, and reddish or "russet" shades found in spherical ones.

"A ginger-haired person would have more spherical melanosomes, and a black-haired or grey-haired person would have more of the sausage-shaped structures," said Professor Benton.

The scientists found both types of melanosome in Confuciusornis and decided to turn their attention to Sinosauropteryx, which is the most primitive feathered dinosaur yet found.

It was about the size of a turkey and would have fed on lizards and other small prey.

"There's a very clear rim of feathers running down the top of its head like a Mohican, all the way along its back," Professor Benton described.

Bands of dark and light along the tail can be seen in the fossils. This close examination has shown that the dinosaur's "Mohican" was russet or ginger-coloured, and that these bands were in fact ginger and white stripes. "This is the first time anyone has ever had evidence of original colour of feathers in dinosaurs," said Professor Benton. He said the study has also confirmed that the bristles on this "rather primitive flesh-eating dinosaur... really were feathers". This gives more weight to a very well-supported theory that modern birds evolved from theropods, the group of small carnivorous dinosaurs to which Sinosauropteryx belonged.

"Critics have said that these visible spiny structures could be shredded connective tissue," Professor Benton explained. "But the discovery of melanosomes within the bristles finally proves that some early dinosaurs were indeed feathered."

The findings also help to resolve a long-standing debate about the evolution and original function of feathers.

"We now know that feathers did not originate as flight structures," said Professor Benton. This suggests that they evolved, initially, for insulation and perhaps for display.

Dr Richard Butler, a palaeontologist at the Bavarian State Collection for Palaeontology, in Munich, Germany, said this was a "fascinating and exciting discovery with important implications for understanding dinosaur evolution and biology".

Dr Butler, who was not involved in this research, told BBC News: "When people ask how we know what colour dinosaurs were, the answer has always been that we make an educated guess. “This discovery suggests that with more work we may be able to accurately reconstruct colour patterns in some dinosaur species, and begin to understand how those colour patterns may have functioned for camouflage or display."

Pomegranate extract stimulates uterine contractions

The team identified beta-sitosterol – a steroid that can inhibit the absorption of cholesterol in the intestine – as the main constituent of pomegranate seed extract. The research suggests that pomegranate extract could be used as a natural stimulant to encourage the uterus to contract during labour.

Pomegranate juice is thought to have a number of health benefits, from lowering cholesterol and blood pressure to protecting against some cancers, but until now there has been no evidence to demonstrate its effects on the uterus. Researchers investigated pomegranate seed extract – more highly concentrated than pomegranate juice – and its effect on uterine smooth muscle samples.

Professor Sue Wray, from the University's Department of Physiology, said: "Previous study has suggested that the pomegranate's antioxidant and anti-inflammatory properties have a positive impact on health. We wanted to understand its effect on uterine contractions to help us explore new ways of treating women who may experience difficult labours. Currently the only available drug to treat women with a poorly contracting uterus is oxytocin, a hormone which only works approximately 50% of the time.

"It is important for us to investigate how the uterus works and what happens when it does not contract normally so that women experiencing problems during labour do not have to undergo major surgery to deliver a healthy baby."

Dr Sajeera Kupittayanant, from Suranaree's Institute of Science, explains: "We found that beta-sitosterol was the main constituent of pomegranate extract, a steroid present in many plant species, but particularly rich in pomegranate seed. We added the extract to uterus tissue samples from animals and found that the muscle cells increased their activity. Our work suggests that the increase is due to a rise in calcium, which is necessary in order for any muscle to contract, but is usually affected by hormones, nerve impulses and some drug treatments.

"The next step is to investigate how beta-sitosterol in pomegranate extract could increase calcium, but it could prove to be a significant step forward in identifying new ways of treating dysfunctional labour."

The research, published in Reproductive Sciences, will support work being conducted at a new centre dedicated to improving experiences in pregnancy and childbirth for women across the world. The Centre for Better Births will bring together researchers and clinicians to improve understanding in areas such as premature labour, recurrent miscarriage and prolonged labour.

Notes to editors: *1. Advice to patients: Researchers used pomegranate seed extract, which is more highly concentrated than pomegranate juice. More research is needed to understand if eating the fruit or drinking its juice has any impact on uterine contractions.*

Ginkgo herbal medicines may increase seizures in people with epilepsy

Restrictions should be placed on the use of Ginkgo biloba (G. biloba) - a top-selling herbal remedy - because of growing scientific evidence that Ginkgo may increase the risk of seizures in people with epilepsy and could reduce the effectiveness of anti-seizure drugs, a new report concludes. The article appears in ACS' monthly

Journal of Natural Products. It also suggests that Ginkgo may have harmful effects in other people after eating raw or roasted Ginkgo seed or drinking tea prepared from Ginkgo leaves.

Eckhard Leistner and Christel Drewke note that consumers use pills, teas, and other products prepared from leaves of the Ginkgo tree to treat a wide array of health problems. Those include Alzheimer's disease and other memory loss, clinical depression, headache, irritable bladder, alcohol abuse, blockages in blood vessels, poor concentration, and dizziness. Scientific concern focuses mainly on one chemical compound in the herb. It is a potentially toxic material known as ginkgotoxin.

They reviewed scientific research on Ginkgo, and found 10 reports indicating that patients with epilepsy who take Ginkgo products face an increased risk of seizures. They note that laboratory studies explain how Ginkgo could have that unwanted effect. Ginkgotoxin seems to alter a chemical signaling pathway in ways that may trigger epileptic seizures. Further evidence showed that Ginkgo can interact with anti-seizure medications and reduce their effectiveness. "Contrary to our own previous assumption, we are now convinced, however, that G. biloba medications and other products can have a detrimental effect on a person's health condition," the report concludes. "It is therefore important that the large number of G. biloba product users and their health care providers be made aware of these risks, in order to enable them to make informed decisions about the use of these preparations."

Article For Immediate Release *"Ginkgo biloba and Ginkgotoxin"*
Download Full Text Article *http://pubs.acs.org/stoken/presspac/presspac/full/10.1021/np9005019*

Fat Tissue May Be a Source of Valuable Blood Stem Cells, Study Says

WASHINGTON – Bone marrow is a leading source of adult stem cells, which are increasingly used for research and therapeutic interventions, but extracting the cells is an arduous and often painful process. Now, researchers have found evidence that fat tissue, known as adipose tissue, may be a promising new source of valuable and easy-to-obtain regenerative cells called hematopoietic stem and progenitor cells (HSPCs), according to a study prepublished online in Blood, the official journal of the American Society of Hematology.

"It's not outside the realm of possibility that a donor graft of adipose tissue-derived HSPCs might be able to partially replace the need for bone marrow transplantation within 10 years," said lead study author Gou Young Koh, MD, PhD, of the Department of Biological Sciences, Korea Advanced Institute of Science and Technology (KAIST) in Daedeok Science Town, Daejeon, South Korea.

HSPCs are powerful cells that have the ability to regenerate and develop into many different kinds of cells. With advances in technologies and understanding of cell functions, HSPCs are now used to repair damaged tissue and are being studied for their potential to treat a vast array of chronic and degenerative conditions. HSPCs are found in high quantities in the bone marrow, but a certain portion known as extramedullary tissue, found outside of bone marrow, circulate between the marrow and the peripheral blood.

Previous research has found that adipose tissue contains many different types of adult stem cells. In this study, researchers hypothesized that the adipose tissue might be a valuable alternative source of HSPCs as an extramedullary tissue but questioned whether the tissue could provide a sufficient quantity of cells to be used for research and therapeutic purposes.

"We know that adipose tissue and bone marrow tissues share similar properties, so we suspected that valuable stem cells might be found in the adipose regions, offering a unique resource for stem cells that might be easier and less costly to extract," said Dr. Koh.

Within the adipose tissue is a special cell population known as the stromal vascular fraction (SVF), which consists of other undefined stem cells as well as immune, endothelial (blood vessel lining), progenitor (undifferentiated or premature precursor cells), and stromal (connective tissue) cells. Cells in the SVF share similar properties to those in the bone marrow. Both contain a population of cells that have the ability to differentiate into several cell types. In addition, both adipose tissue and bone marrow offer similar environments for optimal stem cell growth and reproduction, including a smaller amount of circulating oxygen and specialized vascular systems as compared with other organs.

The research team characterized the HSPCs in the SVF of mouse adipose tissue with both in vitro and in vivo analyses. They studied the origin of the HSPCs to better predict their behavior and determine whether the quantity of cells could be increased by promoting more frequent HSPC movement between the bone marrow and peripheral blood using granulocyte colony-stimulating factor, or G-CSF, a growth hormone used to encourage development of stem cells. The team found that the more they could mobilize the HSPCs between the bone marrow and the peripheral blood, the more HSPCs they would find in the SVF.

The study results provide compelling evidence that the SVF derived from adipose tissue contains functional HSPCs capable of generating hematopoietic (blood-forming) cells. Importantly, researchers found that the cells were able to differentiate into a variety of hematopoietic cells when tracked for at least 16 weeks post-

transplantation, which reflects long-term and permanent reconstitution of donor hematopoietic cells in recipients.

The frequency of HSPCs in the adipose tissue found in the study was significantly less than that found in bone marrow (approximately 0.2 percent of the HSPCs found in total bone marrow). Therefore, researchers wanted to determine whether the SVF might be used practically as an alternative source of HSPCs. Fortunately, according to the researchers, a vast amount of the SVF in adipose tissue can be easily obtained from patients using conventional liposuction and isolation methods that are safe and relatively pain-free.

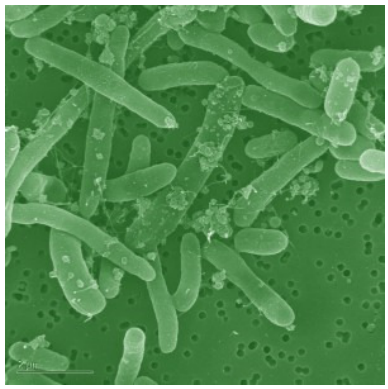
"These study results suggest that more HSPCs might be obtained from the stromal vascular fraction through increased mobilization of these cells from the bone marrow using G-CSF," said Dr. Koh. "So once a technology can be defined to purify HSPCs from the stromal vascular fraction, we believe adipose tissue may be a good alternative and novel resource for obtaining functional and transplantable HSPCs."

The research team is actively extending their research in this area, including plans for a human clinical study. They also emphasize the need for a clinically safer and more efficient method for isolating the HSPCs from the adipose tissue.

Reporters who wish to receive a copy of the study or arrange an interview with Dr. Koh may contact Patrick Irelan at 202-776-0544 or pirelan@hematology.org.

Microbes Produce Fuels Directly from Biomass

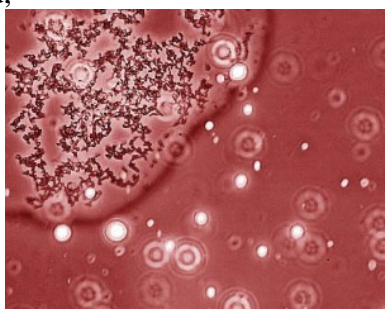
A collaboration led by researchers with the U.S. Department of Energy's Joint BioEnergy Institute (JBEI) has developed a microbe that can produce an advanced biofuel directly from biomass. Deploying the tools of synthetic biology, the JBEI researchers engineered a strain of Escherichia coli (E. coli) bacteria to produce biodiesel fuel and other important chemicals derived from fatty acids.



"The fact that our microbes can produce a diesel fuel directly from biomass with no additional chemical modifications is exciting and important," says Jay Keasling, the Chief Executive Officer for JBEI, and a leading scientific authority on synthetic biology. "Given that the costs of recovering biodiesel are nowhere near the costs required to distill ethanol, we believe our results can significantly contribute to the ultimate goal of producing scalable and cost effective advanced biofuels and renewable chemicals."

Electron micrograph shows rod-shaped E. coli secreting oil droplets containing biodiesel fuel, along with fatty acids and alcohol. (Image by Jonathan Remis, JBEI)

Keasling led the collaboration, which was was made up of a team from JBEI's Fuels Synthesis Division that included Eric Steen, Yisheng Kang and Gregory Bokinsky, and a team from LS9, a privately-held industrial biotechnology firm based in South San Francisco. The LS9 team was headed by Stephen del Cardayre and included Zhihao Hu, Andreas Schirmer and Amy McClure. The collaboration has published the results of their research in the January 28, 2010 edition of the journal Nature. The paper is titled, "Microbial Production of Fatty Acid-Derived Fuels and Chemicals from Plant Biomass."



A combination of ever-increasing energy costs and global warming concerns has created an international imperative for new transportation fuels that are renewable and can be produced in a sustainable fashion. Scientific studies have consistently shown that liquid fuels derived from plant biomass are one of the best alternatives if a cost-effective means of commercial production can be found. Major research efforts to this end are focused on fatty acids – the energy-rich molecules in living cells that have been dubbed nature's petroleum.

Once E. coli have secreted oil, they sequester themselves from the droplets as shown by this optical image, thereby facilitating oil recovery. (Image by Eric Steen, JBEI)

Fuels and chemicals have been produced from the fatty acids in plant and animal oils for more than a century. These oils now serve as the raw materials not only for biodiesel fuel, but also for a wide range of important chemical products including surfactants, solvents and lubricants.

"The increased demand and limited supply of these oils has resulted in competition with food, higher prices, questionable land-use practices and environmental concerns associated with their production," Keasling says. "A more scalable, controllable, and economic alternative route to these fuels and chemicals would be through the microbial conversion of renewable feedstocks, such as biomass-derived carbohydrates."

E. coli is a well-studied microorganism whose natural ability to synthesize fatty acids and exceptional amenability to genetic manipulation make it an ideal target for biofuels research. The combination of E. coli

with new biochemical reactions realized through synthetic biology, enabled Keasling, Steen and their colleagues to produce structurally tailored fatty esters (biodiesel), alcohols and waxes directly from simple sugars.

"Biosynthesis of microbial fatty acids produces fatty acids bound to a carrier protein, the accumulation of which inhibits the making of additional fatty acids," Steen says. "Normally E. coli doesn't waste energy making excess fat, but by cleaving fatty acids from their carrier proteins, we're able to unlock the natural regulation and make an abundance of fatty acids that can be converted into a number of valuable products. Further, we engineered our E. coli to no longer eat fatty acids or use them for energy."

After successfully diverting fatty acid metabolism toward the production of fuels and other chemicals from glucose, the JBEI researchers engineered their new strain of E. coli to produce hemicellulases – enzymes that are able to ferment hemicellulose, the complex sugars that are a major constituent of cellulosic biomass and a prime repository for the energy locked within plant cell walls.

"Engineering E. coli to produce hemicellulases enables the microbes to produce fuels directly from the biomass of plants that are not used as food for humans or feed for animals," Steen says. "Currently, biochemical processing of cellulosic biomass requires costly enzymes for sugar liberation. By giving the E. coli the capacity to ferment both cellulose and hemicellulose without the addition of expensive enzymes, we can improve the economics of cellulosic biofuels."

The JBEI team is now working on maximizing the efficiency and the speed by which their engineered strain of E. coli can directly convert biomass into biodiesel. They are also looking into ways of maximizing the total amount of biodiesel that can be produced from a single fermentation.

"Productivity, titer and efficient conversion of feedstock into fuelare the three most important factors for engineering microbes that can produce biofuels on an industrial scale," Steen says. "There is still much more research to do before this process becomes commercially feasible."

This research was supported by funds from LS9, Inc., and the UC Discovery Grant program. LS9 is using synthetic biology techniques to develop patent-pending UltraClean™ fuels and sustainable chemicals. The UC Discovery Grant program is a three-way partnership between the University of California, private industry and the state of California that is aimed at strengthening and expanding California's economy through targeted fields of research.

JBEI is one of three Bioenergy Research Centers funded by the U.S. Department of Energy to advance the development of the next generation of biofuels. Headquartered in Emeryville, California, JBEI is a scientific partnership led by Lawrence Berkeley National Laboratory (Berkeley Lab) and including the Sandia National Laboratories, the University of California (UC) campuses of Berkeley and Davis, the Carnegie Institution for Science (located on the campus of Stanford University), and the Lawrence Livermore National Laboratory.

Additional Information *For more information about JBEI, visit the Website at www.jbei.org*
For more information about the research group of Jay Keasling, visit the Website at http://keaslinglab.lbl.gov/wiki/index.php/Main_Page
For more information about LS9, Inc., visit the Website at http://www.ls9.com/
For more information about the UC Discovery Grant program, visit the Website at http://ucdiscoverygrant.org

Hey presto! Brain cells from mouse tails

*** 28 January 2010 by Ewen Callaway**

In a feat of cellular alchemy, connective tissue from a mouse's tail has been transformed directly into working brain cells.

Ordinarily, so drastic a makeover would require the creation of so-called induced pluripotent stem (iPS) cells and then turning these into neurons, an inefficient process that can take weeks.

Marius Wernig and colleagues at Stanford University in California discovered that inserting a cocktail of three genes into fibroblasts turns them directly into neurons in just days. "The real surprise was that this conversion is extremely efficient," he says.

By many indications, these neurons are the real deal. Under a microscope, they look like a kind of mouse brain cell found in the cortex and they can form synapses to send and receive signals from others. Wernig expects that the cells will integrate into a mouse's brain - an experiment that's in the works. If they do, cells produced using a similar process might one day be used to treat conditions such as Parkinson's disease in humans.

No teratoma

Because such cells are derived from adult cells, not pluripotent cells – which have the potential to form a kind of tumour called a teratoma – they might be safer than iPS cells.

But first, Wernig must work out how to produce different kinds of neurons and show that the method is safe. "These are very early days," he says.

In the meantime, researchers could use the cells to study neurological and psychiatric disorders in Petri dishes. The new technique also offers the hope that other kinds of cells can live a second life. "If we just know the right factors, we can turn any cell into any other cell we want," says Wernig.

Future for iPS

However, the new approach won't make iPS cells obsolete, says Sheng Ding, a cell biologist at the Scripps Research Institute in La Jolla, California, who was not involved in the study. That's because the new technique yields cells that have a lower, but not negligible, risk of forming tumours once implanted. But as with iPS cells destined for transplant, researchers will have to work out how to create neurons without using a virus to deliver the genes that reprogram the cells, as these viruses could also cause cancer.

"Eventually you have to replace those genes with small molecules, with proteins, with whatever," says Ding, who is working on cellular reprogramming methods that use small molecules, rather than viruses.

Ding also questions whether the increased efficiency of direct reprogramming offers any tangible advantage. The induced neurons cannot divide, so you get what you put in, whereas iPS cells can multiply themselves indefinitely, he points out. *Journal reference: Nature, DOI: 10.1038/nature08797*

'Overweight' adults age 70 or older are less likely to die over a 10-year period

Than those of 'normal' weight: new study calls into question current BMI guidelines for older adults

Adults aged over 70 years who are classified as overweight are less likely to die over a ten year period than adults who are in the 'normal' weight range, according to a new study published today in the Journal of The American Geriatrics Society.

Researchers looked at data taken over a decade among more than 9,200 Australian men and women aged between 70 and 75 at the beginning of the study, who were assessed for their health and lifestyle as part of a study into healthy aging. The paper sheds light on the situation in Australia, which is ranked the third most obese country, behind the United States and the United Kingdom.

Obesity and overweight are most commonly defined according to body mass index (BMI), which is calculated by dividing bodyweight (in kg) by the square of height (in metres). The World Health Organisation (WHO) defines four principal categories: underweight, normal weight, overweight, and obese. The thresholds for these categories were primarily based on evidence from studies of morbidity and mortality risk in younger and middle-aged adults, but it remains unclear whether the overweight and obese cut-points are overly restrictive measures for predicting mortality in older people.

The study began in 1996 and recruited 4,677 men and 4,563 women. The participants were followed for ten years or until their death, whichever was sooner, and factors such as lifestyle, demographics, and health were measured. The research uncovered that mortality risk was lowest for participants with a BMI classified as overweight, with the risk of death reduced by 13% compared with normal weight participants. The benefits were only seen in the overweight category not in those people who are obese.

"Concerns have been raised about encouraging apparently overweight older people to lose weight and as such the objective of our study was to examine the major unresolved question of, 'what level of BMI is associated with the lowest mortality risk in older people?'" said lead researcher Prof. Leon Flicker, of the University of Western Australia. "These results add evidence to the claims that the WHO BMI thresholds for overweight and obese are overly restrictive for older people. It may be timely to review the BMI classification for older adults."

In those participants who died before the conclusion of the study, the researchers concluded that the type of disease which caused their death, for example heart disease or cancer, did not affect the level of protection being overweight had. To remove any risk of bias in participants with illnesses which caused them to lose weight, and also increased their risk of dying, the researchers contrasted subjects who were relatively healthy compared with those who had major chronic diseases or smoked and found no apparent differences in the BMI: mortality relationship.

While the same benefit in being overweight was true for men and women, being sedentary doubled the risk of death for women, whereas it only increased the risk by a quarter in men.

"Our study suggests that those people who survive to age 70 in reasonable health have a different set of risks and benefits associated with the amount of body fat to younger people, and these should be reflected in BMI guidelines," concluded Flicker.

India announces first manned space mission

By Habib Beary in Bangalore

India's space agency has said it will launch its first manned mission to space in 2016.

A senior official of the Indian Space Research Organisation (Isro) in Bangalore said that two astronauts would take part. "We are preparing for the manned space flight," Isro Chairman K Radhakrishnan told reporters.

"We will design and develop the space module for the manned mission in the next four years," he said. Observers say India is emerging as a major player in the multi-billion dollar space market. In September it launched seven satellites in a single mission, nearly a month after the country's inaugural Moon mission was aborted.

Key architect

Isro says that it will soon shortlist two astronauts to train for the space flight. The manned mission will cost 124 billion rupees ($2,676,740,597). Delhi has given its approval for the mission, space officials told the BBC.

India's space agency is also setting up a full-fledged training facility in Bangalore to train the astronauts.

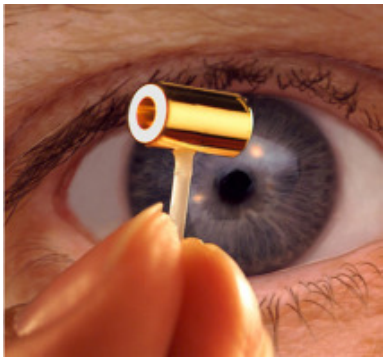
The country's first unmanned Moon mission, Chandrayaan, was launched last year. The second unmanned project, Chandrayaan-II, will be launched in the first quarter of 2013 - a prelude to the manned space mission.

India's first Moon mission had to be terminated because of a failure of critical communication components, but Isro officials termed the mission a success because 95% of the scientific objectives were completed.

India also plans a mission to Mars in 2030.

Giant laser reaches key milestone for fusion

*** 20:59 28 January 2010 by Jeff Hecht, Livermore**



The world's largest laser is approaching the long-sought goal of igniting a fusion reaction that produces more energy than the laser delivers.

Lasers are intended to do this by super-heating a fusion fuel pellet until it implodes, heating and compressing its central core to the temperatures and pressures needed for nuclear fusion.

Past experiments have been plagued by irregular implosions that wasted most of the input energy. But now, researchers led by Brian MacGowan of the Lawrence Livermore National Laboratory in California have managed to squeeze targets of material into spheres rather than pancakes or more lopsided shapes, paving the way for future attempts at fusion.

Fusion experiments at the National Ignition Facilty use a two-stage process called inertial confinement. First, clusters of laser beams are fired into opposite ends of a metal cylinder called a hohlraum (pictured), which contains a fusion fuel pellet. In about 15 nanoseconds, the hohlraum reaches about 3.3 million °C, yielding an intense burst of X rays. This burst implodes the target, compressing its core to the density needed for fusion **(Illustration: Lawrence Livermore National Security, LLC/Lawrence Livermore National Laboratory/Department of Energy)**

The work was performed at Livermore's 192-laser beam National Ignition Facility (NIF), which began operating in 2009.

The team used targets that did not contain the key ingredients for fusion – two isotopes of hydrogen known as deuterium and tritium. But the symmetrical implosion of the targets suggests that NIF should be able to ignite fusion with laser pulses of 1.2 to 1.3 megajoules – well below its full 1.8-megajoule capacity.

"From everything we can see, we're on the right path here," Jeff Wisoff, a top NIF manager told New Scientist.

Researchers spent last year slowly cranking up the output of the laser, ultimately reaching a total energy of more than 1 megajoules. Now they're pausing to mount new instruments on the 10-centimetre-thick aluminium target chamber and to install giant concrete doors to contain neutrons they expect to produce in future fusion experiments.

In a few months, they will begin testing a series of new targets designed to assess beam interactions and compression. If all goes well, they could try for fusion ignition by the end of the year.

Right-handed and left-handed people do not see the same bright side of things

Despite the almost universal association of the right with life, right, positive and good things, and the left with death, inadequacy, negative and bad things, recent researches show that left-handed people hold the opposite association. Thus, left-handers become a critical case in which conceptual associations, result of a sensory-motor experience, and those that rely on linguistic and cultural uses, are contradictory. A sensory-motor experience in itself is capable of creating abstract conceptual associations.

These are the conclusions derived from various studies compiled by professor Julio Santiago de Torres, from the Department of Experimental Psychology and Behavioural Physiology at the University of Granada, who has conducted a bibliographic review on the subject, published in Ciencia Cognitiva: Revista Electrónica de Divulgación.

One of the latest works on this subject was undertaken by researcher Daniel Casasanto (Stanford University), who found out that left-handers tend to associate the left with nice and good things and the right with ugly and

bad things, which goes against the enormous power of cultural context in which they live and the language they use.

Good things and bad things

In one of his experiments, Casasanto presented participants a diagram that depicts a character who was planning a trip to the zoo, and who loves zebras and thinks they are good, but dislikes pandas and thinks they are bad. The participant had to draw a zebra in the box that best represented good things and a panda in the box that best represented bad things.

Most of right-handed people located good things in the box on the right while left-handers placed them in the box on the left. Interestingly, only 14% of participants thought that his election had to do with what his dominant hand was.

Then, to see whether the left or right location could affect rating dimensions on abstract personality, he asked another group of participants to rate pairs of objects depicted in another drawing, indicating which of the two seemed more intelligent, more honest, more attractive and happier. And in a final experiment, participants were asked to assess which candidate would they chose for a job, or what product would they buy in a store.

In all tasks, right-handers tended to evaluate the object on the right better, while left-handers favoured the one on the left. Therefore, UGR professor says, "these results demonstrate that perceptuomotor experiences, in this case the greater ease and fluidity of interaction with one or another side of space, are sufficient to generate stable associations between specific dimensions, such as space, and concepts of a high degree of abstraction, such as kindness, intelligence or honesty."

These data provide one of the first clear demonstrations that sensory-motor experience can exert a powerful influence on the conceptualization of even our most abstract ideas.

A wrong world

As professor Santiago explains, "a left-handed person has often the feeling of having been born in a wrong world. From scissors to computer keyboards designs, everything is projected for right-handers. The fact that left-handed people are able to adapt quite well to these manual controls that are contrary to their nature, indicates a first interesting fact that it is often overlooked: undoubtedly, there is a difference in motor ability between the dominant and the non-dominant hand, but it is far from being a great difference."

In fact, the researcher points out, "speed and accuracy differences between the right and the left hand that are usually found, do not go beyond 10%. In addition, the left hand can be trained to high levels of implementation, as in the case of musicians or typists. In contrast with the intensive use of the right hand that characterizes an average right-handed person in over 90% of the tasks.

Julio Santiago recalls in his article that association between right and left with the symbolic systems of the world cultures "is deep, and reaches almost every aspect of life. Thus, right and left are respectively associated with aristocratic and common people, male and female, sacred and profane, good and bad. Eventually, these partnerships control aspects of life as varied as the position in which dead are buried, distribution of space in homes and churches, positions in which men and women sit at the table or in the temple and the hand chosen for saluting, swearing, eating or bathing."

Moreover, Santiago points out, "even vocabulary is also full of similar facts such as, for example, the word "siniestro", which derives from sinister, "izquierda" in Latin.

Reference: *Julio Santiago Torres, Department of Experimental Psychology and Behavioural Physiology, University of Granada. Tel: (+34) 958 246 278. E-mail: santiago@ugr.es*

Study Says Lead May Be the Culprit in ADHD

ADHD, or attention-deficit/hyperactivity disorder, is among the costliest of behavioral disorders. Its combination of inattention, impulsivity and hyperactivity leads to accidental injuries, school failure, substance abuse, antisocial behavior and more. Yet despite nearly a century of study, the disorder’s roots remain mysterious.

Much of modern ADHD research has focused on heritability of the condition, and indeed evidence suggests that genes may account for as much as 70 percent of hyperactivity and inattention in children. But that leaves 30 percent unexplained, so recently the focus has shifted to the environment. What is it that triggers an underlying susceptibility and changes it into a full-blown disorder? New research suggests that the culprit may be an old villain—lead—and what’s more it explains the causal pathway from exposure to disability.

Lead is a neurotoxin. This has been known for a long time, and in fact government regulation drastically reduced environmental lead a generation ago. But regulating automobile fuel and paint didn’t entirely eliminate lead from the environment. It’s found in trace amounts in everything from children’s costume jewelry to imported candies to soil and drinking water. Every American today is exposed to low levels of the metal, and indeed nearly all children have measureable levels of lead in their bodies. According to psychological scientist

Joel Nigg of the Oregon Health & Science University, this universal low-level exposure makes lead an ideal candidate for the disorder's trigger.

This was just a theory until quite recently, but two recent studies now provide strong evidence. The first study compared children formally diagnosed with ADHD to controls, and found that the children with the disorder had slightly higher levels of lead in their blood. This study showed a link only between blood lead and hyperactivity/impulsivity symptoms, not inattention. But a second study showed a robust link between blood lead and both parent and teacher ratings of ADHD symptoms, including both hyperactivity and attention problems. In both studies, the connection was independent of IQ, family income, race, or maternal smoking during pregnancy.

Nigg offers a causal model for the disabling symptoms associated with ADHD: Lead attaches to sites in the brain's striatum and frontal cortex, where it acts on the genes in these regions—causing them to turn on or remain inactive. Gene activity shapes the development and activity of these brain regions. By disrupting brain activity, the toxin in turn alters psychological processes supported by these neurons, notably cognitive control. Finally, diminished cognitive control contributes to hyperactivity and lack of vigilance. Nigg describes his new data and his explanatory model in the February issue of the journal Current Directions in Psychological Science.

Genetically modified seeds 'are everywhere'

*** 29 January 2010 by Andy Coghlan**

GENETICALLY modified crops are everywhere, it seems - even in Europe. Strict laws designed to keep the European Union free of unauthorised GM crops and products are not working, and are posing problems for the EU's €150 billion livestock industry, according to farmers' representatives. They say that supplies of animal feed for poultry and pigs are being refused entry at European ports when found to contain even trace amounts of unauthorised GM material.

Under Europe's "zero-tolerance" laws on GM contamination, introduced in 2007, the presence of even a few seeds of unauthorised GM material will rule out an entire shipment. The animal feed industry says that the laws are unworkable because GM material is almost ubiquitous, given today's global supply chain.

"Though we understand the consumer concern in Europe, we don't understand zero tolerance because it closes down trade," says Pekka Pesonen, secretary general of Copa-Cogeca, a coalition of groups representing 15 million EU farmers in total. He claims that European pig and poultry farmers will go out of business unless the EU adopts a more pragmatic screening approach by setting a threshold - say 0.5 per cent - beneath which GM contamination is tolerated.

Pesonen says such "tolerances" operate for other contaminants, including pesticides and heavy metals. So why not for GM material, much of which has been cleared for human consumption elsewhere in the world?

Last year 200,000 tonnes of conventional animal feed - mainly soy and maize - were refused entry to the EU when they were found to contain small amounts of GM maize varieties. Then flax from Canada was found to contain traces of a GM variety named CDC Triffid that was withdrawn from commercial sale in 2001. Following a ban on flax more than 100 shipments were rejected, but trade is slowly resuming.

The rejected tonnage is only a fraction of the 32 million tonnes of feed imported each year. But it leads to delays to subsequent consignments, higher prices and a reluctance by importers to risk further shipments.

Prices will be higher still this year, says Pesonen owing to droughts in South America and a growing market for American farmers selling crops to China, which accepts mixed shipments.

Increasing numbers of GM crop varieties are on the way. At present, around 30 varieties are grown around the world, but that is predicted to quadruple by 2015, making screening trickier than ever.

A further complication arises because all the European commissioners are due to be replaced in February. A spokeswoman for the health commission, which introduced the zero-tolerance policy to satisfy widespread misgivings in Europe about the safety of GM crops, says that "intensive consultations" on feed imports have already taken place. "Once the new commission is established, it will have to consider how to proceed on this matter," she says.

Multiple sclerosis risk changes with the season

Previous studies have shown multiple sclerosis (MS) patients are more often born in spring than in any other season, indicating that there is an environmental risk factor for the disease. A paper in the journal Neurology, reviewed for f1000 Medicine by Emmanuelle Waubant and Ellen Mowry, now suggests that this seasonal effect is mediated by the gene HLA-DRB1.

In many European populations, the HLA-DRB1*15 allele of this gene is associated with an increased risk of MS, and the large-scale study of MS patients from Canada, Sweden and Norway now shows that this allele is more common among patients born in the spring.

Waubant and Mowry said the study was "unique in its attempt to understand how genes and environment interact in MS". However, even though there is a correlation between birth month, genetics and risk of MS, it is not yet clear how this is regulated.

One likely contender is vitamin D, which influences expression of the HLA-DRB1*15 allele. Since vitamin D production fluctuates with the seasons, a vitamin D deficit in pregnant mothers could be related to the increased risk of MS among spring births, but this requires further investigation.

Waubant and Mowry said the study may influence preventative and therapeutic treatments through the understanding of environmental risks and their interaction with relevant genotypes.

Previous studies by the Neurology paper's authors showed that in people who carry the gene variant, a lack of vitamin D during early life might impair the ability of the thymus to delete rogue T cells, which then go on to attack the body, leading to a loss of myelin on the nerve fibres.

Study author Dr Sreeram Ramagopalan said that taking vitamin D supplements during pregnancy may reduce the risk of a child developing MS in later life. Government guidelines also recommend that children under five take daily vitamin D supplements.

Notes to Editors

1 Emmanuelle Waubant, MD PhD, is a Member of Faculty of 1000 Medicine, and Associate Professor of Neurology at the University of California San Francisco http://f1000medicine.com/about/biography/8473485501764352

2 Ellen Mowry, MD MCR, is Associate Member of Faculty of 1000 Medicine, and Clinical Instructor of Neurology at the University of California San Francisco http://neurology.ucsf.edu/brain/faculty/bios/mowry.aspx

3 The full text of this article is available free for 90 days at http://www.f1000medicine.com/article/xy02t4j40r2slgt/id/1387957

Did rice wine lead to flushed faces in Asia?

*** 14:54 29 January 2010 by Ewen Callaway**

A mutation that causes some Asians to flush red when they down a beer may have evolved to help their ancestors cope with rice wine. A genetic study suggests that the mutation evolved around 10,000 years ago, about the same time as Asians were starting to farm rice and figuring out how to ferment it into boozy drinks.

Bing Su, a geneticist at the Chinese Academy of Sciences in Kunming, and colleagues, studied the genes of 2275 people from 38 east-Asian populations, looking for a mutation that modifies the gene that codes for the enzyme alcohol dehydrogenase.

The mutation causes alcohol to be metabolised at 100 times the speed that it otherwise would be. As the enzyme removes alcohol so quickly from the blood stream, it protects people from the harmful effects of alcohol, and Su believes it confers an evolutionary advantage: a study in the Han Chinese suggests that those carrying the mutation have the lowest risk of alcoholism (American Journal of Human Genetics, vol 65 p 795).

The mutation also causes a by-product of the alcohol's metabolisation to accumulate in the body, which makes those who have the mutation flush red when they drink.

Follow the rice

The mutation is found most frequently in Asia and least frequently in Europe and Africa, but the reason for this has remained a mystery. Su's explanation is that the mutation spread across Asia and towards Europe in lockstep with rice cultivation.

Genetic analysis shows that the mutation cropped up between 10,000 and 7000 years ago. Su's team found that the mutation is virtually ubiquitous in the Zhejiang province in south-eastern China but becomes less common further north and west.

These dates and locations square up with archaeological evidence of early rice cultivation, which suggests rice was first domesticated in south-eastern China between 12,000 and 8000 years ago, and then spread west.

Nine-thousand-year-old Chinese pottery shards in south-central China bear traces of alcohol. Su believes the earliest rice cultivators began fermenting rice to help preserve it and break it down to release more nutrients.

Nefarious effects

The mutation in alcohol dehydrogenase would have protected those who had it from some of the nefarious effects of alcohol and alcoholism. As a result, Su says, natural selection for the mutation caused it to spread west in near-synchrony with rice paddies.

Others think the case is not as cut-and-dried as Su claims. "I think the interpretation is too simplistic," says Kenneth Kidd a geneticist at Yale University. But he agrees that cultural forces probably shaped the evolution of the alcohol dehydrogenase mutation among Asians.

It is not clear from the study whether the dehydrogenase mutation confers a significant enough advantage to spread through natural selection, or if it may simply have spread as the population of rice farmers themselves spread west. Journal reference: *BMC Evolutionary Biology (DOI: 10.1186/1471-2148-10-15)*

Gates Foundation to Double Spending on Vaccines

By DONALD G. McNEIL Jr.

Endorsing vaccines as the world's most cost-effective public health measure, Bill and Melinda Gates said Friday that their foundation would more than double its spending on them over the next decade, to at least $10 billion.

The change could save the lives of as many as eight million children by 2020, Mr. Gates calculated. He said he hoped his gift would inspire other charities and donor nations to do the same.

"Vaccines are a real success story," Mr. Gates said in an interview before the announcement, which he made at the World Economic Forum in Davos, Switzerland. "The cost is tiny, and yet it saves more lives than any other component of a health care system."

Julian Lob-Levyt, the executive secretary of the GAVI Alliance, a partnership among drug companies, health agencies and charities bringing vaccines to poor countries, said he "hugely welcomed" the announcement.

"If other donors follow the lead of the Gates Foundation and step up their funding for vaccines," Dr. Lob-Levyt said, "GAVI has the ability to immunize millions of children against the world's two biggest childhood killers, pneumonia and diarrhea."

Vaccines already get more financing from the Gates Foundation than any other cause, and Mr. Gates said no money would be shifted away from other projects, like improved crops, assistance to small businesses and, on the domestic front, schools and libraries. Instead, he and Warren Buffett will increase their annual gifts to the foundation, and about 30 percent of all spending, up from 20 percent, will be for vaccines.

In calculating that eight million lives could be saved, Mr. Gates cited a computer model developed for the foundation by public health specialists at Johns Hopkins University.

Whether such an optimistic prediction comes true depends on several factors that are still uncertain.

For starters, Mr. Gates wants to make sure that 90 percent of the world's children get shots for routine childhood diseases like measles, diphtheria, whooping cough and polio. Right now, almost 80 percent do. But with 134 million children born each year, it is a constant struggle to keep up, and efforts can be interrupted by factors like war, natural disasters, bad roads and corrupt officials.

Then he assumes that two new vaccines against rotavirus and pneumococcal disease, which are major killers of malnourished children, are adopted as routine immunizations in most poor countries and reach 80 percent of all children by 2020. Even in wealthy countries, the introduction of any new vaccine can be tricky because of bureaucratic and logistical delays and because unexpected rumors can spring up, like the persistent one that polio vaccine is a plot to sterilize Muslim girls.

Mr. Gates's model also assumes that a malaria vaccine now in development by GlaxoSmithKline will be approved and will by 2014 reach at least some of the one million children, mostly in Africa, who die annually of the disease.

Yet the vaccine, known as RTS,S, is still in the testing phase. And as Mr. Gates acknowledged, "you can always be surprised" during clinical trials.

On the pessimistic side, his model assumes that no vaccine against AIDS or tuberculosis will be licensed during the decade — something that virtually all public health specialists ruefully agree with because progress on those has been very slow.

Forget Gingko: Try Blueberries for Improved Memory

Blueberries contain an antioxidant that could prevent mental health decline as you age.

By Emily Sohn Fri Jan 29, 2010 02:30 PM ET

THE GIST:

**** Blueberries could help slow the mental decline that often comes with old age.***

**** Their secret? Antioxidant molecules called anthocyanins.***

**** Animal studies have supported the brain-boosting power of blueberries for a while, but this is the first study of its kind in people.***

There may be a simple way to ease the memory lapses and brain slips that typically accompany old age: Eat more blueberries. In a small study, older adults who drank a couple cups of blueberry juice a day improved their scores on a learning and memory task by 20 percent. Studies in animals have linked blueberries with brain function, but this is one of the first such studies in people.

The results, while still preliminary, suggest that blueberries might just live up to their reputation as "superfoods." Among other health benefits, adding the tasty little, blue marbles to your diet could help slow the march of memory decline and possibly even prevent memories from slipping in the first place.

"We're getting the first signal in humans that this might work," said Robert Krikorian, a neuropsychologist at the University of Cincinnati in Ohio. "There's so much research now suggesting that fruits and vegetables are beneficial. I don't have any qualms about recommending that people eat blueberries."

The case for blueberries has been building for more than a decade. In animal studies, older individuals that consume blueberry extract improve their performance on memory tasks, sometimes to the point of being just as sharp as their younger counterparts.

To explain how blueberries might bring about such impressive brain-boosting effects, other studies have zeroed in on a type of antioxidant called anthocyanins. These molecules belong to a larger group called polyphenols, which come in thousands of varieties. Polyphenols appear in virtually all fruits and vegetables, and have been shown to reduce the risk of cancers and heart disease, among other benefits.

In animals that have consumed lots of blueberries, scientists have spotted anthocyanins in the brain structures that are known to be involved in memory. There, molecules appear to work their magic by helping neurons communicate with each other, facilitating memory processing.

Anthocyanins also make brain cells more resilient in the face of stress. The molecules might even act as a sort of mild toxin that prods the body to grow stronger.

The major question lingering from all of that work, Krikorian said, was whether any of it applied to people. To find out, he recruited nine adults who were, on average, in their mid-70s. All participants had experienced some mild memory decline.

At the beginning of the study, each participant took a series of learning and memory tests. In one task, they memorized pairs of unrelated words, such as "garden" and "note." Words in each pair had no obvious connection to each other, making them challenging to remember.

For the next 12 weeks, participants drank three glasses of blueberry juice a day, for a total of between two and two and a half cups. The exact amount they drank depended on body weight. During the last week of the study, participants took the memory tests again.

Out of a possible score of 20 on the paired-words task, the average score was about 9 before the juice drinking began. Three blueberry-filled months later, average scores rose to about 13, the researchers reported in the Journal of Agricultural and Food Chemistry. That's a 20 percent improvement. Krikorian had previously conducted a similar study with anthocyanin-rich grape juice, which turned up similar results.

While the number of subjects in the blueberry study was small, the results were encouraging, said Mark Smith, a neuroscientist at Case Western Reserve University in Cleveland. The findings raise hopes, he added, that blueberries could help stave off Alzheimer's and other age-related neurodegenerative diseases.

"It's an early study, and I don't want to hype it, but you're getting the effects of a pharmaceutical here by using a food supplement," Smith said. "The data is all pointing in the right direction. I think it's brilliant. It's a major step into human beings."

Plenty of details have yet to be worked out. How many blueberries do you need to eat to see any benefits, for example? Does juice work better than whole fruit? When is the best time in life to stock up on the fruit?

For now, research suggests that blueberries will do more for older people whose brains are starting to fade than for younger people who are still sharp. Still, it can't hurt to get into the habit early of eating a variety of colorful fruits and vegetables.

"Blueberries in the context of a balanced diet is never a bad idea," Smith said. "They're not going to do any harm."

Novel studies of decomposition shed new light on our earliest fossil ancestry

Revelations of rotting fish provide scientists with clearer picture of early life

Decaying corpses are usually the domain of forensic scientists, but palaeontologists have discovered that studying rotting fish sheds new light on our earliest ancestry.

The researchers, from the Department of Geology at the University of Leicester, devised a new method for extracting information from 500 million year old fossils -they studied the way fish decompose to gain a clearer picture of how our ancient fish-like ancestors would have looked. Their results indicate that some of the earliest fossils from our part of the tree of life may have been more complex than has previously been thought.

Their findings have been published today, Sunday Jan 31, ahead of print in Advance Online Publication (AOP) of the science journal Nature on www.nature.com The work was funded by the Natural Environment Research Council (NERC).

Dr Rob Sansom, lead author of the paper explains: "Interpreting fossils is in some ways similar to forensic analysis – we gather all the available clues to put together a scientific reconstruction of something that happened in the past. Unlike forensics, however, we are dealing with life from millions of years ago, and we are less interested in understanding the cause or the time of death. What we want to get at is what an animal was

like before it died and, as with forensic analysis, knowing how the decomposition that took place after death altered the body provides important clues to its original anatomy."

This is something that palaeontologists sometimes overlook, according to Sansom, "probably because spending hundreds of hours studying the stinking carcasses of rotting fish is not something that appeals to everyone." But the rewards are worth the discomfort.

Fish-like fossils from half a billion years ago are recognised as being part of our evolutionary history because they possess characteristic anatomical features, such as a tail, eyes and the precursor of a backbone. Sansom continues: "It seems contradictory, but decomposition is an important part of the process by which animals become preserved and fossilized, so by knowing how these important anatomical features change as they rot, we are better able to correctly interpret the most ancient fossils representing the lowest branches of our part of the evolutionary tree."

"These fossils provide our only direct record of when and how our earliest vertebrate ancestors evolved" adds Dr Mark Purnell, one of the leaders of the study. "Did they appear suddenly, in an evolutionary explosion of complexity, or gradually over millions of years? What did they look like? – in what ways did they differ from their worm-like relatives and how did this set the stage for later evolutionary events? Answers to these fundamental questions - the how, when and why of our own origins - remain elusive because reading the earliest vertebrate fossil record is difficult."

These are four rotting fish. A sequence of images showing how the characteristic features of the body of amphioxus, a close living relative of vertebrates, change during decay. Colors are caused by interference between the experimental equipment and the light illuminating the specimens. **Mark Purnell, Rob Sansom, Sarah Gabbott, University of Leicester**

The scarcity of branches in this part of the evolutionary tree could reflect rapid, explosive evolution or the simple fact that, because they lacked bones or teeth, the earliest vertebrates left few fossils.

This is the area in which Dr Sarah Gabbott, who with Purnell conceived the Leicester study, is an expert: "Only in the most exceptional circumstances do soft-tissues, such as eyes, muscles and guts, become fossilized, yet it is precisely such remains that we rely on for understanding our earliest evolutionary relatives: half-a-billion years ago it's pretty much all our ancestors had."

The results published today in Nature, show that some of the characteristic anatomical features of early vertebrate fossils have been badly affected by decomposition, and in some cases may have rotted away completely. Knowing how decomposition affected the fossils means our reconstructions of our earliest ancestors will be more scientifically accurate.

You can watch a video of rotting primitive fish here: http://www.youtube.com/watch?v=zKk1OFYDPEU

Notes to editors: *For interviews contact: Dr Mark Purnell, University of Leicester, Tel +44 116 252 3645, mark.purnell@le.ac.uk Dr Rob Sansom, University of Leicester, Tel +44 116 252 3629, rss24@le.ac.uk Dr Sarah Gabbott, Tel, +44 116 252 3636, sg21@le.ac.uk*