http://www.eurekalert.org/pub_releases/2012-03/bc-ksc030212.php

Keep smiling: Collagen matrix promotes gum healing around exposed roots

Research demonstrates that a novel method using bovine collagen is able to enhance gum healing.

Receding gums often result in tooth sensitivity and can lead to decay of the root and persistent inflammation of the gum. New research published in BioMed Central's open access journal Head & Face Medicine demonstrates that a novel method using bovine collagen is able to enhance gum healing. This resulted in thicker margins around the tooth and, in over half the cases, complete coverage of exposed roots.

Researchers across Germany and Switzerland led by Dr Shahram Ghanaati and the dentist Dr Markus Schlee investigated the possibility of using collagen, extracted from bovine pericardium, to form a support for mending receding gums and exposed roots. The collagen was extracted by a process involving osmotic, oxidative and alkaline treatment. This ensured that the cell walls were broken down, proteins and fats dissolved, and that bacteria, viruses and other pathogens were inactivated and removed.

The study followed 14 otherwise healthy patients with over 60 'recessions' between them. Their damaged teeth were cleaned before surgery and the collagen implants held in place with loops of surgical thread around the affected tooth. Two weeks later the sutures were removed. None of the patients needed antibiotics.

The patients were re-examined after six months to see how well they had recovered. Dr Schlee described the results, "In all cases the healed-over implant improved the look and severity of the recession, and, in over half of all treatments, resulted in total coverage of the exposed root. We would not have expected any of these patients to get better without surgery."

The collagen seems to be able to act as a scaffold for the body's own cells to repair the damage leading to results on a level comparable to that of connective tissue grafts. Bovine collagen is a possible solution for patients with little available donor tissue or for whom multiple surgeries are not an option.

1. Bovine pericardium based non-cross linked collagen matrix for successful root coverage, a clinical study in human Markus Schlee, Shahram Ghanaati, Ines Willershausen, Michael Stimmlmayr, Anton Sculean and Robert A Sader Head & Face Medicine (in press)

http://www.sciencedaily.com/releases/2012/03/120304141848.htm

Study Shows Brain Flexibility, Gives Hope for Natural-Feeling Neuroprosthetics

Major advances in neuroscience could lead to a wider range of brain-controlled prosthetic limbs that can restore mobility for people.

ScienceDaily - Opening the door to the development of thought-controlled prosthetic devices to help people with spinal cord injuries, amputations and other impairments, neuroscientists at the University of California, Berkeley, and the Champalimaud Center for the Unknown in Portugal have demonstrated that the brain is more flexible and trainable than previously thought.

Their new study, published March 4 in the advanced online publication of the journal Nature, shows that through a process called plasticity, parts of the brain can be trained to do something they normally do not do. The same brain circuits employed in the learning of motor skills, such as riding a bike or driving a car, can be used to master purely mental tasks, even arbitrary ones.

Over the past decade, tapping into brain waves to control disembodied objects has moved out of the realm of parlor tricks and parapsychology and into the emerging field of neuroprosthetics. This new study advances work by researchers who have been studying the brain circuits used in natural movement in order to mimic them for the development of prosthetic devices.

"What we hope is that our new insights into the brain's wiring will lead to a wider range of better prostheses that feel as close to natural as possible," said Jose Carmena, UC Berkeley associate professor of electrical engineering, cognitive science and neuroscience. "They suggest that learning to control a BMI (brain-machine interface), which is inherently unnatural, may feel completely normal to a person, because this learning is using the brain's existing built-in circuits for natural motor control."

Carmena and co-lead author Aaron Koralek, a UC Berkeley graduate student in Carmena's lab, collaborated on this study with Rui Costa, co-principal investigator of the study and principal investigator at the Champalimaud Neuroscience Program, and co-lead author Xin Jin, a post-doctoral fellow in Costa's lab.

Previous studies have failed to rule out the role of physical movement when learning to use a prosthetic device. "This is key for people who can't move," said Carmena, who is also co-director of the UC Berkeley-UCSF Center for Neural Engineering and Prostheses. "Most brain-machine interface studies have been done in healthy, able-bodied animals. What our study shows is that neuroprosthetic control is possible, even if physical movement is not involved."

To clarify these issues, the scientists set up a clever experiment in which rats could only complete an abstract task if overt physical movement was not involved. The researchers decoupled the role of the targeted motor neurons needed for whisker twitching with the action necessary to get a food reward.

The rats were fitted with a brain-machine interface that converted brain waves into auditory tones. To get the food reward -- either sugar-water or pellets -- the rats had to modulate their thought patterns within a specific brain circuit in order to raise or lower the pitch of the signal.

Auditory feedback was given to the rats so that they learned to associate specific thought patterns with a specific pitch. Over a period of just two weeks, the rats quickly learned that to get food pellets, they would have to create a high-pitched tone, and to get sugar water, they needed to create a low-pitched tone.

If the group of neurons in the task were used for their typical function -- whisker twitching -- there would be no pitch change to the auditory tone, and no food reward.

"This is something that is not natural for the rats," said Costa. "This tells us that it's possible to craft a prosthesis in ways that do not have to mimic the anatomy of the natural motor system in order to work."

The study was also set up in a way that demonstrated intentional, as opposed to habitual, behavior. The rats were able to vary the amount of pellets or sugar water received based upon their own level of hunger or thirst.

"The rats were aware; they knew that controlling the pitch of the tone was what gave them the reward, so they controlled how much sugar water or how many pellets to take, when to do it, and how to do it in absence of any physical movement," said Costa.

Researchers hope these findings will lead to a new generation of prosthetic devices that feel natural.

"We don't want people to have to think too hard to move a robotic arm with their brain," said Carmena.

Co-author John Long, former UC Berkeley graduate student at the Helen Wills Neuroscience Institute and member of the Carmena lab, also collaborated in this study.

The National Science Foundation, Multiscale Systems Research Center, Defense Advanced Research Projects Agency, National Institute on Alcohol Abuse and Alcoholism, Marie Curie International, and the European Research Council helped support this research.

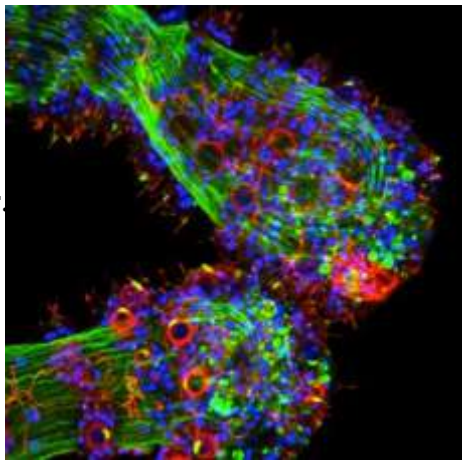
The above story is reprinted from materials provided by University of California - Berkeley. The original article was written by Sarah Yang.

Aaron C. Koralek, Xin Jin, John D. Long II, Rui M. Costa & Jose M. Carmena. Corticostriatal plasticity is necessary for learning intentional neuroprosthetic skills. Nature, 2012 DOI: 10.1038/nature10845

http://www.physorg.com/news/2012-03-eyes-hydra-cells.html

Seeing without eyes: Hydra stinging cells respond to light

In the absence of eyes, the fresh water polyp, Hydra magnipapillata, nevertheless reacts to light.



They are diurnal, hunting during the day, and are known to move, looping end over end, or contract, in response to light. New research published in BioMed Central's open access journal BMC Biology shows that stinging cells (cnidocytes) in hydra tentacles, which the animals use for self protection and to catch prey, are linked via a simple nervous system to primitive light responsive cells that co-ordinate the animals' feeding behavior.

Hydra are members of a family of radially symmetric animals (Cnidaria), all of which use specialized cnidocytes to catch prey. This family also includes well-known creatures such as jellyfish and corals, which, like other cnidarians, have the simple design of a mouth surrounded by tentacles. Hydra tentacles contain barbed, poison containing cnidocytes that they use to stun animals like the water flea, Daphnia, before eating them alive, and to protect themselves from attack by other animals.

Hydra magnipapillata tentacleopsin is shown in blue, cnidocytes and neurons shown in red. **Dr. David Plachetzki, University of California**

Researchers from the University of California lead by Dr David Plachetzki have discovered that the light sensitive protein opsin found in sensory cells is able to regulate the firing of harpoon-like cnidocytes. These light sensitive neurons are found integrated into arsenals that include the stinging cnidocytes as well as desmoneme cnidocytes, used to grasp prey, and sticky isorhiza, which help the hydra to summersault at 10cm a day.

The linking of opsin to cnidocytes explains how hydra are able to respond to light even though they do not have eyes. Dr Plachetzki described how other proteins necessary for phototransduction are also present in the sensory cells. "Not only did we find opsin in the sensory neurons that connect to cnidocytes in the hydra, but we also found other components of phototransduction in these cells. These included cyclic nucleotide gated ion

channels (CNG) required to transfer the signal and a hydra version of arrestin, which wipes the phototransduction slate clean for a second signal."

Dr Plachetzki continued, "We were also able to demonstrate that cnidocyte firing itself is effected by the light environment and that these effects are reversed when components of the phototransduction cascade are turned off."

Cnidarians have been around for over 600 million years. However the hydra's simple approach to using light, to aid survival and increase their chances of catching prey, uses the same visual pathway as humans and hints at a common ancestor.

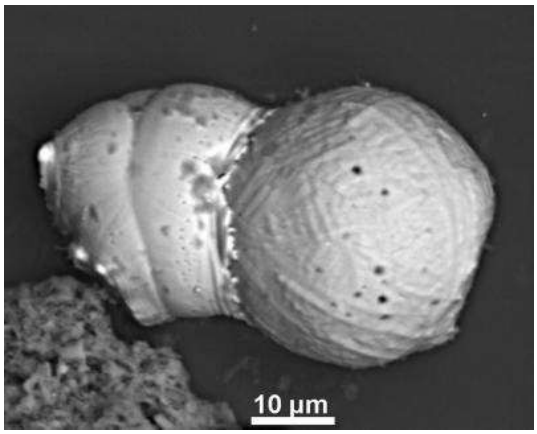
More information: Cnidocyte discharge is regulated by light and opsin-mediated phototransduction, David C Plachetzki, Caitlin R Fong and Todd H Oakley, BMC Biology (in press) Provided by BioMed Central

http://www.eurekalert.org/pub_releases/2012-03/uoc--sjl030512.php

Study jointly led by UCSB researcher supports theory of extraterrestrial impact

An international team has identified a nearly 13,000-year-old layer of thin, dark sediment buried in the floor of Lake Cuitzeo in central Mexico.

Santa Barbara, Calif. - A 16-member international team of researchers that includes James Kennett, professor of earth science at UC Santa Barbara, has identified a nearly 13,000-year-old layer of thin, dark sediment buried in the floor of Lake Cuitzeo in central Mexico. The sediment layer contains an exotic assemblage of materials, including nanodiamonds, impact spherules, and more, which, according to the researchers, are the result of a cosmic body impacting Earth.



This image shows the "tectonic" effects of the collision of one spherule with another during the cosmic impact. **UCSB**

These new data are the latest to strongly support of a controversial hypothesis proposing that a major cosmic impact with Earth occurred 12,900 years ago at the onset of an unusual cold climatic period called the Younger Dryas. The researchers' findings appear today in the Proceedings of the National Academy of Sciences.

Conducting a wide range of exhaustive tests, the researchers conclusively identified a family of nanodiamonds, including the impact form of nanodiamonds called lonsdaleite, which is unique to cosmic impact. The researchers also found spherules that had collided at high velocities with other spherules during the chaos of impact. Such features, Kennett noted, could not have formed through anthropogenic, volcanic, or other natural terrestrial processes. "These materials form only through cosmic impact," he said.

The data suggest that a comet or asteroid — likely a large, previously fragmented body, greater than several hundred meters in diameter — entered the atmosphere at a relatively shallow angle. The heat at impact burned biomass, melted surface rocks, and caused major environmental disruption. "These results are consistent with earlier reported discoveries throughout North America of abrupt ecosystem change, megafaunal extinction, and human cultural change and population reduction," Kennett explained.

The sediment layer identified by the researchers is of the same age as that previously reported at numerous locations throughout North America, Greenland, and Western Europe. The current discovery extends the known range of the nanodiamond-rich layer into Mexico and the tropics. In addition, it is the first reported for true lake deposits.

In the entire geologic record, there are only two known continent-wide layers with abundance peaks in nanodiamonds, impact spherules, and aciniform soot. These are in the 65-million-year-old Cretaceous-Paleogene boundary layer that coincided with major extinctions, including the dinosaurs and ammonites; and the Younger Dryas boundary event at 12,900 years ago, closely associated with the extinctions of many large North American animals, including mammoths, mastodons, saber-tooth cats, and dire wolves.

"The timing of the impact event coincided with the most extraordinary biotic and environmental changes over Mexico and Central America during the last approximately 20,000 years, as recorded by others in several regional lake deposits," said Kennett. "These changes were large, abrupt, and unprecedented, and had been recorded and identified by earlier investigators as a 'time of crisis.' "

Other scientists contributing to the research include Isabel Israde-Alcántara and Gabriela Dominguez-Vásquez of the Universidad Michoacana de San Nicólas de Hidalgo; James L. Bischoff of the U.S. Geological Survey; Hong-Chun Li of National Taiwan University; Paul S. DeCarli of SRI International; Ted E. Bunch and James H. Wittke of Northern Arizona University; James C. Weaver of Harvard University; Richard B. Firestone of Lawrence Berkeley National Laboratory; Allen West of GeoScience Consulting; Chris Mercer of the National Institute for Materials Science; Sujing Zie and Eric K. Richman of the University of Oregon, Eugene; and Charles R. Kinzie and Wendy S. Wolbach of DePaul University.

http://www.eurekalert.org/pub_releases/2012-03/wuso-nam030512.php

New Alzheimer's marker strongly predicts mental decline

A new marker of Alzheimer's disease can predict how rapidly a patient's memory and other mental abilities will decline after the disorder is diagnosed, researchers at Washington University School of Medicine in St. Louis have found.

In 60 patients with early Alzheimer's disease, higher levels of the marker, visinin-like protein 1 (VILIP-1), in the spinal fluid were linked to a more rapid mental decline in the years that followed.

Scientists need to confirm the results in larger studies, but the new data suggest that VILIP-1 potentially may be a better predictor of Alzheimer's progression than other markers.

"VILIP-1 appears to be a strong indicator of ongoing injury to brain cells as a result of Alzheimer's disease," says lead author Rawan Tarawneh, MD, now an assistant professor of neurology at the University of Jordan. "That could be very useful in predicting the course of the disease and in evaluating new treatments in clinical trials."

The study appears March 6 in Neurology.

VILIP-1 was originally identified as a potential indicator of brain cell damage in the laboratory of Jack Ladenson, PhD, the Oree M. Carroll and Lillian B. Ladenson Professor of Clinical Chemistry in Pathology and Immunology at Washington University. Scientists think VILIP-1 serves as a calcium sensor in brain cells. It is released into the cerebrospinal fluid when the cells are injured.

Tarawneh is a former postdoctoral research associate in the laboratory of David Holtzman, MD, the Andrew B. and Gretchen P. Jones Professor and head of Washington University's Department of Neurology. In an earlier study, she and her colleagues showed that healthy subjects with high levels of VILIP-1 were more likely to develop cognitive impairment and Alzheimer's disease over a two- to three-year follow-up period.

For the new study, scientists identified patients with very mild or mild Alzheimer's disease enrolled in studies at the Charles F. and Joanne Knight Alzheimer's Disease Research Center at Washington University School of Medicine. At the outset, researchers measured levels of VILIP-1 in patients' spinal fluid and assessed their mental abilities using an extensive battery of tests. The cognitive function testing was repeated annually.

"Memory and other mental abilities declined faster in patients with the highest levels of VILIP-1," Tarawneh says. "In patients with early symptoms of Alzheimer's disease, VILIP-1 seems to be at least as good as — and potentially even better than — the other prognostic indicators we used in the study."

The two additional indicators studied were the proteins amyloid beta and tau. Changes in the spinal fluid levels of those proteins mainly reflect the fact that amyloid beta and tau are starting to form abnormal deposits in the brain. In contrast, VILIP-1 appears to reveal how much damage to brain cells has occurred as a result of brain changes caused by Alzheimer's.

"These results are intriguing, but we need a larger study to fully understand how the insights provided by VILIP-1 compare to those we can gain from other markers," Tarawneh says.

She is working with Washington University scientists to standardize the tests that measure VILIP-1 for expanded use in research.

Tarawneh R, Lee J-M, Ladenson JH, Morris JC, Holtzman DM. CSF VILIP-1 predicts rates of cognitive decline in early Alzheimer's disease. Neurology, March 6, 2012.

Funding from the National Institutes of Health (NIH), Siemens Health Care Diagnostics and the Charles and Joanne Knight Alzheimer's Research Initiative supported this research.

http://www.bbc.co.uk/news/health-17261234

Surgeons call for end to metal hip replacements

Expert surgeons in the UK say patients should no longer be given all-metal hip replacements, despite assurances from regulators amid safety concerns.

By Michelle Roberts Health reporter, BBC News

Large head metal-on-metal implants can cause serious side effects with wear. The BBC's Newsnight and the British Medical Journal recently discovered the problems were known about for decades. The Medicines and Healthcare products Regulatory Agency (MHRA) insists the implants can still be used but the British Hip Society disagrees. Its surgeons say the operations should no longer be performed. But patients with joints measuring less than 36mm (1.4in) and those who have had only hip resurfacing are not affected.

The MHRA said last week that patients who have already undergone large head metal-on-metal hip replacements - 49,000 patients in all - should be monitored annually for life.

The regulator said that they should have blood tests to check for minute metal debris from the joints, and magnetic resonance imaging scans if they have raised metal levels or show adverse symptoms.

According to latest figures from the National Joint Registry for England and Wales, about 1,400 patients had a large head metal-on-metal hip replacement in 2010. The British Hip Society says patients like these should not receive such implants because there is not enough evidence to show any benefits outweigh the risks.

But Dr Susanne Ludgate, clinical director of the MHRA, said the implants were justified in some instances.

"We recognise that there is emerging evidence of increased revision rates associated with large head metal-on-metal hip replacements. But the clinical evidence is mixed and this does not support their removal from the market. Metal-on-metal resurfacing hip implants enable young patients to lead pain-free, independent lives.

"The percentage of patients implanted with these large head metal-on-metal hip implants dropped to 2% in 2010 and is continuing to decrease. "There are alternative hip replacements available that are proven to produce good clinical outcomes for patients. "The MHRA, in combination with our expert advisory group, is continuing to monitor closely all the latest evidence about these devices. We will take quick action if we need to and, if patients have any questions, they should speak to their orthopaedic surgeon or doctor."

http://nyti.ms/wRic39

A Heart Helper May Come at a Price for the Brain

After a heart attack and quadruple bypass surgery in 2010, Steve Colburn of Portland, Ore., began taking a cholesterol-lowering statin at the maximum dose. Soon, he began experiencing memory problems.

By TARA PARKER-POPE

"Thinking and remembering became so laborious that I could not even recall my three-digit telephone extension or computer password at work," said Mr. Colburn, 62, a sales representative and product developer. "All day, every day, I felt like my brain was mush."

His doctor suggested a "drug vacation," and when Mr. Colburn stopped taking the statin for six weeks, the problems disappeared. Then he tried a different statin at a high dose, but the cognitive difficulties returned. His doctor has since lowered his dose by more than half, and while the memory lapses have not disappeared, he has learned to cope.

"I felt like I didn't have a choice to give up the drug," Mr. Colburn said. "But I wanted to work with a dose that kept my numbers in an acceptable range and at the same time hopefully provided enough clarity of thinking that I could live with it."

Statins are the most prescribed drugs in the world, and there is no doubt that for people at high risk of cardiovascular problems, the drugs lower not only cholesterol but also the risk of heart attack and stroke. But for years doctors have been fielding reports from patients that the drugs leave them feeling "fuzzy," and unable to remember small and big things, like where they left the car, a favorite poem or a recently memorized presentation. Last week, the Food and Drug Administration finally acknowledged what many patients and doctors have believed for a long time: Statin drugs carry a risk of cognitive side effects. The agency also warned users about diabetes risk and muscle pain.

Nearly 21 million patients in the United States were prescribed statins last year, but nobody knows how many of them have experienced cognitive side effects. Dr. Beatrice Golomb, associate professor of medicine at the University of California, San Diego, has collected more than 3,000 reports of side effects related to statin use. She said doctors have too often dismissed the complaints, writing off the memory lapses and muscle pain, in particular, as a normal sign of getting older.

Many patients on statins also take medications for other health problems, which has made it difficult to discern whether statins are always to blame. For six years, Bill Moseley of Towson, Md., tried taking statins to lower his cholesterol; he also began taking medications for hypertension and high blood sugar. He found the drugs to be mind-numbing. "I felt like a zombie in the afternoons," he said.

While taking the cocktail of drugs, he began making driving errors. "I'd feel spacey and wouldn't be in the right lane in enough time to make a turn," he said. "Or I wouldn't see someone I should be seeing. It was a feeling of detached, suppressed mental capability that should be there."

Against his doctor's advice, Mr. Moseley in 2006 stopped all of the drugs and began focusing on healthful eating and exercise, meeting regularly with a personal trainer and lifting weights. Four months later, the cognitive problems disappeared. Today, he is 69, his cholesterol has dropped from 225 to about 125, and his blood pressure and blood sugar are under control.

"I'm back to normal, and the more I work out over time, the better and better I get," he said.

To be sure, millions of patients taking statins never experience cognitive side effects. John Hannon, 60, of Oceanside, N.Y., began taking a statin 20 years ago to lower his total cholesterol, which was about 270. Now his total cholesterol is in the 135 to 150 range.

"I've had no side effects that I'm aware of," he said. "For me, it has been a wonder drug."

Dr. Steven Nissen of the Cleveland Clinic noted that cognitive side effects have not been detected in randomized controlled trials of statin therapy. And even the warnings about muscle aches and diabetes need to be weighed against the fact that the drugs are proven to lower risk for heart attack and stroke, he said.

"For most physicians, and certainly for me, these warnings haven't changed the decision-making process about who gets a statin and who doesn't," Dr. Nissen said.

Robert F. Hickey of Eagle, Colo., started taking statins in 2008 to lower his cholesterol, which was above 300. He also takes a myriad of other medications as a result of a kidney transplant. Last September, he began noticing memory problems and would sometimes go blank in the middle of memorized presentations.

"I began to notice, for a split second, difficulty with word recall," said Mr. Hickey, a clinical psychologist and lecturer. "It was vocabulary that I use every day and had used for decades."

His doctor put him through a battery of tests for early-onset dementia but found no signs of it. Instead, he suggested cutting the statin dose in half. Mr. Hickey said he hasn't noticed any meaningful improvement yet, but the real test will come this week during a lecture in Las Vegas.

"I'll have my hard copy with me, just in case," he said.

http://www.scientificamerican.com/podcast/episode.cfm?id=psoriasis-linked-to-protection-from-12-03-05

Psoriasis Linked to Protection from HIV-1

Many psoriasis patients have the same gene variants as people who are not significantly affected by an HIV-1 infection. Charles Q. Choi reports

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Psoriasis is an autoimmune disease—the immune system mistakenly attacks its own body, causing red, itchy, scaly patches on the skin. But there may be a hidden upside. People with psoriasis are more likely to have gene variants that protect them against the effects of HIV-1.

Researchers had noticed that some psoriasis patients had the same gene variants as people known as "HIV-1 controllers." Such people have HIV-1, but they naturally maintain low levels of the virus and generally do not develop any obvious symptoms of AIDS.

To investigate further, scientists looked at more than 1,700 psoriasis patients and nearly 3,600 people who don't have it. People who have psoriasis were significantly more likely to have the gene variants known to defend against HIV-1 and delay its progression to AIDS. The study is in the journal Public Library of Science Genetics. [Haoyan Chen et al., ***"Psoriasis Patients Are Enriched for Genetic Variants That Protect against HIV-1 Disease"]***

These findings suggest that psoriasis is a malfunction of antiviral gene variants that ordinarily protect us against disease. Further research could help us understand why autoimmune diseases develop, and give researchers new tools for treating HIV.

http://www.eurekalert.org/pub_releases/2012-03/ucl-sdt030512.php

Scientists discover that specific antibodies halt Alzheimer's disease in mice

Antibodies that block the process of synapse disintegration in Alzheimer's disease have been identified, raising hopes for a treatment to combat early cognitive decline in the disease.

Alzheimer's disease is characterized by abnormal deposits in the brain of the protein Amyloid-ß, which induces the loss of connections between neurons, called synapses.

Now, scientists at UCL have discovered that specific antibodies that block the function of a related protein, called Dkk1, are able to completely suppress the toxic effect of Amyloid-ß on synapses. The findings are published today in the Journal of Neuroscience.

Dr Patricia Salinas, from the UCL Department of Cell & Developmental Biology, who led the study, said: "These novel findings raise the possibility that targeting this secreted Dkk1 protein could offer an effective treatment to protect synapses against the toxic effect of Amyloid-ß. "Importantly, these results raise the hope for a treatment and perhaps the prevention of cognitive decline early in Alzheimer's disease."

Dkk1 is elevated in the brain biopsies of people with Alzheimer's disease but the significance of these findings was previously unknown. Scientists at UCL have found that Amyloid-ß causes the production of Dkk1, which in turn induces the dismantling of synapses (the connections between neurons) in the hippocampus, an area of the brain implicated in learning and memory.

In this paper, scientists conducted experiments to look at the progression of synapse disintegration of the hippocampus after exposure to Amyloid-ß, using brain slices from mice. They were able to monitor how many synapses survived in the presence of a specific antibody which targets Dkk1, compared to how many synapses were viable without the antibody.

The results show that the neurons that were exposed to the antibody remained healthy, with no synaptic disintegration.

Dr Salinas said: "Despite significant advances in understanding the molecular mechanisms involved in Alzheimer's disease, no effective treatment is currently available to stop the progression of this devastating disease." She added: "This research identifies Dkk1 as a potential therapeutic target for the treatment of Alzheimer's disease."

Alzheimer's represents 60% of all cases of dementia. Alzheimer's Research UK estimates that in the UK the annual national cost of all the dementias is around £23 billion, which represents double the costs for cancer and 3-5 times the costs for heart disease and stroke. New studies predict an increase in the number of Alzheimer's cases of epidemic proportions.

The research was funded by Alzheimer's Research UK, the UK's leading dementia research charity, and the Biotechnology and Biological Sciences Research Council, UK.

Dr Simon Ridley, Head of Research at Alzheimer's Research UK, said: "We're delighted to have supported this study, which sheds new light on the processes that occur as Alzheimer's develops. By understanding what happens in the brain during Alzheimer's, we stand a better chance of developing new treatments that could make a real difference to people with the disease.

"Studies like this are an essential part of that process, but more work is needed if we are to take these results from the lab bench to the clinic. Dementia can only be defeated through research, and with the numbers of people affected by the condition soaring, we urgently need to invest in research now."

The Secreted Wnt antagonist Dickkopf-1 is required for Amyloid B-mediated synaptic loss' is published in the Journal of Neuroscience. Copies are available from UCL Media Relations.

http://www.eurekalert.org/pub_releases/2012-03/tju-slt030612.php

Surgery less than 24 hours after traumatic cervical spinal cord injury leads to improved outcomes

Researchers at the Rothman Institute at Jefferson have shown that patients who receive surgery less than 24 hours after a traumatic cervical spine injury suffer less neural tissue destruction and improved clinical outcomes.

PHILADELPHIA - "This practice-changing study is the first to show that the timing of surgery after traumatic spinal cord injury (SCI) matters," says Alexander Vaccaro, MD, PhD, professor of Orthopaedics and Neurosurgery at Jefferson Medical College of Thomas Jefferson University and attending surgeon at Thomas Jefferson University Hospital, the largest spinal cord injury center in the country. The results of their study, the Surgical Timing in Acute Spinal Cord Injury Study (STASCIS) are available in PLoS One.

The multicenter study recruited 313 patients; 182 of whom underwent surgery less than 24 hours after traumatic cervical SCI and 131 of whom underwent surgery at or after 24 hours post-SCI.

For both groups, the degree of neurologic improvement was measured by change in American Spinal Injury Association's (ASIA's) ASIA Impairment Scale (AIS). A two-grade improvement in AIS scores post-surgery was associated with improved neurologic outcomes. Baseline neurological assessments were performed within 24 hours of injury on all subjects.

A total of 222 patients were followed to six months post-surgery.

In the early surgery group (surgery performed less than 24 hours post-injury), 42.7 percent showed no improvement, 36.6 percent had a one grade improvement, 16.8 percent had a two-grade improvement and 3.1 percent had a three grade improvement. Comparatively, in the late surgery group (surgery performed at 24 hours or more post-injury), 50 percent showed no improvement, 40.7 percent had a one grade improvement and 8.8 percent had a two grade improvement.

"What this tells us is that the odds of a significant (at least two grade) improvement in neurologic status is 2.8 times higher when surgery is performed within 24 hours post-injury. This can be the difference between walking and not for the rest of one's life," says Vaccaro.

Complications occurred in 24.2 percent of early surgery patients versus 30.5 percent of late surgery patients.

"Previous research has been inconclusive on the issue, with the common thought among most surgeons that you can wait up to five days post-injury and have the same outcomes. We should not practice that way anymore armed with this new information," says Vaccaro.

Research was performed in collaboration with the University of Toronto; University of Virginia; University of Maryland, Baltimore; University of British Columbia; and the University of Kansas.

http://www.eurekalert.org/pub_releases/2012-03/uoc--usp030612.php

UCLA scientists pinpoint how vitamin D may help clear amyloid plaques found in Alzheimer's

A team of academic researchers has identified the intracellular mechanisms regulated by vitamin D3 that may help the body clear the brain of amyloid beta, the main component of plaques associated with Alzheimer's disease.

Published in the March 6 issue of the Journal of Alzheimer's Disease, the early findings show that vitamin D3 may activate key genes and cellular signaling networks to help stimulate the immune system to clear the amyloid-beta protein.

Previous laboratory work by the team demonstrated that specific types of immune cells in Alzheimer's patients may respond to therapy with vitamin D3 and curcumin, a chemical found in turmeric spice, by stimulating the innate immune system to clear amyloid beta. But the researchers didn't know how it worked.

"This new study helped clarify the key mechanisms involved, which will help us better understand the usefulness of vitamin D3 and curcumin as possible therapies for Alzheimer's disease," said study author Dr. Milan Fiala, a researcher at the David Geffen School of Medicine at UCLA and the Veterans Affairs Greater Los Angeles Healthcare System.

For the study, scientists drew blood samples from Alzheimer's patients and healthy controls and then isolated critical immune cells from the blood called macrophages, which are responsible for gobbling up amyloid beta and other waste products in the brain and body.

The team incubated the immune cells overnight with amyloid beta. An active form of vitamin D3 called 1a,25–dihydroxyvitamin D3, which is made in the body by enzymatic conversion in the liver and kidneys, was added to some of the cells to gauge the effect it had on amyloid beta absorption.

Previous work by the team, based on the function of Alzheimer's patients' macrophages, showed that there are at least two types of patients and macrophages: Type I macrophages are improved by addition of 1a,25–dihydroxyvitamin D3 and curcuminoids (a synthetic form of curcumin), while Type II macrophages are improved only by adding 1a,25–dihydroxyvitamin D3.

Researchers found that in both Type I and Type II macrophages, the added 1a,25–dihydroxyvitamin D3 played a key role in opening a specific chloride channel called "chloride channel 3 (CLC3)," which is important in supporting the uptake of amyloid beta through the process known as phagocytosis. Curcuminoids activated this chloride channel only in Type I macrophages. The scientists also found that 1a,25–dihydroxyvitamin D3 strongly helped trigger the genetic transcription of the chloride channel and the receptor for 1a,25–dihydroxyvitamin D3 in Type II macrophages. Transcription is the first step leading to gene expression.

The mechanisms behind the effects of 1a,25–dihydroxyvitamin D3 on phagocytosis were complex and dependent on calcium and signaling by the "MAPK" pathway, which helps communicate a signal from the vitamin D3 receptor located on the surface of a cell to the DNA in the cell's nucleus.

The pivotal effect of 1a,25–dihydroxyvitamin D3 was shown in a collaboration between Dr. Patrick R. Griffin from the Scripps Research Institute and Dr. Mathew T. Mizwicki from UC Riverside. They utilized a technique based on mass spectrometry, which showed that 1a,25–dihydroxyvitamin D3 stabilized many more critical sites on the vitamin D receptor than did the curcuminoids.

"Our findings demonstrate that active forms of vitamin D3 may be an important regulator of immune activities of macrophages in helping to clear amyloid plaques by directly regulating the expression of genes, as well as the structural physical workings of the cells," said study author Mizwicki, who was an assistant research biochemist in the department of biochemistry at UC Riverside when the study was conducted.

According to the team, one of the next stages of research would be a clinical trial with vitamin D3 to assess the impact on Alzheimer's disease patients. Previous studies by other teams have shown that a low serum level of 25–hydroxyvitamin D3 may be associated with cognitive decline. It is too early to recommend a definitive dosage of vitamin D3 to help with Alzheimer's disease and brain health, the researchers said. They add that ongoing studies are showing that vitamin D3 may be beneficial in reducing the incidence of a growing number of human diseases.

The study was funded in part by the Alzheimer's Association and by the National Institutes of Health.

Other study authors included Danusa Menegaz and Antonio Barrientos-Duran of the department of biochemistry at UC Riverside; Jun Zhang and Patrick R. Griffin of the department of molecular therapeutics at the Scripps Research Institute in Jupiter, Fla.; Stephen Tse of the department of medicine at the David Geffen School of Medicine at UCLA and the Veterans Affairs Greater Los Angeles Healthcare System; and John R. Cashman of the Human BioMolecular Research Institute in San Diego, Calif.

http://www.eurekalert.org/pub_releases/2012-03/tes-vdd030212.php

Vitamin D deficiency linked to higher mortality in female nursing home residents

New study underscores need for effective strategy for preventing and treating vitamin D deficiency

The majority of institutionalized elderly female patients are vitamin D deficient and there is an inverse association of vitamin D deficiency and mortality, according to a recent study accepted for publication in The Endocrine Society's Journal of Clinical Endocrinology and Metabolism (JCEM).

Recommendations for dietary vitamin D intake in the elderly are higher than any other age group because vitamin D deficiency is extraordinarily prevalent in this population and is considered a causal risk factor for skeletal diseases. Treatment involves the daily ingestion of up to 800 IU of vitamin D. The current study examined whether vitamin D deficiency is an independent risk factor for mortality in institutionalized elderly patients.

"Our findings show that the vast majority of nursing home residents are severely vitamin D deficient and those with the lowest vitamin D levels are at high risk of mortality," said Dr. Stefan Pilz, MD, of the Medical University of Graz, Austria, and lead author of the study. "This situation warrants immediate action to prevent and treat vitamin D deficiency."

In this study, researchers examined a sample of 961 nursing home residents in Austria, with an average age of 83.7 years. The researchers recorded 284 deaths—or 30 percent of the study cohort—after a mean follow-up time of 27 months. Their findings showed that vitamin D levels were below recommended levels in 92.8 percent of the study participants, suggesting that while vitamin D deficiency among frail and elderly populations has been acknowledged for several decades, no effective strategies to treat the deficiencies have been developed and implemented.

"Vitamin D supplementation in these patients can exert significant benefits on clinically relevant outcomes such as fractures," said Pilz. "In light of our findings, and the existing literature on adverse effects of vitamin D deficiency, there exists now an urgent need for effective strategies to improve vitamin D status in older institutionalized patients."

Other researchers working on the study include: H. Dobnig, A. Tomaschitz, K. Kienreich, A. Meinitzer, C. Friedl, D. Wagner, C. Piswanger-Solkner, W. Marz and A. Fahrleitner-Pammer, all of the Medical University of Graz.

The article, "Low 25-hydroxyvitamin D is associated with increased mortality in female nursing home residents," appears in the April 2012 issue of JCEM.

http://www.eurekalert.org/pub_releases/2012-03/cl-rtp030612.php

Research on flavanols and procyanidins provides new insights into how these phytonutrients may positively impact human health

Demonstration of distinct roles of flavanols and procyanidins provides a basis for improving the design and interpretation of future studies

Collaborative research by Mars, Incorporated and the University of California, Davis has provided important new insights into the distinct roles of flavanols and procyanidins in the human body. Recently published online in the American Journal of Clinical Nutrition, the findings significantly advance understanding of how these phytonutrients may work in the body to exert cardiovascular benefits. In ways not previously possible, the researchers were able to gain novel insights that further our understanding of the metabolic fate of procyanidins, and highlight the need for more careful discrimination between flavanols and procyanidins when examining the health benefits of foods. Taken together, these findings may enable stronger and clearer associations between health and the intake of specific food components, and a more comprehensive understanding of the cardiovascular health benefits of flavanols and procyanidins.

Flavanols and procyanidins are sub-classes of a group of natural compounds called flavonoids. A growing body of evidence demonstrates that foods rich in flavanols and procyanidins, such as cocoa, can have a positive impact on blood vessel function and cardiovascular health. To understand how the flavanols and procyanidins present in certain foods may exert their cardiovascular effects, it is crucial to assess what happens to these compounds in the body following consumption. Previous studies have demonstrated that flavanols are absorbed, enter the body, and directly mediate improvements in cardiovascular function. In contrast, procyanidins have been shown to be poorly absorbed or not at all and evidence for a direct effect of procyanidins on blood vessel function is therefore limited. Nevertheless, as flavanols are the structural building blocks of procyanidins, it has been proposed that digestive processes in the gut may cause the break-down of procyanidins into flavanols, which may subsequently be absorbed into the body. If correct, this "break-down hypothesis" would mean that procyanidins exert cardiovascular benefits by acting as precursors of flavanols. Answering this question is

therefore crucial for a comprehensive understanding of the role of these phytonutrients for human health and nutrition.

"Assessing whether or not procyanidins are absorbed or contribute to the systemic flavanol pool is more than just a technical distinction. In fact, the answers to these questions could have a significant impact on investigations into the mechanisms underlying the cardiovascular health benefits associated with the intake of flavanol- and procyanidin-containing foods," commented Dr. Hagen Schroeter – study author and director of fundamental health and nutrition research at Mars, Incorporated.

As flavanols and procyanidins are commonly found together in foods, such as cocoa, grapes, and apples, up until now it has not been possible to directly assess the individual contribution of procyanidins to the circulating pool of flavanols in the body. Using carefully developed, nutrient-matched cocoa-based drinks, containing flavanols and procyanidins either in combination or individually, the researchers in this study were able to confirm that procyanidins are poorly absorbed. More importantly, the study also demonstrated for the first time that procyanidins do not break-down in the gut to contribute to the flavanols present in circulation. This outcome makes it very unlikely that procyanidins affect blood vessel function, either directly or through a break-down into flavanols. Interestingly, the research also demonstrates that micro-organisms in the digestive system transform both flavanols and procyanidins into another group of compounds called gamma-valerolactones. Further research is needed to investigate if, and to what extent, these compounds formed in the gut contribute to the cardiovascular health benefits observed following the consumption of foods rich in flavanols and procyanidins. In addition, the data of this study do not rule out the possibility that procyanidins may exert biological activities in the digestive system that may be beneficial for human health.

Dr. Schroeter further commented on the implications of these findings, "The differences between the absorption and metabolism of flavanols and procyanidins, as demonstrated by this research, may prompt changes in how scientists design and interpret epidemiological investigations and in vitro studies to more meaningfully reflect what happens in the body. Furthermore, the fact that our results mean that it is unlikely that procyanidins exert direct effects on blood vessel function, may lead researchers to focus specifically on studying the mechanisms by which flavanols – and perhaps even gamma-valerolactones – affect cardiovascular function."

The research has been published in the American Journal of Clinical Nutrition and is available online here: http://www.ajcn.org/content/early/2012/02/28/ajcn.111.028340.abstract. It was part-funded by the European Commission under the FLAVIOLA project and forms part of a wider body of work examining the health benefits of diets rich in flavanols and procyanidins.

http://www.eurekalert.org/pub_releases/2012-03/asa-map030612.php

Marriage: A powerful heart drug in short supply

Married adults who undergo heart surgery are more than three times as likely as single people who have the same surgery to survive the next three months, a new study finds.

WASHINGTON, DC - "That's a dramatic difference in survival rates for single people, during the most critical post-operative recovery period," says Ellen Idler, a sociologist at Emory University and lead author of the study, which appears in the March issue of the Journal of Health and Social Behavior. "We found that marriage boosted survival whether the patient was a man or a woman."

While the most striking difference in outcomes occurred during the first three months, the study showed that the strong protective effect of marriage continues for up to five years following coronary artery bypass surgery. Overall, the hazard of mortality is nearly twice as great for unmarried as it is for married patients about to undergo the surgery.

"The findings underscore the important role of spouses as caregivers during health crises," Idler says. "And husbands were apparently just as good at caregiving as wives."

Tying the knot has been associated with longer life since 1858, when William Farr observed that marriage protected against early mortality in France. The evidence keeps accumulating that the widowed, never married, and divorced have higher risks of mortality. Much of the research, however, has looked broadly across populations during an entire lifespan, or relies only on medical records.

"We wanted to zero in on a particular window of time: a major health crisis," Idler says, "and we wanted to add the in-person element of patient interviews, in addition to the full record of their medical history and hospitalization."

The major study involved more than 500 patients undergoing either emergency or elective coronary bypass surgery. All of the study subjects were interviewed prior to surgery. Data on survival status of the patients were obtained from the National Death Index.

While the data are inconclusive for what caused the striking difference in the three-month survival rate, the interviews provided some possible clues.

"The married patients had a more positive outlook going into the surgery, compared with the single patients," Idler says. "When asked whether they would be able to manage the pain and discomfort, or their worries about the surgery, those who had spouses were more likely to say, yes."

Patients who survived more than three months were approximately 70 percent more likely to die during the next five years if they were single. An analysis of the data showed that smoking history accounted for the lower survival rates in the single patients over this longer term. "The lower likelihood that married persons were smokers suggests that spousal control over smoking behavior produces long-term health benefits," Idler says.

When it comes to healing hearts, marriage may be powerful medicine, but it's in increasingly short supply, Idler says, which does not bode well for aging baby boomers.

Barely half of U.S. adults are currently married, the lowest percentage ever, according to the Pew Research Center.

The study, which Idler coauthored with Rutgers University's David Boulifard and Richard Contrada, was funded by the National Institute on Aging.

http://www.sciencedaily.com/releases/2012/03/120306195700.htm

Running Hot and Cold in the Deep Sea: Scientists Explore Rare Environment

Among the many intriguing aspects of the deep sea, Earth's largest ecosystem, exist environments known as hydrothermal vent systems where hot water surges out from the seafloor.

ScienceDaily - On the flipside the deep sea also features cold areas where methane rises from "seeps" on the ocean bottom.

It's extremely rare to find both habitat types intersecting in one place, but that's what researchers found and explored during an expedition in 2010 off Costa Rica. A description of the scientists' findings, including a large number of mysterious, undescribed species, is published in a study led by Lisa Levin of Scripps Institution of Oceanography at UC San Diego in the March 7 issue of the Proceedings of the Royal Society B (Biological Sciences).

Because researchers who study such areas primarily focus on hydrothermal vent systems or methane seeps, Levin and her colleagues were surprised to find a hybrid site in an area where only cold seeps have been previously reported. They coined the phrase "hydrothermal seep" to describe the ecosystem.

"The most interesting aspects of this site are the presence of vent-like and seep-like features together," said Levin, "along with a vast cover of tubeworms over large areas and a wealth of new, undescribed species."

A 'foundation' species of tubeworm found in hot vents and cold seeps. **Credit: Greg Rouse**

The researchers investigated the geochemical properties of the area -- known as the Jaco Scar at the Costa Rica margin where an underwater mountain is moving under a tectonic plate -- along with small organisms and microbes. Co-existing animals ranged from those known to primarily inhabit hot vents or cold seeps, along with "foundation" species that exist in both settings. In addition to tube worms the team documented fish, mussels, clam beds and high densities of crabs.

Because so little is known about the deep ocean, the researchers say it's likely that further hybrid or "mosaic" ecosystems remain undiscovered, possibly featuring marine life specialized to live in such an environment.

"There are plenty of surprises left in the deep sea," said Levin, director of the Scripps Center for Marine Biodiversity and Conservation. "Not only are there new species but there are almost certainly new communities and ecosystems to be discovered." "In this instance the human presence, in the submersible ALVIN, was key to our findings. The site had been visited remotely by other researchers, but it was not until human eyes saw shimmering water coming from beneath a large tubeworm bush that we really understood how special Jaco Scar is."

Coauthors of the paper include Greg Rouse, Geoffrey Cook and Ben Grupe of Scripps Institution of Oceanography; Victoria Orphan and Grayson Chadwick of the California Institute of Technology; Anthony Rathburn of Indiana State University; William Ussler III of Monterey Bay Aquarium Research Institute; Shana Goffredi of Occidental College; Elena Perez of the Natural History Museum in London; Anders Waren of the Swedish Museum of Natural History; and Bruce Strickrott of Woods Hole Oceanographic Institution.

The National Science Foundation supported the research. Assistance was provided by the Centro de Investigación en Ciencias del Mar y Limnología (CIMAR), Universidad de Costa Rica.

http://www.physorg.com/news/2012-03-vomit-bird-defence-predators.html

Vomit bird throws up a defence against predators

Babies of a bird species called the Eurasian roller vomit a foul-smelling orange liquid as a defence mechanism against predators, biologists have discovered.

Offspring of the bright-blue jackdaw-sized bird -- Latin name Coracias garrulus -- throw up the repugnant fluid when they are frightened in their nests, according to a paper appearing on Wednesday in the journal Biology Letters. Babies of a bird species called the Eurasian roller vomit a foul-smelling orange liquid as a defence mechanism against predators, biologists have discovered.

Offspring of the bright-blue jackdaw-sized bird -- Latin name Coracias garrulus -- throw up the repugnant fluid when they are frightened in their nests, according to a paper appearing on Wednesday in the journal Biology Letters.

Covered in vomit, the nestlings not surprisingly become less attractive as a snack, the team says. But the smell also alerts parents, returning to the nest, that a threatening incident has happened in their absence, they believe. The scientists tested the "olfactory cue" theory by visiting nests with 10-day-old nestlings inside.

They used a small paintbrush to daub a tiny amount of either lemon juice or vomit on the inside of the nest. Parents returning to a vomit-treated nest reacted with great caution, delaying the time when they would settle in the home.

Previous research has found that birds have a surprisingly wide range of defensive reactions.

For instance, the northern fulmar (Fulmaris glacialis) yawks up stomach oils against intruders that makes them lose their waterproof coating. And the common eider (Somateria mollissima) and northern shoveler (Anas acuta) have the ability to spray faeces on their eggs to deter mammal egg-thieves.

However, the Eurasian roller is the first bird that has been found to use a scent, derived in response to a threat, as a means of communication, says the paper. In that regard, it joins many other animals, from insects to humans, that use the "smell of fear" to warn fellow members of their species of an attack.

The study is led by Deseada Parejo of Spain's Estacio Experimental de Zonas Aridas.

http://www.eurekalert.org/pub_releases/2012-03/acs-sse030712.php

Strong scientific evidence that eating berries benefits the brain

Strong scientific evidence exists that eating berry fruits has beneficial effects on the brain and may help prevent age-related memory loss and other changes

Strong scientific evidence exists that eating blueberries, blackberries, strawberries and other berry fruits has beneficial effects on the brain and may help prevent age-related memory loss and other changes, scientists report. Their new article on the value of eating berry fruits appears in ACS' Journal of Agricultural and Food Chemistry.

In the article, Barbara Shukitt-Hale, Ph.D., and Marshall G. Miller point out that longer lifespans are raising concerns about the human toll and health care costs of treating Alzheimer's disease and other forms of mental decline. They explain that recent research increasingly shows that eating berry fruits can benefit the aging brain. To analyze the strength of the evidence about berry fruits, they extensively reviewed cellular, animal and human studies on the topic.

Their review concluded that berry fruits help the brain stay healthy in several ways. Berry fruits contain high levels of antioxidants, compounds that protect cells from damage by harmful free radicals. The two also report that berry fruits change the way neurons in the brain communicate. These changes in signaling can prevent inflammation in the brain that contribute to neuronal damage and improve both motor control and cognition. They suggest that further research will show whether these benefits are a result of individual compounds shared between berry fruits or whether the unique combinations of chemicals in each berry fruit simply have similar effects.

http://www.eurekalert.org/pub_releases/2012-03/uosd-mfb030712.php

Mechanism for Burgess Shale-type preservation

A team of researchers claims to have unlocked the mystery of the Burgess Shale in their study

The Burgess Shale of British Columbia is arguably the most important fossil deposit in the world, providing an astounding record of the Cambrian "Explosion," the rapid flowering of complex life from single-celled ancestors. While most of the fossil record is comprised of shells, teeth and bones, the Burgess Shale preserves the softer bits—the eyes, guts, gills and other delicate structures—of animals belonging to Earth's earliest complex ecosystems a half a billion years ago. The process for this extraordinary preservation remained a mystery since the initial discovery of the Burgess Shale in 1909 until now.

A team of researchers led by Robert Gaines, of Pomona College (USA), and Emma Hammarlund, of the Nordic Center for Earth Evolution (Denmark), claims to have unlocked the mystery of the Burgess Shale in their study, "Mechanism for Burgess Shale-type preservation," published in Monday the 5th of March in the Proceedings of the National Academy of Sciences. In addition to Gaines and Hammarlund, the team includes researchers from t Yunnan University (China), the University of Leicester (UK) and Guizhou University(China).

The team collected evidence from the Burgess Shale, two new drill cores from the Chengjiang deposit in Yunnan Province, China, and from five other principal Burgess Shale-type deposits in Utah and China. Using geochemical analysis involving the sulfur isotypes from pyrite (fool's gold), they found a striking global pattern that unlocks the key to the unusual preservation process.

The process begins with the very rapid burial of organisms in mud layers with little to no oxygen. The critical discovery by the research team was a layer of calcium carbonate cement, in all of the sites, laid on the sea floor soon after burial of the fossils in mud. This mineral carpet acted as a barrier to the microbial communities that would normally consume soft tissue organisms in two-three weeks. Because the microbes were prevented from degrading the soft tissues completely, the organic remains of animals were conserved, leading to the preservation of the extraordinary fossils found today.

"What turned out to be the important key for this type of preservation is the chemistry of the global sea water," explains Gaines. "The preservation was greatly aided by enhanced calcium carbonate concentrations in the Cambrian oceans and by depletion of oxygen and sulfate. Importantly, low oxygen concentrations in the global oceans during this interval of time limited the amount of sulfate, an important microbial nutrient."

In the past, researchers have focused on the fossils themselves, rather than the details of the sediments and their chemistry. Gaines and Hammarlund found it was necessary to unlock the mystery of the strange preservation—a sign that the environment was not normal.

The drill cores from the Chengjiang site were important because the heavy rains from the Himalayan monsoons in the area leach minerals, including pyrite and calcium carbonate, from the rocks that are exposed on the surface. With these cores, the team's unique collection of samples led to the recognition that unique aspects of early Paleozoic seawater chemistry that were key to the unusual Burgess-type soft-bodied fossil preservation—the low sulfate concentration, low-oxygen bottom water conditions, and the mineral carpet that aided in choking the hungry microbes—was a striking global pattern.

"I had little idea of what to expect from the geochemical data, which rarely can provide a 'silver bullet,' says Gaines. "I was literally floored. I have rarely seen geochemical data so convincing. My initial hypothesis was validated by a consistent and worldwide pattern."

http://bit.ly/AaGPZy

Treatment Allows Drug-Free Transplant Patients to Elude Graft-versus-Host Disease

Bone-marrow transfers prior to organ transplants could end the need for lifelong immunosuppression

By Elie Dolgin of Nature magazine

Graft-versus-host disease (GvHD) is a common and often deadly complication of bone-marrow transplantation that occurs when immune cells from an unrelated donor attack the transplant recipient's tissue. Now, researchers have for the first time managed to completely replace people's bone-marrow-derived stem cells with those from unrelated donors without causing GvHD. And because of this, the recipients could also accept kidneys from the same donors without the need for drugs that suppress the immune system.

"The outcome has been amazing," says Lindsay Porter, a 47-year-old Chicago resident with polycystic kidney disease who was one of the study subjects. She has been off immunosuppressive drugs for seven months. "I feel so normal, it feels like it's not a big deal."

But according to experts in the field, the findings, published today in Science Translational Medicine, are a huge deal. "It's kind of difficult to believe," says Tatsuo Kawai, a transplant surgeon at Massachusetts General Hospital in Boston, who wrote a commentary to accompany the paper. "It's almost common sense to have GvHD in mismatched individuals."

Facilitating tolerance

The latest study builds off of work Kawai and his colleagues began fourteen years ago, when they launched the first clinical trial that attempted to use bone marrow to induce immune tolerance for kidney recipients, to avoid the sometimes dangerous side effects of life-long immosuppressive therapy.

Working first in people with perfectly immune-matched siblings and then with partially mismatched donor-recipient pairs, the researchers showed that the majority of individuals could achieve stable kidney function and successfully wean off of their immunosuppressants with few problems -- in one case for up to nine years. But

the study subjects only maintained noticeable levels of the foreign bone marrow for a few weeks, and the protocol didn't work for everybody. Some researchers speculated that maintaining higher levels of donor immune cells for longer could help to improve the success rate.

For the latest study, a team led by Suzanne Ildstad, director of the University of Louisville's Institute for Cellular Therapeutics in Kentucky, found a way to avoid GvHD by using a regimen involving chemotherapy, radiation and blood stem cells manipulated to eliminate those that cause GvHD while retaining specialized bone-marrow-derived cells they called `facilitating cells'.

Ildstad and her colleagues report that five of eight people who underwent the treatment were able to stop all immunosuppressive therapy within a year after their kidney and stem-cell transplants, four of which came from unrelated donors. Notably, all of these patients maintained entirely donor-derived immune systems with no signs of GvHD. Ildstad and her team have since treated seven more people. "We continue to see good results," she says.

It might be premature, however, to say for certain that the trial participants are in the clear. "The question is: will these patients remain free of GvHD?" says David Sachs, director of the Transplantation Biology Research Center at Massachusetts General Hospital. "You would hope that it's true, but it's a little early to claim that."

Beyond organ transplants, many experts think that the protocol could be used to treat other diseases that require bone marrow transplants but for which there are severe shortages of matched donors. "This opens up bone-marrow transplants to virtually any patient out there with a haematological condition" such as leukaemia or sickle-cell anaemia, says John Tisdale, a haematologist at the US National Heart, Lung and Blood Institute in Bethesda, Maryland.

It remains unclear whether the secret to Ildstad's recipe is the facilitating cells or the timing of a certain chemotherapy drug, called cyclophosphamide, that is used to prevent graft rejection and GvHD. "The facilitating cell adds an extra level of complexity that might not be necessary," Tisdale says. The question is difficult to answer -- all of the study subjects received the facilitating cells.

Moreover, much about the cells themselves and the method used to isolate them remain shrouded in a veil of secrecy -- Ildstad is seeking a way to commercialize the approach through a company she founded called Regenerex, based in Louisville. "It's difficult to assess something that doesn't provide the key methodology," says Megan Sykes, director of the Columbia Center for Translational Immunology at Columbia University in New York. "Nobody is quite sure what these cells are."

http://bit.ly/wIKazH

Symptoms of late-stage Alzheimer's can be delayed

AT LAST, some good news for people with Alzheimer's.

Those in the later stages of the disease can benefit from taking donepezil and memantine, which delay the onset of more severe symptoms. Earlier evidence suggested that only people with mild to moderate symptoms benefited from the drugs, so doctors often halt treatment in the later stages of the disease.

Now, Robert Howard at King's College London and colleagues have shown that people with advanced Alzheimer's benefit too. They gave either one or both of the drugs to 285 people with Alzheimer's, who were already taking donepezil but had reached a point where they would normally stop.

The drugs delayed decline by four months in those who continued with one or both for the following year, compared with those on a placebo (The New England Journal of Medicine, vol 366, p 893). "It makes a huge difference - between being able and not able to feed yourself, for example," says Clive Ballard, director of research at the Alzheimer's Society in the UK.

As a bonus, a cheaper generic version of donepezil was launched last month.

Since it was first published, this article has been updated to correct Clive Ballard's job title

http://www.sciencedaily.com/releases/2012/03/120308062541.htm

Cannabinoid 2 Receptors Regulate Impulsive Behaviour

A new study led by the Neuroscience Institute of Alicante reveals how manipulating the endocannabinoid system can modulate high levels of impulsivity.

ScienceDaily - This is the main problem in psychiatric illnesses such a schizophrenia, bipolar disorder and substance abuse. Spanish researchers have for the first time demonstrated that the CB2 receptor, which has modulating functions in the nervous system, is involved in regulating impulsive behaviour.

"Such a result proves the relevance that manipulation of the endocannabinoid system can have in modulating high levels of impulsivity present in a wide range of psychiatric and neurological illness," explains Jorge Manzanares Robles, a scientist at the Alicante Neuroscience Institute and director of the study.

Carried out on mice, the study suggests the possibility of undertaking future clinical trials using drugs that selectively act on the CB2 and thus avoid the psychoactive effects deriving from receptor CB1 manipulation, whose role in impulsivity has already been proven.

However, the authors of the study published in the British Journal of Pharmacology remain cautious. Francisco Navarrete, lead author of the study, states that "it is still very early to be able to put forward a reliable therapeutic tool."

The study assessed the actions of two cannabinoid drugs that stimulate and block CB2 in the mouse strain showing high levels of impulsivity. The scientists then analysed whether these drugs were capable of modulating impulsive behaviour and the cerebral modifications associated with this change in behaviour.

The authors concluded that CB2 receptor activity modulation reduced impulsive behaviour in mice, depending on the patterns that governed the administration of each drug. Furthermore, the genetic expression levels of CB2 tended to return to normal, leaning towards strains that had little impulsivity.

The Endocannabinoid System

The Endocannabinoid System mainly comprises two receptors (CB1 and CB2), two endogenous ligands and two metabolism enzymes. It regulates many aspects of embryonic development and is involved in many homeostatic mechanisms.

Although it was thought that CB2 only regulates immune response on a peripheral level, a study published in the 'Science' journal in 2005 showed that it was found in the brain under normal conditions. Since then many authors have linked it to the regulation of emotional behaviour and cognitive functions.

For example, the same group of Spanish researchers has contributed greatly in applying this receptor in regulating anxiety and depression. Furthermore, others studies have demonstrated how their altered role is linked to increased chances of becoming depressed or anxious or taking drugs.

Virtue or defect?

Impulsivity is a personality trait characterised by behavioural actions that lack forethought or in which the subsequent consequences are not considered. The authors outline that this is "a normal behaviour that allows us as human beings to adapt to our surroundings under certain circumstances that require an immediate reaction."

Nonetheless, such behaviour can cause a disproportionate response and lead to a pathological state. There a multitude of psychiatric illness that are characterised by a high level of impulsivity. One of these includes substance abuse, which is extremely problematic for society in general.

Francisco Navarrete, José M. Pérez-Ortiz, Jorge Manzanares. Cannabinoid CB2 receptor-mediated regulation of impulsive-like behaviour in DBA/2 mice. British Journal of Pharmacology, 2012; 165 (1): 260 DOI: 10.1111/j.1476-5381.2011.01542.x

http://www.sciencedaily.com/releases/2012/03/120308062545.htm

The Darwin-Wallace Mystery Solved: Darwin Vindicated from Accusations of Deceit

A National University of Singapore. study has traced historical shipping records and vindicated Darwin from accusations of deceit.

ScienceDaily - For the past four decades, Charles Darwin had been accused of keeping the essay of fellow naturalist Alfred Russel Wallace for a fortnight, thereby enabling him to revise elements of his theory of evolution, before jointly announcing the theory of evolution by natural selection in July 1858. Just recently, two researchers from the National University of Singapore (NUS), supported by a private donation, reconstructed the route taken by Wallace's letter to Darwin from Ternate and provided evidence that Wallace sent the letter a month later than historians had always assumed, thus clearing Darwin of the accusations against him.

Dr John van Wyhe, a historian of science and Senior Lecturer in the Departments of Biological Sciences & History at NUS and his collaborator Dr Kees Rookmaaker, published their study, titled "A new theory to explain the receipt of Wallace's Ternate Essay by Darwin in 1848," in the Biological Journal of the Linnean Society in December 2011.

The controversy

Alfred Russel Wallace, the naturalist who spent eight years in Singapore and South East Asia between 1854 and 1862, discovered evolution by natural selection independently of Charles Darwin. Wallace had a dramatic eureka moment while living on the island of Ternate in the Moluccas (now Indonesia). He wrote up his ideas in an essay which he sent in 1858, to Charles Darwin, for him to pass on to noted geologist Charles Lyell. Darwin's accusers claim that he waited two weeks to do so, lying about the date of receipt to give himself time to revise his own ideas in the light of Wallace's.

Wallace's essay was published together with an essay by Darwin in 1858 and marks the first publication of the theory of evolution which then resulted in one of the greatest revolutions in the history of science.

How the mystery began

In 1972 a researcher found another letter from Wallace to a friend named Bates that was sent on the March 1858 steamer from the island of Ternate in modern Indonesia. The letter still bore postmarks from Singapore and London which showed that it arrived in London on 3 June 1858 -- two weeks before Darwin said he received the essay from Wallace. Thus began the mystery -- how could two letters from Wallace leave Ternate on the same steamer and travel along the same mail route back to London but Darwin received his two weeks later than Bates did? This mystery has led to numerous conspiracy theories. For example, several writers have claimed that Darwin stole ideas from Wallace's essay during the time he kept the letter secret. But most other evidence suggests that Darwin received the letter when he said he did.

So did Darwin receive the letter when he said he did, or not?

"I initially assumed that it was impossible to solve since so many historians had examined it before. But it occurred to me that we really have no contemporary evidence of when Wallace sent the essay to Darwin, only his much later recollection that he sent it by the next post after writing it in February. That suggested that the essay was sent in March 1858. But this recollection from years later seemed to me not very reliable as evidence of what really happened at the time. The other evidence that Darwin received it on 18 June 1858 seemed more likely. All of his correspondence changed dramatically after that date for example. Since that side of the correspondence was all one really had to go on, it occurred to me to trace the letter from Darwin's end, rather than Wallace's," said Dr van Wyhe.

If Darwin really received it on 18 June- how could it get there? It had come to his house in the countryside from London the day before, the 17th.

Dr van Wyhe then found that a steamer arrived in England the day before, the 16th with mail from India and South East Asia. This was surely not a coincidence -- Wallace's letter must have been on that ship. Dr van Wyhe then had to trace back the remainder of the 9,240 miles of the journey from England, through the Mediterranean, across Egypt, to Sri Lanka, Penang, Singapore, Jakarta and so on. His assistant on the Wallace Online project, Dr Kees Rookmaaker, who speaks Dutch, was an invaluable help as he was able to check the ship arrival and departure times in the Dutch newspapers and sources for the Dutch East Indies, while Dr van Wyhe went through the English newspapers. It was an exciting detective story tracing the connections that mail batch took from London to South East Asia.

"Eventually our mail itinerary was completed all the way back to Ternate and we were astonished to find that there was an unbroken series of mail connections to Ternate -- not in March as all other writers before had assumed, but in April 1858! My further research has clarified why Wallace mailed it later than we assumed and many other parts of this famous, but misunderstood chapter in the history of science," added Dr van Wyhe.

"First of all, we now know that Wallace was replying to an early letter from Darwin- and that letter from Darwin arrived in Ternate on the March steamer. We have assembled the first complete collection of all the surviving Wallace correspondence from Ternate and nearby islands. These reveal that he never replied to a letter on the same steamer which delivered it. Apparently the turn over time was too short. Therefore this is an additional reason to doubt that Wallace could have sent the famous letter to Darwin in March as so long assumed," said Dr van Wyhe.

Dr van Wyhe is currently completing a major new book on Wallace in South East Asia which aims to radically revise the traditional story of Wallace and his famous independent discovery of evolution.

Dr van Wyhe is the Director of the research project in Singapore -- Wallace Online, a website which aims to be the definitive and reliable source of Wallace's work. It will contain all of Wallace's books and article, as well as a complete collection of his specimens collected from South-east Asia, and much more, such as a revised itinerary of his whereabouts during these years and his notebooks edited for the first time to modern scholarly standards. The website will be launched in 2013, the centenary of the death of Wallace.

This study was supported by a generous private donation to the Darwin Online-Wallace Online projects.

http://www.eurekalert.org/pub_releases/2012-03/uoc--oow_1030812.php

Oldest organism with skeleton discovered in Australia

Finding fine-tunes understanding of life's evolution on Earth; informs search for extraterrestrial life

RIVERSIDE, Calif. – A team of paleontologists has discovered the oldest animal with a skeleton. Called Coronacollina acula, the organism is between 560 million and 550 million years old, which places it in the Ediacaran period, before the explosion of life and diversification of organisms took place on Earth in the Cambrian.

The finding provides insight into the evolution of life – particularly, early life – on the planet, why animals go extinct, and how organisms respond to environmental changes. The discovery also can help scientists recognize life elsewhere in the universe.

The Ediacaran Period, named after the Ediacara Hills of South Australia, ranges 630-542 million years ago. The Cambrian Period, marked by a rapid diversification of life-forms on Earth as well as the rise of mineralized organisms, ranges 542-488 million years ago.

This is a reconstruction of how Coronacollina would have appeared in life. Coronacollina remained in place on the sea floor, and may have used its spicules as support struts. Coronacollina resembles the Cambrian fossil sponge, Choia. The three raised points on the rim are evident, with a central hollow and four spicules extending from the cone rim.
Daniel Garson for Droser lab, UC Riverside

"Up until the Cambrian, it was understood that animals were soft bodied and had no hard parts," said Mary Droser, a professor of geology at the University of California, Riverside, whose research team made the discovery in South Australia. "But we now have an organism with individual skeletal body parts that appears before the Cambrian. It is therefore the oldest animal with hard parts, and it has a number of them - they would have been structural supports - essentially holding it up. This is a major innovation for animals."

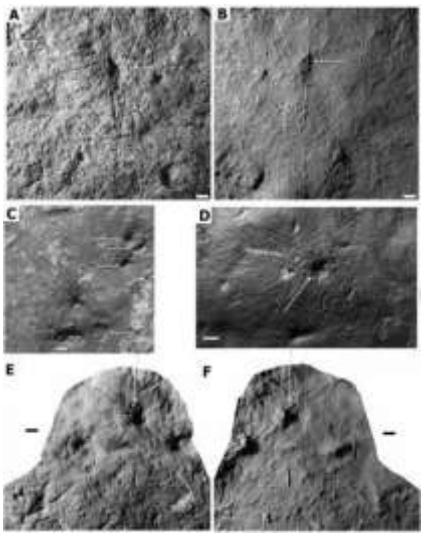
Coronacollina acula is seen in the fossils as a depression measuring a few millimeters to 2 centimeters deep. But because rocks compact over time, the organism could have been bigger – 3 to 5 centimeters tall. Notably, it is constructed in the same way that Cambrian sponges were constructed.

"It therefore provides a link between the two time intervals," Droser said. "We're calling it the 'harbinger of Cambrian constructional morphology,' which is to say it's a precursor of organisms seen in the Cambrian. This is tremendously exciting because it is the first appearance of one of the major novelties of animal evolution."

According to Droser, the appearance of Coronacollina acula signals that the initiation of skeletons was not as sudden in the Cambrian as was thought, and that Ediacaran animals like it are part of the evolutionary lineage of animals as we know them. "The fate of the earliest Ediacaran animals has been a subject of debate, with many suggesting that they all went extinct just before the Cambrian," she said. "Our discovery shows that they did not." Study results appeared online Feb. 14 in Geology.

The researchers note that Coronacollina acula lived on the seafloor. Shaped like a thimble to which at least four 20-40-centimeter-long needle-like "spicules" were attached, Coronacollina acula most likely held itself up by the spicules. The researchers believe it ingested food in the same manner a sponge does, and that it was incapable of locomotion. How it reproduced remains a mystery.

Coronacollina acula is so named because it translates as "little rimmed hill with needles" (corona – rim or crown; collis – hill; acula – needle). The name describes the fossil organism's morphology, and, specifically, its two components: the truncated cone-shaped body, which appears in the fossils as a pit, and the long brittle spicules, which appear in the fossils as thin grooves.



Ediacaran fossils often show the imprint of the whole body of the organism. With Coronacollina acula, however, skeletal parts were found to have fallen off.

"If you have soft parts holding your body together, then, as they decay, you lose your skeletal parts," Droser explained. "Which is why it's rare to find two clam shells together in fossils. We've now found whole organisms of Coronacollina acula – the thimble-shaped body in the center, with spicules coming off it like knitting needles. And we have found hundreds of them. They appear to have been a gregarious species, with a lot of them living together."

This shows the best Coronacollina specimens showing the main body with articulated spicules. Specimens originate from different field localities. Arrows indicate main body of Coronacollina. White/black bars indicate 1 cm. A, C, D and E are photographs of fossil impressions in the rock. B and F are latex casts showing how the fossils would have looked in life, after compression. **Droser lab, UC Riverside.**

Droser explained that the spicules had to have been mineralized because the casts show they are ruler-straight. Moreover, they broke. "We often associate skeletons with predation since skeletons greatly assist animals in their fight against predators," Droser said. "But Coronacollina acula used its skeleton only for support, there being no predators in the Ediacaran."

The research work began as a master's thesis project in Droser's lab. Erica Clites, now a physical science technician at Glen Canyon National Recreation Area for the National Park Service, chose to work on this project because it promised a good challenge with rewarding results.

"Every aspect of the organism's reconstruction had to be backed up by supporting statistics," said Clites, who graduated from UCR in 2009 and is the first author of the research paper. "Through painstaking measurements and detailed descriptions, the pits and needles contained in the rock were revealed as a sponge-like animal."

Droser and Clites were joined in the study by James G. Gehling of the South Australian Museum, Adelaide.

The research was supported by grants from NASA, the National Science Foundation, a UC Riverside John Dunham Field Grant, and an Australian Research Council Discovery Grant.

http://www.eurekalert.org/pub_releases/2012-03/nuos-suu030812.php

Sobered up using LSD

Journal of Psychopharmacology article examines intriguing evidence on the psychedelic drug

Forty years ago, LSD was used in the treatment of alcoholics - with good results. Perhaps it's time to look at it again?

In the 1950s, '60s and '70s, researchers in many places in the world experimented with LSD in the treatment of various disorders, including alcoholism. Not all experiments were scientifically tenable by today's standards, but some were. Now Teri Krebs and Pål-Ørjan Johansen, researchers at the Norwegian University of Science and Technology (NTNU), have taken a closer look at these experiments.

The results of all of these studies pointed in the same direction, which Krebs and Johansen say is quite clear: A single dose of LSD, provided for treatment purposes, helped heavy alcoholics and made it less likely that they would relapse.

"There has long been a need for better treatments for addiction. We think it is time to look at the use of psychedelics in treating various conditions," the researchers say.

536 alcoholics

The Norwegian researchers found six different studies of LSD and alcoholism that were scientifically sound, in which patients were randomly assigned, as if by tossing a coin, to receive either LSD or a comparison treatment. They combined all the data from these studies, involving a total of 536 people – the first such rigorous quantitative analysis in the world.

All of the studies were conducted either in the U.S. or Canada between 1966 and 1970. The studies all involved individuals who were admitted to treatment for alcoholism and who voluntarily participated in the trials. Nearly all were men.

Within each of the studies all patients were given the same treatment programme. But on one treatment day some patients were given a single large dose of LSD, while control patients received a low dose of LSD or a stimulant drug - or nothing. In some studies, during the duration of the drug effects, patients talked with a therapist, while in other studies, patients received only brief reassurance if they wanted. But all were encouraged to reflect on their alcohol problem.

Neither patients nor the individuals who were treating them knew in advance who would get a full dose of LSD.

Clear improvements - greater opportunities

"In independent and standardized follow-up examinations, ranging from one to twelve months later, all of the studies showed that the patients who had received a full dose of LSD fared the best. On average, 59 per cent of full-dose patients showed a clear improvement compared with 38 per cent in the other groups," say Krebs and Johansen.

LSD patients were less likely to relapse into problematic alcohol use and had higher levels of total abstinence. In some studies their relatives also reported the same findings. Many of the patients said they had gained a new appreciation for their alcohol problem and new motivation to address it.

These patients also reported greater self-acceptance and openness, as well as greater faith in their ability to deal with future problems.

Affects the brain

"We do not yet fully know why LSD works this way," the researchers admit. "But we know that the substance is non-toxic and that it is not addictive. We also know that it has a striking effect on the imagination, perception and memories."

The researchers explain that LSD interacts with a specific type of serotonin receptor in the brain.

"LSD may stimulate the formation of new connections and patterns, and generally seems to open an individual to an awareness of new perspectives and opportunities for action," they say.

Not followed up

By 1971 LSD had been banned for non-medical use, and although the drug was and is still permitted as an experimental medical treatment, it became increasingly difficult to conduct clinical trials. Despite the promising studies, LSD was claimed to have no demonstrated medical use. There may be several reasons for this, the researchers explained.

"The earliest studies reported promising results but also had methodological problems. Many scientists expected unrealistically good results from a single dose, and tended to ignore effects that lasted less than a year. Importantly, many of the individual studies did not have enough patients to reach a conclusion by themselves."

"But when we combine studies that had sound methodology, the results are unambiguous. We can therefore safely conclude that a single dose of LSD had a positive treatment effect that lasted at least six months," Krebs and Johansen said.

Should offer repeated doses

The improvement was greatest during the first few months of treatment. As the months passed, the effect gradually decreased.

"It is unusual for psychiatric drugs to have an effect that lasts for several months after a single dose. We now better understand that alcoholism is a chronic, relapsing disorder that typically requires ongoing treatment. The next step should be to periodically provide additional doses of LSD in combination with modern evidence-based treatment programs," the researchers conclude.

The meta-analysis is being published in the Journal of Psychopharmacology.

The work was financed by the Research Council of Norway and conducted during a research stay at Harvard Medical School. Krebs and Johansen are currently affiliated with the Department of Neuroscience at NTNU.

Reference: Teri S. Krebs and Pål-Ørjan Johansen: Lysergic acid diethylamide (LSD) for alcoholism: a meta-analysis of randomized controlled trials (Journal of Psychopharmacology) DOI:10.1177/0269881112439253

http://www.eurekalert.org/pub_releases/2012-03/hu-mm030812.php

Magnetic moon

Researchers suggest magnetic anomalies on the moon are the result of asteroid collision

In the nearly five decades since the first lunar surveys were conducted as part of NASA's Apollo program, scientists have advanced a number of increasingly complex theories to explain the vast swaths of highly magnetic material that had been found in the some parts of the Moon's crust.

But now a team of researchers from Harvard, MIT and the Institut de Physique du Globe de Paris, have proposed a surprisingly simple explanation for the unusual findings – the magnetic anomalies are remnants of a massive asteroid collision. As described in a paper published March 9 in Science, the researchers believe an asteroid slammed into the moon approximately 4 billion years ago, leaving behind an enormous crater and iron-rich, highly magnetic rock.

While there is evidence that the Moon once generated its own magnetic field, there is little to suggest it was strong enough to account for the anomalies seen in earlier surveys, Sarah Stewart-Mukhopadhyay, the John L. Loeb Associate Professor of the Natural Sciences, and one of three co-authors of the paper, said. To explain the findings, then, researchers turned to a number of elaborate scenarios.

"The conundrum has always been that the magnetism we see on the Moon is not correlated with any surface geology," she said. "The theory that has been most commonly cited to explain it is an 'impact-induced field,' in which an impact concentrates and amplifies the Moon's magnetic field. But it was difficult to test – people have tried to model it, but it is right at the edge of what could work.

"We have a simpler idea," she continued. "Because the fields in this area are stronger than those found in any normal lunar rocks, our hypothesis is that it isn't lunar material. We know the magnetic properties of asteroidal material are much higher than that of the Moon. It is possible that metallic iron from an asteroid could have been magnetized by the impact, and deposited on the Moon."

Ironically, their first clue came from the surveys that had long confounded scientists.

When combined with more recent, hyper-accurate topographical surveys of the Moon's surface, it quickly became clear that most of the magnetic anomalies are scattered around the rim of an enormous, 2,400 kilometer-diameter crater known as South Pole-Aitken.

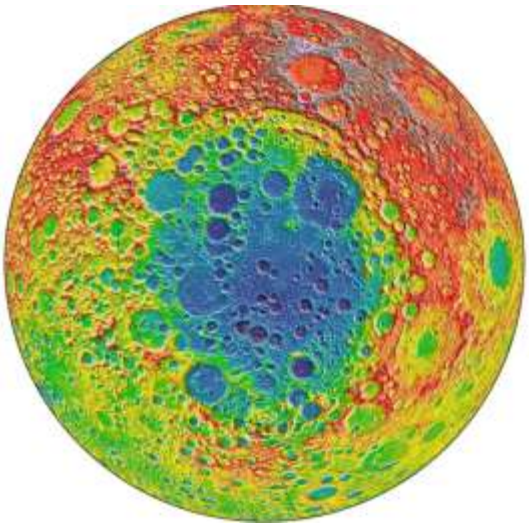
The oldest definitive structure on the Moon, the crater is between 3.9 and 4.5 billion years old, and is slightly elongated, suggesting it was formed by an object that struck the moon at an oblique angle.

Testing that hypothesis, however, proved tricky.

"The question was whether the projectile material could survive and stay on the Moon, and where it would end up," Stewart-Mukhopadhyay said. "What I did was model the impact and formation of the basin using computer codes that are typically used to model explosives."

To create those models, Stewart-Mukhopadhyay started with "equations of state," mathematical formulas that describe the asteroid and the Moon's crust, mantle and core. The far trickier part of modeling the impact, however, is in describing the rheology – the conditions under which each material deforms and flows.

"We modeled a number of scenarios using faster or slower impacts and more shallow or more vertical angles," she said. "Each time, the model produced similar results to what we see on the Moon."



Beyond its surprisingly simple explanation to a decades-old scientific puzzle, the paper suggests new ways to answer questions about what the early solar system was like, and how the magnetic fields of the planets were formed.

This LOLA image centers on the South Pole-Aitken (SPA) basin, the largest impact basin on the Moon (diameter = 2600 km), and one of the largest impact basins in the Solar System. The distance from its depths to the tops of the highest surrounding peaks is over 15 km, almost twice the height of Mount Everest on Earth. SPA is interesting for a number of reasons. To begin with, large impact events can remove surficial materials from local areas and bring material from beneath the impact craters to, or closer to, the surface. The larger the crater, the deeper the material that can be exposed. As SPA is the deepest impact basin on the Moon, more than 8 km (5 mi) deep, the deepest lunar crustal materials should be exposed here. In fact, the Moon's lower crust may be revealed in areas within SPA: something not found anywhere else on the Moon. **NASA/Goddard**

"We don't have much evidence of what was hitting the Earth before 3.9 billion years ago," Stewart-Mukhopadhyay said. "And there are some big questions about where those projectiles were coming from. Presumably if you picked up even the soil from this part of the Moon, you would have some of the material that came along with this large impact event.

"It may also be true that extra-terrestrial materials play a larger role in the magnetic fields of other planets than anyone has appreciated," she continued. "Magnetism is one of the clues that let us construct a geologic history of the surface of a planet. If we now have to consider that it may have come from a collision like this one, that's something we need to be aware of."

http://bit.ly/wtiprA

Microraptor's glossy black feather coat reconstructed

The unusual four-winged dinosaur Microraptor may have been coated with dark, iridescent feathers, an analysis of a newly discovered fossil suggests.

19:00 08 March 2012 by Jeff Hecht

The exquisitely preserved specimen also reveals that the 130-million-year-old beast carried a pair of long thin tail feathers. Both features suggest that early feathers evolved as much for display as for insulation, before they were adapted for flight.

Matthew Shawkey at the University of Akron in Ohio and colleagues used a scanning electron microscope to work out the colour and sheen of the fossil's feathers, using a technique developed by co-author Jakob Vinther, now at the University of Texas at Austin. Vinther recently used the approach to show that a feather from Archaeopteryx, a 150-million-year-old early bird, was black.

Microraptor feathers were also black, the new analysis reveals: they are full of tiny structures called melanosomes that contained light-absorbing pigment. The melanosomes' shape and arrangement is similar to that seen in living birds with iridescent feathers, suggesting that Microraptor also had an iridescent sheen.

The exquisitely well-preserved fossil of a Microraptor **(Image: Mick Ellison)**

Shake a tail feather

The new fossil is the first to clearly preserve the tip of Microraptor's long thin tail. Two thin feathers emerged at the tip, but they would have had little aerodynamic effect and may even have impaired flight, says Shawkey.

It's more likely that the tail feathers were used for display, says co-author Julia Clarke, also at the University of Texas. Other dinosaurs living in China at the same time had patterned tails that may have had a similar function.

It is possible that the feathers' iridescence added to the display. However, iridescence may evolve for other reasons. Earlier this year, Shawkey reported that golden moles have iridescent fur despite being blind burrow-dwellers. He speculated that the feature may help the mammals shed water or slip through their burrows with lower friction.

Knowing the colours of fossil animals "gives insight into what evolution is doing", says Alan Brush, an ornithologist at the University of Connecticut in Storrs who was not involved with the study. Microraptor belongs to the group of dinosaurs from which birds evolved. "This says birds have been using plumage patterns to tell each other apart since the dawn of their evolution," says Brush.

A reconstruction of the Microraptor, with colouring inferred from the current study and plumage based on the new fossil and previous specimens **(Image: Science/AAAS)**

Journal reference: Science, DOI: 10.1126/science.1213780

http://www.sciencedaily.com/releases/2012/03/120308174710.htm

Drug Helps Purge Hidden HIV

A team of researchers at the University of North Carolina at Chapel Hill has successfully flushed latent HIV infection from hiding, with a drug used to treat certain types of lymphoma.

ScienceDaily - Tackling latent HIV in the immune system is critical to finding a cure for AIDS.

The results were presented March 8 at the 19th Conference on Retroviruses and Opportunistic Infections in Seattle, Washington.

While current antiretroviral therapies can very effectively control virus levels, they can never fully eliminate the virus from the cells and tissues it has infected.

"Lifelong use of antiretroviral therapy is problematic for many reasons, not least among them are drug resistance, side effects, and cost," said David Margolis, MD, professor of medicine, microbiology and immunology, and epidemiology at the University of North Carolina at Chapel Hill. "We need to employ better long-term strategies, including a cure."

Margolis' new study is the first to demonstrate that the biological mechanism that keeps HIV hidden and unreachable by current antiviral therapies can be targeted and interrupted in humans, providing new hope for a strategy to eradicate HIV completely.

In a clinical trial, six HIV-infected men who were medically stable on anti-AIDS drugs, received vorinostat, an oncology drug. Recent studies by Margolis and others have shown that vorinostat also attacks the enzymes that keep HIV hiding in certain CD4+ T cells, specialized immune system cells that the virus uses to replicate. Within hours of receiving the vorinostat, all six patients had a significant increase in HIV RNA in these cells, evidence that the virus was being forced out of its hiding place.

"This proves for the first time that there are ways to specifically treat viral latency, the first step towards curing HIV infection," said Margolis, who led the study. "It shows that this class of drugs, HDAC inhibitors, can attack persistent virus. Vorinostat may not be the magic bullet, but this success shows us a new way to test drugs to target latency, and suggests that we can build a path that may lead to a cure."

The research conducted is part of a UNC-led consortium, the Collaboratory of AIDS Researchers for Eradication (CARE), funded by the National Institute of Allergy and Infectious Diseases. The consortium is administered by the North Carolina Translational and Clinical Sciences (NC TraCS) Institute at UNC, one of 60 medical research institutions in the US working to improve biomedical research through the NIH Clinical and Translational Science Awards (CTSA) program.

Other UNC authors on the paper include Nanci Archin, PhD, Shailesh Choudary, PhD, Joann Kuruc, MSN, and Joseph Eron, MD of the medical school; Angela Kashuba, PharmD of the Eshelman School of Pharmacy; and Michael Hudgens, PhD, of the Gillings School of Global Public Health.

Funding for this research was provided by the National Institutes of Health, Merck & Co., and the James B. Pendleton Charitable Trust.

http://bit.ly/wRYjrk

Extra female genes make men more masculine

NOW here's a brain bender: an extra set of female genes appears to make males more masculine.

09 March 2012 by Jessica Hamzelou

The surprising discovery suggests that sex chromosomes play a role in directing behaviour that extends beyond the effects of hormones.

"The predominant idea is that the difference between male and female behaviours is down to hormones," says Emilie Rissman at the University of Virginia in Charlottesville. This starts early in life - male fetuses are exposed to testosterone from 4 weeks old, while females are not.

To find out if sex chromosomes play a role in sex-specific behaviours beyond dictating which hormones are present, Rissman's team took advantage of a mutation in mice that causes the sex-determining region of the male Y chromosome to jump to a non-sex chromosome. The mice are male but have two X chromosomes.

While these XX male mice had the same level of testosterone as normal XY mice, they displayed more masculine sexual behaviours - mounting females more often and ejaculating more frequently.

To confirm that the differences were a result of a hidden factor on the X chromosome and not the lack of a Y chromosome, the team compared XY male mice with XXY male mice, which carry an extra X chromosome. Sure enough, the XXY mice also showed more male sexual behaviours (Hormones and Behaviour, DOI: 10.1016/j.yhbeh.2012.02.003).

The finding tallies with research that suggests a female's second "inactivated" X chromosome may actually express a quarter of its genes. These could alter the expression of genes on other chromosomes, and might be partly responsible for behavioural differences between the sexes, says Rissman.

"The extent to which these findings are generalisable to humans remains to be seen," says William Davies at Cardiff University, UK. However, the idea may provide an explanation for evidence that XXY men have more sex than men with the regular XY.

If Rissman's team can identify a region of the X chromosome that is linked to sexual activity, its protein products could be a target for libido-boosting therapies.

http://nyti.ms/xEq1jS

Nuclear Disaster in Japan Was Avoidable, Critics Contend

A year after a huge earthquake and tsunami caused nearly catastrophic meltdowns at a nuclear plant, Japan is still grappling with a crucial question: was the accident simply the result of an unforeseeable natural disaster or something that could have been prevented?

By MARTIN FACKLER

TOKYO - Japan's nuclear regulators and the plant's operator, Tokyo Electric Power, or Tepco, have said that the magnitude 9.0 earthquake and 45-foot tsunami on March 11 that knocked out cooling systems at the Fukushima Daiichi Nuclear Power Plant were far larger than anything that scientists had predicted. That conclusion has allowed the company to argue that it is not responsible for the triple meltdown, which forced the evacuation of about 90,000 people.

But some insiders from Japan's tightly knit nuclear industry have stepped forward to say that Tepco and regulators had for years ignored warnings of the possibility of a larger-than-expected tsunami in northeastern Japan, and thus failed to take adequate countermeasures, such as raising wave walls or placing backup generators on higher ground.

They attributed this to a culture of collusion in which powerful regulators and compliant academic experts looked the other way while the industry put a higher priority on promoting nuclear energy than protecting public safety. They call the Fukushima accident a wake-up call to Japan to break the cozy ties between government and industry that are a legacy of the nation's rush to develop after World War II.

"March 11 exposed the true nature of Japan's postwar system, that it is led by bureaucrats who stand on the side of industry, not the people," said Shigeaki Koga, a former director of industrial policy at the Ministry of Economics, Trade and Industry, or METI, which both promotes and regulates the nuclear industry.

One of those whose warnings were ignored was Kunihiko Shimazaki, a retired professor of seismology at the University of Tokyo. Eight years ago, as a member of an influential cabinet office committee on offshore earthquakes in northeastern Japan, Mr. Shimazaki warned that Fukushima's coast was vulnerable to tsunamis more than twice as tall as the forecasts of up to 17 feet put forth by regulators and Tepco.

Minutes of the meeting on Feb. 19, 2004, show that the government bureaucrats running the committee moved quickly to exclude his views from debate as too speculative and "pending further research." None of the other 13 academics on the committee objected. Mr. Shimazaki's warnings were not even mentioned in the

committee's final report two years later. He said the committee did not want to force Tepco to make expensive upgrades at the plant.

"They completely ignored me in order to save Tepco money," said Mr. Shimazaki, 65.

Mr. Shimazaki and others say the fault lay not in outright corruption, but rather complicity among like-minded insiders who prospered for decades by scratching one another's backs. They describe a structure in which elite career bureaucrats controlled rubber-stamp academic policy-making committees, while at the same time leaving it to industry to essentially regulate itself.

In one of the most widely watched reforms to come out of the Fukushima accident, the government is moving to restore trust in regulatory oversight by separating Japan's main nuclear regulatory agency from METI. In a bill now in Parliament, the government of Prime Minister Yoshihiko Noda wants to put the nuclear watchdog, the Nuclear and Industrial Safety Agency, known as NISA, into the more safety-minded Environmental Ministry as early as next month.

However, many here say targeting a single ministry does not go far enough in ending the murky links between government and industry. Critics like Mr. Koga, the former METI official, point to other, broader problems, such as the fact that Japan's regulators are not nuclear specialists, but are reliant for expertise on the very companies they are charged with monitoring.

At the Japan Nuclear Energy Safety Organization, for example, a government agency that carries out safety inspections on behalf of NISA, most of the inspectors are former employees of the power companies and reactor manufacturers who often wink at safety lapses to protect their former employers, says Setsuo Fujiwara, a former inspector.

Mr. Fujiwara, who used to design reactors, said he clashed with supervisors over an audit he conducted in March 2009 at the Tomari nuclear plant on the northern island of Hokkaido. Mr. Fujiwara said he refused to approve a routine test by the plant's operator, Hokkaido Electric Power, saying the test was flawed.

A week later, he said he was summoned by his boss, who ordered him to "correct" his written report to indicate that the test had been done properly. After Mr. Fujiwara refused, his employment contract was not renewed.

"They told me my job was just to approve reactors, not to raise doubts about them," said Mr. Fujiwara, 62, who is now suing the safety organization to get rehired. In a written response to questions from The New York Times, the agency said it could not comment while the court case was under way.

Tepco and its supporters say it is easy in hindsight to second-guess the company. They said no one could have been fully prepared for the magnitude 9.0 earthquake, the largest in Japan's recorded history, and giant tsunami that knocked out cooling systems at three of Fukushima Daiichi's six reactors.

But many experts and industry insiders disagree, saying the plant had ample warning, including from its own engineers.

In 2008, Tepco engineers made three separate sets of calculations that showed that Fukushima Daiichi could be hit by tsunamis as high as 50 feet, according to the company. A Tepco spokesman, Takeo Iwamoto, said Tepco did not tell regulators at NISA for almost a year, and then did not reveal the most alarming calculation, of a 50-foot wave, until March 7 of last year — four days before the tsunami actually struck.

Asked why the company did not move more quickly to strengthen defenses at the plant, he said that the calculations were considered "provisional estimates" based on academic theories that were not then widely accepted. Officials at NISA said regulators followed their standard procedure of leaving it to Tepco to conduct so-called back checks of tsunami defenses.

Critics say the same hands-off approach prevailed at the committees of outside experts that were supposed to serve as a check on regulators. Many former committee members, as well as current and former METI officials, say that bureaucrats not only tightly choreographed the topics for discussion by the committees, but also wrote the final reports on the committees' findings.

This was the case in a crucial revision of seismic guidelines for nuclear plants that was completed in 2006 by the Nuclear Safety Commission, said Katsuhiko Ishibashi, a retired seismologist at Kobe University who served on a committee to create the new guidelines for tsunami preparedness.

Mr. Ishibashi, who has long warned of the dangers posed by earthquakes to nuclear plants, said he often felt he was the token critic on the 22-member committee. He ended up quitting in anger during the last meeting in August 2006, after seeing a draft of the revised guidelines that, he said, contained none of his warnings.

"The bureaucrats held the real power because they wrote the report," said Mr. Ishibashi, 67. "Fukushima Daiichi is a disaster that could have been avoided." *Yasuko Kamiizumi and Makiko Inoue contributed reporting.*