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First Man Has Prostatectomy Because of *BRCA* Gene Mutation

The first man has undergone prostatectomy after finding that out that he carries the BRCA2 gene mutation.

Zosia Chustecka

UPDATED May 21, 2013 - *BRCA* gene mutations increase the risk for a number of cancers, including prostate cancer. They were in the news last week after superstar Angelina Jolie announced that she had a prophylactic mastectomy to avoid breast cancer. Hot on the heels of that extensive media coverage, news of the first prophylactic prostatectomy because of the genetic mutation made the front page of the *Sunday Times*.

The surgery was performed by Roger Kirby, MD, director of the Prostate Cancer Center in London, United Kingdom, an eminent prostate cancer specialist who has performed more than 2000 prostatectomies. Ironically, he himself recently underwent radical prostatectomy after prostate cancer was found.

The man who underwent surgery was participating in a clinical trial, conducted by the Institute of Cancer Research (ICR), that involved more than 20,000 men. Previous results from this trial have shown that a man with a *BRCA2* mutation has an 8.6-fold increased risk of developing prostate cancer, and with a *BRCA1* mutation has a 3.4-fold increased risk. Just weeks ago, the ICR researchers reported that prostate cancer in men with the *BRCA2* mutation is more aggressive and more likely to be fatal (*J Clin Oncol*. 2013;31:1748-1757).

"Knowing you are a carrier is like having the sword of Damocles hanging over you," Dr. Kirby said in an interview with the *Sunday Times*. "You are living in a state of constant fear. I am sure more male *BRCA* carriers will follow suit."

The man who underwent the surgery is described as a 53-years-old businessman from London who is married with children and has several family members who have had breast or prostate cancer. When he found out he was carrying the *BRCA2* mutation, he asked to have his prostate removed.

Initially, the ICR researchers were reluctant, the newspaper reports, because there was no indication of a problem, either from prostate-specific antigen tests or from a magnetic resonance imaging scan. However, a biopsy showed microscopic malignant changes. Even then, however, Dr. Kirby said he would not have operated if the man had not been identified as a carrierof the *BRCA2* gene mutation.

"The relatively low level of cancerous cells we found in this man's prostate before the operation should, these days, not prompt immediate surgery to remove the gland, but given what we now know about the nature of *BRCA2*, it was definitely the right thing to do for this patient," he told the newspaper.

BRCA2 Prostate Cancer Aggressive and Lethal

When the results of the ICR study showing that prostate cancer in men with *BRCA2* mutations is both aggressive and lethal were first published, senior author Ros Eeles, MBBS, PhD, professor of oncogenetics at the ICR and honorary consultant in clinical oncology at The Royal Marsden NHS Foundation Trust in Surrey, United Kingdom, said that "it is clear from our study that prostate cancers linked to inheritance of the *BRCA2* cancer gene are more deadly than other types."

"It must make sense to start offering affected men immediate surgery or radiotherapy, even for early-stage cases that would otherwise be classified as low risk. We won't be able to tell for certain that earlier treatment can benefit men with inherited cancer genes until we've tested it in a clinical trial, but the hope is that our study will ultimately save lives by directing treatment at those who most need it," she said in an ICR statement.

The ICR research team examined the medical records of 61 carriers of the *BRCA2* mutation, 18 carriers of the *BRCA1* mutation, and 1940 noncarriers.

They found that *BRCA1/2* mutation carriers were more likely than noncarriers to be diagnosed with advanced-stage prostate cancer (37% vs 28%) or cancer that had already spread (18% vs 9%). For those whose cancers had not spread past the prostate at diagnosis, more carriers than noncarriers had metastatic disease within 5 years (23% vs 7%). Patients with *BRCA2* mutations were also significantly less likely to survive the cancer; survival was significantly shorter in carriers of the mutation than noncarriers (6.5 vs 12.9 years). The researchers conclude that a *BRCA2* test could be used in combination with other factors as a prognostic test.

Men with a *BRCA1* mutation also had a shorter average survival time (10.5 years), but it was not significantly different from noncarriers.

Alan Ashworth, PhD, chief executive of ICR, explained that testing for the *BRCA2* gene has "offered families with an inherited risk for prostate or breast cancer the chance for close monitoring, earlier diagnosis, and preventative management. Our knowledge of cancer genetics is now increasingly shaping the way we treat the disease, by allowing us to offer more intensive treatment, or even different drugs altogether, for people who have inherited cancer genes."

Julie Sharp, MD, senior science information manager at Cancer Research UK, noted that "this study shows that doctors need to consider treating men with prostate cancer and a faulty *BRCA2* gene much sooner than they

currently do, rather than waiting to see how the disease develops. We've known that men who inherit a faulty *BRCA2* gene are at greater risk of developing prostate cancer, but this is the largest study to show that the faulty gene also makes the disease more likely to develop quickly and spread."

Decision Based on Emotion, Not Data

"The issue of performing a so-called prophylactic prostatectomy because the man is a carrier of the *BRCA* gene raises many complexities," said Marc Garnick, MD, clinical professor of medicine at the Beth Israel Deaconess Medical Center in Boston, Massachusetts. Dr. Garnick, who is editor-in-chief of the *Harvard Annual Report on Prostate Diseases*, was approached for comment by *Medscape Medical News.*

According to the news report, this man "had actual evidence of prostate cancer, as determined by the presence of malignant cells in his prostate gland.... This is not necessarily comparable to a woman without any evidence of cancer - just a heightened risk of developing cancer - selecting prophylactic mastectomy because she is a *BRCA* gene carrier," Dr. Garnick pointed out.

This patient is totally representative of the population of men who would have undergone radical prostatectomy in the past, he explained. "However, recent controversies about the harm resulting from these procedures performed on men with otherwise only microscopic cancers has brought this practice into sharper focus."

The recent ICR results suggesting that male *BRCA* carriers who have prostate cancer have more aggressive cancers is "of interest, but preliminary, and worthy of additional study," Dr. Garnick noted.

Prophylactic radical prostatectomy...is based predominantly on emotions, not data. Dr. Marc Garnick

"The real unanswered question relates to whether our current interventions, if applied to this group of men with aggressive cancers, either with or without *BRCA* mutations, will ultimately have a positive impact on the course of the disease. Pessimistically, most of the level 1 data suggest this not the case, but the potential association between *BRCA* with more aggressive prostate cancers provides a fertile ground for appropriately conducted clinical research to help answer the question for the patients we serve," Dr. Garnick explained.

"Currently, a man's decision to undergo a prophylactic radical prostatectomy because he is carrying the *BRCA* gene is based predominantly on emotions, not data. Medical science is charged with determining if this is ultimately the right thing to do, and only appropriately conducted clinical research can answer this question," he said.

http://www.eurekalert.org/pub_releases/2013-05/tjnj-ppi052313.php

Patient participation in decision making associated with increased costs, services

Patient participation in decision making was associated with a longer length of stay and higher total costs

A survey of almost 22,000 admitted patients at the University of Chicago Medical Center found patient preference to participate in decision making concerning their care was associated with a longer length of stay and higher total hospitalization costs, according to a report published online by JAMA Internal Medicine.

Hyo Jung Tak, Ph.D., and colleagues examined the relationship between patient preferences for participation in medical decision making and health care utilization among patients hospitalized between July 1, 2003 and August 31, 2011 by asking patients to complete a survey. The survey data were then linked with administrative data, including length of stay and total hospitalization costs. Nearly all of the patients indicated they wanted information about their illnesses and treatment options, but just over 70 percent preferred to leave the medical decisions to their physician. "Preference to participate in medical decision making increased with educational level and with private health insurance," the authors note. "…patients who preferred to participate in decision making concerning their care had a 0.26-day longer length of stay and $865 higher total hospitalization costs."

In conclusion the authors write: "That patient preference for participation is associated with increased resource use contrasts with some perspectives on shared decision making that emphasize reductions of inappropriate use. However, in the presence of physician incentives to decrease use, such as exist for hospitalized patients and are likely to increase under health reform, increased resource use may occur. Future studies related to patient participation in decision making should examine effects on both outcomes and costs."

(JAMA Intern Med. Published online May 27, 2013. doi: 10.1001/jamainternmed.2013.6048.

http://www.eurekalert.org/pub_releases/2013-05/uoq-tap052713.php

The Antarctic polar icecap is 33.6 million years old

Seasonal primary productivity of plankton communities appeared with the first ice

The Antarctic continental ice cap came into existence during the Oligocene epoch, some 33.6 million years ago, according to data from an international expedition led by the Andalusian Institute of Earth Sciences (IACT) - a Spanish National Research Council-University of Granada joint centre. These findings, based on information contained in ice sediments from different depths, have recently been published in the journal Science.

Before the ice covered Antarctica, the Earth was a warm place with a tropical climate. In this region, plankton diversity was high until glaciation reduced the populations leaving only those capable of surviving in the new climate.
The Integrated Ocean Drilling Program international expedition has obtained this information from the paleoclimatic history preserved in sediment strata in the Antarctic depths. IACT researcher Carlota Escutia, who led the expedition, explains that "the fossil record of dinoflagellate cyst communities reflects the substantial reduction and specialization of these species that took place when the ice cap became established and, with it, marked seasonal ice-pack formation and melting began".
The appearance of the Antarctic polar icecap marks the beginning of plankton communities that are still functioning today. This ice-cap is associated with the ice-pack, the frozen part that disappears and reappears as a function of seasonal climate changes.
The article reports that when the ice-pack melts as the Antarctic summer approaches, this marks the increase in primary productivity of endemic plankton communities. When it melts, the ice frees the nutrients it has accumulated and these are used by the plankton. Dr Escutia says "this phenomenon influences the dynamics of global primary productivity".
Since ice first expanded across Antarctica and caused the dinoflagellate communities to specialize, these species have been undergoing constant change and evolution. However, the IACT researcher thinks "the great change came when the species simplified their form and found they were forced to adapt to the new climatic conditions".
Pre-glaciation sediment contained highly varied dinoflagellate communities, with star-shaped morphologies. When the ice appeared 33.6 million years ago, this diversity was limited and their activity subjected to the new seasonal climate.
Alexander J. P. Houben, Peter K. Bijl, Jörg Pross, Steven M. Bohaty, Sandra Passchier, Catherine E. Stickley, Ursula Röhl, Saiko Sugisaki, Lisa Tauxe, Tina van de Flierdt, Matthew Olney, Francesca Sangiorgi, Appy Sluijs, Carlota Escutia Henk Brinkhuis and the Expedition 318 Scientists. Reorganization of Southern Ocean Plankton Ecosystem at the Onset of Antarctic Glaciation. Science. DOI: 10.1126/science.1223646

http://www.sciencedaily.com/releases/2013/05/130528091624.htm

Aspirin Triggered Resolvin Protects Against Cognitive Decline After Surgery

Resolvins could protect against the cognitive impairment that often affects recovery of surgical and critically ill patients

Resolvins are molecules naturally produced by the body from omega-3 fatty acids - a process that can be jumpstarted by common aspirin. In a new study, published in The FASEB Journal, researchers at Karolinska Institutet describe how resolvins could protect against the cognitive impairment that often affects recovery of surgical and critically ill patients. The study adds new knowledge on how peripheral surgery affects the brain and neuronal function contributing to the processes of cognitive decline.
Hospitalization for surgery or critical illness can lead to cognitive dysfunction in some patients, especially the elderly. This is often reported as inattention, disorganized thinking, altered consciousness and prolonged disruptions in learning and memory functions. The mechanisms whereby surgery and/or anesthesia may lead to cognitive impairment remain unclear, but the researchers behind the current study have previously demonstrated that inflammation and release of pro-inflammatory molecules, like cytokines, play an important role in causing brain inflammation and cognitive decline after surgery.
Today there is no effective treatment for postoperative cognitive dysfunctions. However, the results now presented in The FASEB Journal suggest that it is possible to prevent and treat this condition by turning off and 'resolving' the inflammation that underlies surgery-induced cognitive decline. In the current preclinical study, treatment with a single dose of aspirin-triggered resolvin D1 (AT-RvD1), a substance from the omega-3 fatty acid docosahexaenoic acid (DHA), protected the brain from memory dysfunction after surgery.
The treatment also had an effect on neuronal function when given 24 hours after surgery. In their study, the researchers also further describe how surgery affects brain function in general, contributing to processes of neuroinflammation and memory impairment.
"We report a novel role for AT-RvD1 in restoring memory dysfunction after surgery," says Dr. Niccolò Terrando, Assistant Professor at the Department of Physiology and Pharmacology, who lead the study. "It was remarkable that AT-RvD1 displayed such unexpected effects on the central nervous system when administered at very low doses in the systemic circulation using this surgical model."
"Aspirin works as an anti-inflammatory by lowering the levels of prostaglandins and thromboxanes but in the presence of essential omega-3 fatty acids can also increases the body's own production of various lipid mediators, including resolvins like AT-RvD1, which promote resolution of inflammatory processes," says

Professor Lars I Eriksson, head of the research group behind these findings at the Section of Anesthesiology and Intensive Care Medicine at Karolinska Institutet. "These molecules, aside from reversing inflammation, also promote healing and tissue regeneration that are of relevance to patient safety and recovery. We hope to apply these therapies to prevent cognitive decline in at-risk surgical patients by translating our findings into patient care."

The study was supported by grants from the Swedish Research Council, Thorsten Söderberg Foundation and European Society of Anesthesiology (ESA), amongst others.

N. Terrando, M. Gomez-Galan, T. Yang, M. Carlstrom, D. Gustavsson, R. E. Harding, M. Lindskog, L. I. Eriksson. Aspirin-triggered resolvin D1 prevents surgery-induced cognitive decline. The FASEB Journal, 2013; DOI: 10.1096/fj.13-230276

http://www.eurekalert.org/pub_releases/2013-05/uos-rsc052813.php

Research shows copper destroys norovirus

New research from the University of Southampton shows that copper and copper alloys will rapidly destroy norovirus – the highly-infectious sickness bug.

The virus can be contracted from contaminated food or water, person-to-person contact, and contact with contaminated surfaces, meaning surfaces made from copper could effectively shut down one avenue of infection.

Worldwide, norovirus is responsible for more than 267 million cases of acute gastroenteritis every year. There is no specific treatment or vaccine, and outbreaks regularly shut down hospital wards and care homes, requiring expensive deep-cleaning, incurring additional treatment costs and resulting in lost working days when staff are infected. Its impact is also felt beyond healthcare, with cruise ships and hotels suffering significant damage to their reputation when epidemics occur among guests.

Professor Bill Keevil, Chair in Environmental Healthcare at the University of Southampton and lead researcher, presented his work at the American Society for Microbiology's 2013 General Meeting last week. The presentation showed norovirus was rapidly destroyed on copper and its alloys, with those containing more than 60 per cent copper proving particularly effective. The contamination model used was designed to simulate fingertip-touch contamination of surfaces.

Professor Keevil from the University's Institute for Life Sciences, says: "Copper alloy surfaces can be employed in high-risk areas such as cruise ships and care homes, where norovirus outbreaks are hard to control because infected people can't help but contaminate the environment with vomiting and diarrhoea.

"The virus can remain infectious on solid surfaces and is also resistant to many cleaning solutions. That means it can spread to people who touch these surfaces, causing further infections and maintaining the cycle of infection. Copper surfaces, like door handles and taps, can disrupt the cycle and lower the risk of outbreaks."

For more information and scientific references, visit http://www.antimicrobialcopper.org

http://www.eurekalert.org/pub_releases/2013-05/m-mpi052813.php

Malaria protection in chimpanzees

Researchers found that adult wild chimpanzees have developed a certain immunity against malaria parasites

Wild great apes are widely infected with malaria parasites. Yet, nothing is known about the biology of these infections in the wild. Using faecal samples collected from wild chimpanzees, an international team of researchers from the Max Planck Institute for Evolutionary Anthropology in Leipzig and the Robert Koch Institute in Berlin has now investigated the effect of the animals' age on malaria parasite detection rates. The data show a strong association between age and malaria parasite positivity, with significantly lower detection rates in adult chimpanzees. This suggests that, as in humans, individuals reaching adulthood have mounted an effective protective immunity against malaria parasites.

In malaria regions the parasite prevalence in the human body as well as malaria-related morbidity and mortality decrease with age. This reflects the progressive mounting of a protective immunity. Researchers of the Max Planck Institute for Evolutionary Anthropology and the Robert Koch Institute now present a study which addresses the age distribution of malaria parasite infection in a group of wild chimpanzees.

To this end the researchers collected 141 faecal samples from seven female and 12 male wild chimpanzees from Taï National Park, Cote d'Ivoire. At time of sampling the animals' ages ranged between 3 and 47 years. The researchers extracted DNA from the faecal samples, analysed it and so identified the malaria parasite-positive samples. "In the course of this 2-month study almost every individual chimpanzee of the group was found positive at least once", says Hélène De Nys of the Max Planck Institute for Evolutionary Anthropology and the Robert Koch Institute. "Our data further suggest that at every point in time at least one individual of this chimpanzee group is infected".

Further analyses showed that malaria parasites were detected more often in younger than in older animals. Whether these were female or male, however, did not make a difference. "This is the first indication that

epidemiological characteristics of malaria parasite infection in wild chimpanzee populations might be comparable to those in human populations", says Roman Wittig of the Max Planck Institute for Evolutionary Anthropology. "As in humans, the development of acquired immunity likely plays an important role in wild chimpanzees as well".

Throughout this process, malaria parasites might also contribute directly to decimating young chimpanzees. During analyses performed on more than 30 dead adult chimpanzees from the same community malaria could be excluded as the cause of death. For young chimpanzees, however, the question remains open. While it is known that mortality in young chimpanzees is high, their bodies are rarely accessible. This is because they are less likely to be found and because their carcasses are carried for several days by their mothers. "Even though at this stage, we cannot pinpoint pathogenicity of malaria parasites found in wild chimpanzees, our results suggest a continuous exposure of this population, leading to the development of a certain resistance to infection", says Fabian Leendertz of the Robert Koch Institute.

Hélène M. De Nys, Sébastien Calvignac-Spencer, Ursula Thiesen, Christophe Boesch, Roman M. Wittig, Roger Mundry and Fabian H. Leendertz Age-related effects on malaria parasite infection in wild chimpanzees
Biology Letters, May 29, 2013, DOI: http://dx.doi.org/10.1098/rsbl.2012.1160

http://phys.org/news/2013-05-discovery-furthers-superconductivity.html

Discovery furthers understanding of superconductivity

Crucial ingredient of high-temperature superconductivity could be found in an entirely different class of materials

Phys.org - Physicists at the University of Arkansas have collaborated with scientists in the United States and Asia to discover that a crucial ingredient of high-temperature superconductivity could be found in an entirely different class of materials.

"There have been more than 60,000 papers published on high-temperature superconductive material since its discovery in 1986," said Jak Chakhalian, professor of physics at the University of Arkansas. "Unfortunately, as of today we have zero theoretical understanding of the mechanism behind this enigmatic phenomenon. In my mind, the high-temperature superconductivity is the most important unsolved mystery of condensed matter physics."

Superconductivity is a phenomenon that occurs in certain materials when cooled to extremely low temperatures such as negative-435 degrees Fahrenheit. High-temperature superconductivity exists at negative-396 degrees Fahrenheit. In both cases electrical resistance drops to zero and complete expulsion of magnetic fields occurs. Superconductors have the ability to transport large electrical currents and produce high magnetic fields, which means they hold great potential for electronic devices and power transmission. The recent finding by the University of Arkansas-led team is important to further understand superconductivity, Chakhalian said.

An article detailing the finding, "Zhang-Rice physics and anomalous copper states in A-site ordered perovskites" was published Monday, May 13, in Scientific Reports, an online journal published by the journal Nature.

Derek Meyers, a doctoral student in physics at the U of A, found that the way electrons form in superconductive material - known as the Zhang-Rice singlet state - was present in a chemical compound that is very different from conventional superconductors.

"There is now a whole different class of materials where you can search for the enigmatic superconductivity," Chakhalian said. "This is completely new because we know that the Zhang-Rice quantum state, which used to be the hallmark of this high-temperature superconductor, could be found in totally different crystal structures. Does it have a potential to become a novel superconductor? We don't know but it has all the right ingredients."

Meyers was the lead researcher. Srimanta Middey, a postdoctoral research associate at the university and Benjamin A. Gray, a doctoral student, performed the theoretical calculations and analyzed the experimental data obtained at the X-ray synchrotron at Argonne National Laboratory near Chicago.

In the mid-1980s, physicists determined that all high-temperature superconductive material must contain copper and oxygen and those elements arrange two-dimensionally.

In this material the electrons combine into a unique quantum state called the Zhang-Rice singlets, Chakhalian explained.

"I can make a closed circuit out of the superconducting material, cool it down and attach a battery that starts the flow of the electrons. The current goes around the loop. Then I detach it and leave it. Hypothetically, 1 billion years later the flow of electrons is guaranteed to be exactly the same - with no losses," he said. "But the problem is we don't know if we are even using it right. We have no microscopic understanding of what is behind it."

More information: www.nature.com/srep/2013/130513/srep01834/full/srep01834.html

http://www.eurekalert.org/pub_releases/2013-05/whoi-sfp052813.php

Scientists find possible solution to an ancient enigma

The widespread disappearance of stromatolites, the earliest visible manifestation of life on Earth, may have been driven by single-celled organisms called foraminifera.

The findings, by scientists at Woods Hole Oceanographic Institution (WHOI); Massachusetts Institute of Technology; the University of Connecticut; Harvard Medical School; and Beth Israel Deaconess Medical Center, Boston, were published online the week of May 27 in the Proceedings of the National Academy of Sciences.

Stromatolites ("layered rocks") are structures made of calcium carbonate and shaped by the actions of photosynthetic cyanobacteria and other microbes that trapped and bound grains of coastal sediment into fine layers. They showed up in great abundance along shorelines all over the world about 3.5 billion years ago.

Stromatolites, once widespread in coastal areas, now thrive in just a few locations in the tropical Atlantic and Indian Oceans and in some very salty lakes. The formations seen here are near Shark Bay on the western coast of Australia. The cyanobacteria in stromatolites live very near the surface of the rock, where they can receive the sunlight they need to photosynthesize. **Virginia Edgcomb, Woods Hole Oceanographic Institution**

"Stromatolites were one of the earliest examples of the intimate connection between biology - living things - and geology - the structure of the Earth itself," said WHOI geobiologist Joan Bernhard, lead author of the study. The growing bacterial community secreted sticky compounds that bound the sediment grains around themselves, creating a mineral "microfabric" that accumulated to become massive formations. Stromatolites dominated the scene for more than two billion years, until late in the Proterozoic Eon.

"Then, around 1 billion years ago, their diversity and their fossil abundance begin to take a nosedive," said Bernhard. All over the globe, over a period of millions of years, the layered formations that had been so abundant and diverse began to disappear. To paleontologists, their loss was almost as dramatic as the extinction of the dinosaurs millions of years later, although not as complete: Living stromatolites can still be found today, in limited and widely scattered locales, as if a few velociraptors still roamed in remote valleys.

While the extinction of the dinosaurs has largely been explained by the impact of a large meteorite, the crash of the stromatolites remains unsolved. "It's one of the major questions in Earth history," said WHOI microbial ecologist Virginia Edgcomb, a co-author on the paper.

Just as puzzling is the sudden appearance in the fossil record of different formations called thrombolites ("clotted stones"). Like stromatolites, thrombolites are produced through the action of microbes on sediment and minerals. Unlike stromatolites, they are clumpy, rather than finely layered.

It's not known whether stromatolites became thrombolites, or whether thrombolites arose independently of the decline in strombolites. Hypotheses proposed to explain both include changes in ocean chemistry and the appearance of multicellular life forms that might have preyed on the microbes responsible for their structure.

Bernhard and Edgcomb thought foraminifera might have played a role. Foraminifera (or "forams," for short) are protists, the kingdom that includes amoeba, ciliates, and other groups formerly referred to as "protozoa." They are abundant in modern-day oceanic sediments, where they use numerous slender projections called pseudopods to engulf prey, to move, and to continually explore their immediate environment. Despite their known ability to disturb modern sediments, their possible role in the loss of stromatolites and appearance of thrombolites had never been considered.

The researchers examined modern stromatolites and thrombolites from Highborne Cay in the Bahamas for the presence of foraminifera. Using microscopic and rRNA sequencing techniques, they found forams in both kinds of structures. Thrombolites were home to a greater diversity of foraminifera and were especially rich in forams that secrete an organic sheath around themselves. These "thecate" foraminifera were probably the first kinds of forams to evolve, not long (in geologic terms) before stromatolites began to decline.

"The timing of their appearance corresponds with the decline of layered stromatolites and the appearance of thrombolites in the fossil record," said Edgcomb. "That lends support to the idea that it could have been forams that drove their evolution."

Next, Bernhard, Edgcomb, and postdoctoral investigator Anna McIntyre-Wressnig created an experimental scenario that mimicked what might have happened a billion years ago.

"No one will ever be able to re-create the Proterozoic exactly, because life has evolved since then, but you do the best you can," Edgcomb said.

They started with chunks of modern-day stromatolites collected at Highborne Cay, and seeded them with foraminifera found in modern-day thrombolites. Then they waited to see what effect, if any, the added forams had on the stromatolites.
After about six months, the finely layered arrangement characteristic of stromatolites had changed to a jumbled arrangement more like that of thrombolites. Even their fine structure, as revealed by CAT scans, resembled that of thrombolites collected from the wild. "The forams obliterated the microfabric," said Bernhard.
That result was intriguing, but it did not prove that the changes in the structure were due to the activities of the foraminifera. Just being brought into the lab might have caused the changes. But the researchers included a control in their experiment: They seeded foraminifera onto freshly-collected stromatolites as before, but also treated them with colchicine, a drug that prevented them from sending out pseudopods. "They're held hostage," said Bernhard. "They're in there, but they can't eat, they can't move."
After about six months, the foraminifera were still present and alive - but the rock's structure had not become more clotted like a thrombolite. It was still layered.
The researchers concluded that active foraminifera can reshape the fabric of stromatolites and could have instigated the loss of those formations and the appearance of thrombolites.

http://phys.org/news/2013-05-real-impact-chernobyl-accident.html

The real impact of the Chernobyl accident

Impact of the Chernobyl nuclear accident has been seriously overestimated

The impact of the Chernobyl nuclear accident has been seriously overestimated, while unfounded statements presented as scientific facts have been used to strangle the nuclear industry, according to Russian researchers. Writing in the International Journal of Low Radiation, Sergei Jargin of the Peoples' Friendship University of Russia in Moscow, suggests that the health effects of food contamination in particular have been distorted in anti-industry propaganda.
Jargin has analyzed the scientific research literature and after the 25th anniversary of the Chernobyl accident, and has investigated the motives and mechanisms of the overestimation of medical risks in an attempt to finally clarify the issues surrounding the Chernobyl legacy. He points out that there are examples in the literature that he considers inaccurate. Moreover, many of these publications cite what Jargin refers to as "numerous references to mass media, websites of unclear affiliation and commercial editions, used to corroborate scientific views," as opposed to properly referenced, peer-reviewed scientific publications.
"Today, there are no alternatives to nuclear power: fossil fuels will become increasingly expensive, contributing to excessive population growth in fuel-producing countries and poverty elsewhere," the Jargin says. He adds that, "Natural sources of power generation like wind, solar, geothermal, hydroelectric power and electricity from combustible renewables and waste will make a contribution, but their share in the global energy balance is too small." It is likely that at some point in the future nuclear fusion reactors will become a viable replacement for the fission reactors we have today, but for the time being, "nuclear energy should be managed and supervised by a powerful international executive," concludes Jargin. Robust due diligence with regard to sociopolitical, geographic, geologic, and other pre-conditions would also help prevent future accidents.
More information: "Food contamination after the Chernobyl accident: dose assessments and health effects" in Int. J. Low Radiation, 2013, 9, 23-29.

http://www.eurekalert.org/pub_releases/2013-05/afps-pua052813.php

Picking up a second language is predicted by ability to learn patterns

Some people seem to pick up a second language with relative ease, while others have a much more difficult time.

Now, a new study suggests that learning to understand and read a second language may be driven, at least in part, by our ability to pick up on statistical regularities.
The study is published in Psychological Science, a journal of the Association for Psychological Science.
Some research suggests that learning a second language draws on capacities that are language-specific, while other research suggests that it reflects a more general capacity for learning patterns. According to psychological scientist and lead researcher Ram Frost of Hebrew University, the data from the new study clearly point to the latter: "These new results suggest that learning a second language is determined to a large extent by an individual ability that is not at all linguistic," says Frost.
In the study, Frost and colleagues used three different tasks to measure how well American students in an overseas program picked up on the structure of words and sounds in Hebrew. The students were tested once in the first semester and again in the second semester.
The students also completed a task that measured their ability to pick up on statistical patterns in visual stimuli. The participants watched a stream of complex shapes that were presented one at a time. Unbeknownst to the

participants, the 24 shapes were organized into 8 triplets - the order of the triplets was randomized, though the shapes within each triplet always appeared in the same sequence. After viewing the stream of shapes, the students were tested to see whether they implicitly picked up the statistical regularities of the shape sequences. The data revealed a strong association between statistical learning and language learning: Students who were high performers on the shapes task tended to pick up the most Hebrew over the two semesters.

"It's surprising that a short 15-minute test involving the perception of visual shapes could predict to such a large extent which of the students who came to study Hebrew would finish the year with a better grasp of the language," says Frost.

According to the researchers, establishing a link between second language acquisition and a general capacity for statistical learning may have broad implications. "This finding points to the possibility that a unified and universal principle of statistical learning can quantitatively explain a wide range of cognitive processes across domains, whether they are linguistic or nonlinguistic," they conclude.

This research was supported by the Israel Science Foundation (159/10) and by the National Institute of Child Health and Human Development (RO1 HD 067364 and PO1HD 01994).

For more information about this study, please contact: Ram Frost at frost@mscc.huji.ac.il.

http://www.eurekalert.org/pub_releases/2013-05/uol-nca052913.php

New chemical approach to treat Alzheimer's

Scientists at the University of Liverpool and Callaghan Innovation in New Zealand have developed a new chemical approach to help harness the natural ability of complex sugars to treat Alzheimer's disease.

The team used a new chemical method to produce a library of sugars, called heparan sulphates, which are known to control the formation of the proteins in the brain that cause memory loss.

Heparan sulphates are found in nearly every cell of the body, and are similar to the natural blood-thinning drug, heparin. Now scientists have discovered how to produce them chemically in the lab, and found that some of these sugars can inhibit an enzyme that creates small proteins in the brain.

These proteins, called amyloid, disrupt the normal function of cells leading to the progressive memory loss that is characteristic of Alzheimer's disease.

Professor Jerry Turnbull, from the University's Institute of Integrative Biology, said: "We are targeting an enzyme, called BACE, which is responsible for creating the amyloid protein. The amyloid builds up in the brain in Alzheimer's disease and causes damage. BACE has proved to be a difficult enzyme to block despite lots of efforts by drug companies." "We are using a new approach, harnessing the natural ability of sugars, based on the blood-thinning drug heparin, to block the action of BACE."

Dr Peter Tyler, from Callaghan Innovation, added: "We have developed new chemical methods that have allowed us to make the largest set of these sugars produced to date. These new compounds will now be tested to identify those with the best activity and fewest possible side effects, as these have potential for development into a drug treatment that targets the underlying cause of this disease."

There are more than 800,000 people in the UK, and 50,000 in New Zealand living with dementia. Over half of these have Alzheimer's disease, the most common cause of dementia. The cost of these diseases to the UK economy stands at £23 billion, more than the cost of cancer and heart disease combined. Current treatments for dementia can help with symptoms, but there are no drugs available that can slow or stop the underlying disease.

The research, published in Chemistry: a European Journal, is supported by the Biotechnology and Biological Sciences Research Council (BBSRC), the Medical Research Council (MRC), Alzheimer's Research UK, and New Zealand Government Research grants.

http://www.sciencedaily.com/releases/2013/05/130528181021.htm

Tobacco Companies Are Not Public Health Stakeholders, Experts Conclude

FDA should be aware that they are dealing with companies with a long history of intentionally misleading the public

When assessing information presented by the tobacco industry, the US regulator, the Food and Drug Administration (FDA) and regulatory bodies in other countries, should be aware that they are dealing with companies with a long history of intentionally misleading the public. They therefore should actively protect their public-health policies on smoking from the commercial interests of the tobacco industry and not consider the industry as a stakeholder, concludes a study by experts from the US and Germany published in this week's PLOS Medicine.

The researchers, led by Stanton Glantz from the Center for Tobacco Control Research and Education at the University of California, San Francisco, reached these conclusions by analysing previously secret documents from the tobacco industry and the Institute of Medicine related to the Institute's landmark 2001 report, Clearing

the smoke - a report that set the tone for the development and regulation of tobacco products in the US, particularly those claiming to be less dangerous.
The authors found that tobacco companies developed and implemented strategies with consulting and legal firms to access the IOM proceedings (that led to the FDA-commissioned Institute of Medicine report on tobacco products) and that the companies used this access to deliver specific, carefully formulated messages designed to serve their business interests.
Although the authors found no evidence that the efforts of tobacco companies exerted direct influence on the IOM committee, the analysis shows that tobacco companies were pleased with the final report, particularly its recommendation that tobacco products can be marketed with exposure or risk reduction claims provided the products substantially reduce exposure and provided the behavioral and health consequences of these products are determined in post-marketing surveillance and epidemiological studies ("tiered testing"). Recommendations within the report have policy implications that were continuing to reverberate in 2012.
The authors say: "There was a lack of clear policy on tobacco industry engagement by the [Institute of Medicine] which, combined with the general presumption of honesty upon which all scientific discourse is based, created an opportunity for the tobacco companies to advocate positions that supported their interests."
They continue: "The presence of tobacco industry representatives on the FDA's Tobacco Products Scientific Advisory Committee, combined with the FDA's official consideration of the tobacco industry as a "stakeholder," increase the likelihood that the tobacco companies will continue to successfully manipulate the scientific discourse around tobacco product regulation, to the companies' benefit and to the detriment of public health."
The authors conclude: "To prevent such an outcome, the FDA and counterpart organizations in other countries need to remain cognizant of the guidelines for implementing FCTC Article 5.3* and that they are dealing with companies with a history of more than 50 years of intentionally misleading the public and who were found by two federal courts to have participated in "a pattern of racketeering activity" in violation of the RICO Act** when assessing the role of the tobacco companies and the information they present as part of the regulatory process."
In an accompanying Perspective, Thomas Novotny (uninvolved in the study) from the University California, San Diego says: "[The tobacco industry] should never be treated as a stakeholder because it is unlikely that the industry will ever be part of the solution to the public health challenge of tobacco use."
Novotny continues: "The profits from selling cigarettes and alternative tobacco products are simply too great for the tobacco industry to simply fade into history. Thus, the public health community needs to do what it does best: to rally popular support for strong, science-based approaches to prevention of tobacco use, to expose the truths about the harms of tobacco use to current users, and to support government agencies in carrying out their legislatively mandated duties to protect public health."

Notes:

**The World Health Organization's Framework Convention on Tobacco Control, developed in response to the globalization of the tobacco epidemic. Article 5.3 relates to the protection of public health policies with respect from tobacco control from commercial and other vested interests of the tobacco industry.*

***Racketeer Influenced and Corrupt Organizations Act is a US federal law that provides for extended criminal penalties and a civil cause of action for acts performed as part of an ongoing criminal organization.*

Funding: This work was supported by National Cancer Institute grant CA-087472. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

http://www.bbc.co.uk/news/health-22689593

Hand, foot and mouth disease: First vaccine

The first vaccine which protects children against hand, foot and mouth disease has been reported by scientists in China.

By James Gallagher Health and science reporter, BBC News

The infection causes a rash and painful blisters, but in some cases results in brain infections which can be fatal.
A trial involving 10,000 children, published in the Lancet, showed the vaccine was 90% effective against one virus which causes the disease. It does not protect against other viruses that result in the disease.
Viruses can cause large outbreaks of hand, foot and mouth disease. In 2009, there was an outbreak in China involving 1.2 million people. Nearly 14,000 people had severe complications and 353 people died.
Groups of researchers in Jiangsu province and Beijing tested a vaccine made from a deactivated enterovirus 71 (EV71), which causes the disease. Two jabs were given to children between six and 35 months old. They prevented 90% of cases of hand, foot and mouth disease caused by EV71.
"Infection with EV71 is of particular concern because it can cause severe disease and even death in children. The EV71 vaccine could help prevent hospital admissions and severe cases," the researchers said.

Hand, foot and mouth disease is caused by many other viruses, such as Coxsackievirus A16 and even other strains of EV71, so this vaccine could not eliminate the disease.
The researchers themselves warn that: "The EV71 vaccine might have little part in reducing the overall incidence of HFMD, even by universal mass immunisation of children."
Commenting on the research, Dr Nigel Crawford and Dr Steve Graham, both from the University of Melbourne, said the vaccine was tailored to the predominant strain in China. "The major effect of this vaccine will be to reduce hospital admission, which is an important result of many vaccines. "The next step is to assess the appropriateness of including an EV71 vaccine in China's national immunisation programme."

http://phys.org/news/2013-05-russian-scientists-rare-blood-mammoth.html

Russian scientists make rare find of 'blood' in mammoth

Russian scientists claimed Wednesday they have discovered blood in the carcass of a woolly mammoth, adding that the rare find could boost their chances of cloning the prehistoric animal.

Russian scientists claimed Wednesday they have discovered blood in the carcass of a woolly mammoth, adding that the rare find could boost their chances of cloning the prehistoric animal.

An expedition led by Russian scientists earlier this month uncovered the well-preserved carcass of a female mammoth on a remote island in the Arctic Ocean.
Semyon Grigoryev, the head of the expedition, said the animal died at the age of around 60 some 10,000 to 15,000 years ago, and that it was the first time that an old female had been found.
But what was more surprising was that the carcass was so well preserved that it still had blood and muscle tissue.

A researcher in Yakutsk on May 13, 2013 next to a carcass of a female mammoth found on an island in the Arctic Ocean

"When we broke the ice beneath her stomach, the blood flowed out from there, it was very dark," Grigoryev, who is a scientist at the Yakutsk-based Northeastern Federal University, told AFP.
"This is the most astonishing case in my entire life. How was it possible for it to remain in liquid form? And the muscle tissue is also red, the colour of fresh meat," he added.
Grigoryev said that the lower part of the carcass was very well preserved as it ended up in a pool of water that later froze over.
The upper part of the body including the back and the head are believed to have been eaten by predators, he added.
"The forelegs and the stomach are well preserved, while the hind part has become a skeleton."
The discovery, Grigoryev said, gives new hope to researchers in their quest to bring the woolly mammoth back to life.
"This find gives us a really good chance of finding live cells which can help us implement this project to clone a mammoth," he said.
"Previous mammoths have not had such well-preserved tissue."
Last year, Grigoryev's Northeastern Federal University signed a deal with cloning pioneer Hwang Woo-Suk of South Korea's Sooam Biotech Research Foundation, who in 2005 created the world's first cloned dog.

A researcher at Northeastern Federal University in Yakutsk on May 13, 2013, holds a phial said to contain mammoth blood

In the coming months, mammoth specialists from South Korea, Russia and the United States are expected to study the remains which the Russian scientists are now keeping at an undisclosed northern location.
"I won't say where it is being kept or it may get stolen," he said.
Last year, a teenager from a nomadic family in Russia's north stumbled upon a massive well-preserved woolly mammoth, in what scientists described as the best such discovery since 1901.
The young male mammoth was dubbed Zhenya after the nickname of the boy who discovered it.
Global warming has thawed ground in northern Russia that is usually almost permanently frozen, leading to the discoveries of a number of mammoth remains.

http://www.eurekalert.org/pub_releases/2013-05/lu-ndl052913.php

Nordic diet lowers cholesterol, study finds

A healthy Nordic diet lowers cholesterol levels, and therefore the risk of cardiovascular disease, a pan-Nordic study where Lund University participated has found.

There was also decreased inflammation associated with pre-diabetes.

- The subjects who ate a Nordic diet had lower levels of harmful LDL cholesterol and higher levels of "good" HDL cholesterol. The amount of harmful fat particles in the blood also declined, says Lieselotte Cloetens, a biomedical nutrition researcher at Lund University.

The 'healthy Nordic diet' used in the study contains local produce such as berries, root vegetables, legumes, and cabbage. Nuts, game, poultry and fish are also included, as well as whole grains, rapeseed oil and low-fat dairy products. The rest of the group ate butter instead of rapeseed oil, less berries and vegetables, and had no rules on red meat or white bread intake.

The researchers now want to focus on the diet's ability to maintain weight loss in a new study, according to Lieselotte Cloetens, who points out that the problem with most diets is maintaining the results.

http://scitechdaily.com/study-shows-changing-gut-bacteria-through-diet-affects-brain-function/

Study Shows Changing Gut Bacteria Through Diet Affects Brain Function

A newly published study found that women who regularly consumed beneficial bacteria known as probiotics through yogurt showed altered brain function in many areas, including those involved in sensory processing.

UCLA researchers now have the first evidence that bacteria ingested in food can affect brain function in humans. In an early proof-of-concept study of healthy women, they found that women who regularly consumed beneficial bacteria known as probiotics through yogurt showed altered brain function, both while in a resting state and in response to an emotion-recognition task.

The study, conducted by scientists with UCLA's Gail and Gerald Oppenheimer Family Center for Neurobiology of Stress and the Ahmanson–Lovelace Brain Mapping Center at UCLA, appears in the current online edition of the peer-reviewed journal Gastroenterology. The discovery that changing the bacterial environment, or microbiota, in the gut can affect the brain carries significant implications for future research that could point the way toward dietary or drug interventions to improve brain function, the researchers said.

"Many of us have a container of yogurt in our refrigerator that we may eat for enjoyment, for calcium or because we think it might help our health in other ways," said Dr. Kirsten Tillisch, an associate professor of medicine at UCLA's David Geffen School of Medicine and lead author of the study. "Our findings indicate that some of the contents of yogurt may actually change the way our brain responds to the environment. When we consider the implications of this work, the old sayings 'you are what you eat' and 'gut feelings' take on new meaning."

Researchers have known that the brain sends signals to the gut, which is why stress and other emotions can contribute to gastrointestinal symptoms. This study shows what has been suspected but until now had been proved only in animal studies: that signals travel the opposite way as well. "Time and time again, we hear from patients that they never felt depressed or anxious until they started experiencing problems with their gut," Tillisch said. "Our study shows that the gut–brain connection is a two-way street."

The small study involved 36 women between the ages of 18 and 55. Researchers divided the women into three groups: one group ate a specific yogurt containing a mix of several probiotics - bacteria thought to have a positive effect on the intestines - twice a day for four weeks; another group consumed a dairy product that looked and tasted like the yogurt but contained no probiotics; and a third group ate no product at all.

Functional magnetic resonance imaging (fMRI) scans conducted both before and after the four-week study period looked at the women's brains in a state of rest and in response to an emotion-recognition task in which they viewed a series of pictures of people with angry or frightened faces and matched them to other faces showing the same emotions. This task, designed to measure the engagement of affective and cognitive brain regions in response to a visual stimulus, was chosen because previous research in animals had linked changes in gut flora to changes in affective behaviors.

The researchers found that, compared with the women who didn't consume the probiotic yogurt, those who did showed a decrease in activity in both the insula - which processes and integrates internal body sensations, like those form the gut - and the somatosensory cortex during the emotional reactivity task.

Further, in response to the task, these women had a decrease in the engagement of a widespread network in the brain that includes emotion-, cognition- and sensory-related areas. The women in the other two groups showed a stable or increased activity in this network.

During the resting brain scan, the women consuming probiotics showed greater connectivity between a key brainstem region known as the periaqueductal grey and cognition-associated areas of the prefrontal cortex. The women who ate no product at all, on the other hand, showed greater connectivity of the periaqueductal grey to emotion- and sensation-related regions, while the group consuming the non-probiotic dairy product showed results in between. The researchers were surprised to find that the brain effects could be seen in many areas, including those involved in sensory processing and not merely those associated with emotion, Tillisch said.

The knowledge that signals are sent from the intestine to the brain and that they can be modulated by a dietary change is likely to lead to an expansion of research aimed at finding new strategies to prevent or treat digestive, mental and neurological disorders, said Dr. Emeran Mayer, a professor of medicine, physiology and psychiatry at the David Geffen School of Medicine at UCLA and the study's senior author.

"There are studies showing that what we eat can alter the composition and products of the gut flora - in particular, that people with high-vegetable, fiber-based diets have a different composition of their microbiota, or gut environment, than people who eat the more typical Western diet that is high in fat and carbohydrates," Mayer said. "Now we know that this has an effect not only on the metabolism but also affects brain function."

The UCLA researchers are seeking to pinpoint particular chemicals produced by gut bacteria that may be triggering the signals to the brain. They also plan to study whether people with gastrointestinal symptoms such as bloating, abdominal pain and altered bowel movements have improvements in their digestive symptoms which correlate with changes in brain response. Meanwhile, Mayer notes that other researchers are studying the potential benefits of certain probiotics in yogurts on mood symptoms such as anxiety. He said that other nutritional strategies may also be found to be beneficial.

By demonstrating the brain effects of probiotics, the study also raises the question of whether repeated courses of antibiotics can affect the brain, as some have speculated. Antibiotics are used extensively in neonatal intensive care units and in childhood respiratory tract infections, and such suppression of the normal microbiota may have long-term consequences on brain development.

Finally, as the complexity of the gut flora and its effect on the brain is better understood, researchers may find ways to manipulate the intestinal contents to treat chronic pain conditions or other brain related diseases, including, potentially, Parkinson's disease, Alzheimer's disease and autism. Answers will be easier to come by in the near future as the declining cost of profiling a person's microbiota renders such tests more routine, Mayer said.

The study was funded by Danone Research. Mayer has served on the company's scientific advisory board. Three of the study authors (Denis Guyonnet, Sophie Legrain-Raspaud and Beatrice Trotin) are employed by Danone Research and were involved in the planning and execution of the study (providing the products) but had no role in the analysis or interpretation of the results.

Publication: Kirsten Tillisch, et al., "Consumption of Fermented Milk Product With Probiotic Modulates Brain Activity," Gastroenterology, Volume 144, Issue 7 , Pages 1394-1401.e4, June 2013; doi:10.1053/j.gastro.2013.02.043

http://www.eurekalert.org/pub_releases/2013-05/e-lsd052713.php

Low sodium diet key to old age for stars

New VLT observations create major headache for stellar theories

The way in which stars evolve and end their lives was for many years considered to be well understood. Detailed computer models predicted that stars of a similar mass to the Sun would have a period towards the ends of their lives - called the asymptotic giant branch, or AGB [1] - when they undergo a final burst of nuclear burning and puff off a lot of their mass in the form of gas and dust.

This expelled material [2] goes on to form the next generations of stars and this cycle of mass loss and rebirth is vital to explain the evolving chemistry of the Universe. This process is also what provides the material required for the formation of planets - and indeed even the ingredients for organic life.

This image from the Wide Field Imager on the MPG/ESO 2.2-metre telescope at the La Silla Observatory in Chile shows the globular star cluster NGC 6752 in the southern constellation of Pavo (The Peacock). Studies of this cluster using ESO's Very Large Telescope have unexpectedly revealed that many of the stars do not undergo mass-loss at the end of their lives. **ESO**

But when Australian stellar theory expert Simon Campbell of the Monash University Centre for Astrophysics, Melbourne, scoured old papers he found tantalising suggestions that some stars may somehow not follow the rules and might skip the AGB phase entirely. He takes up the story:

"For a stellar modelling scientist this suggestion was crazy! All stars go through the AGB phase according to our models. I double-checked all the old studies but found that this had not been properly investigated. I decided to investigate myself, despite having little observational experience."
Campbell and his team used ESO's Very Large Telescope (VLT) to very carefully study the light coming from stars in the globular star cluster NGC 6752 in the southern constellation of Pavo (The Peacock). This vast ball of ancient stars contains both a first generation of stars and a second that formed somewhat later [3]. The two generations can be distinguished by the amount of sodium they contain - something that the very high-quality VLT data can be used to measure. "FLAMES, the multi-object high-resolution spectrograph on the VLT, was the only instrument that could allow us to get really high-quality data for 130 stars at a time. And it allowed us to observe a large part of the globular cluster in one go," adds Campbell.
The results were a surprise - all of the AGB stars in the study were first generation stars with low levels of sodium and none of the higher-sodium second generation stars had become AGB stars at all. As many as 70% of the stars were not undergoing the final nuclear burning and mass-loss phase [4] [5].
"It seems stars need to have a low-sodium "diet" to reach the AGB phase in their old age. This observation is important for several reasons. These stars are the brightest stars in globular clusters - so there will be 70% fewer of the brightest stars than theory predicts. It also means our computer models of stars are incomplete and must be fixed!" concludes Campbell.
The team expects that similar results will be found for other star clusters and further observations are planned.

Notes

[1] AGB stars get their odd name because of their position on the Hertzsprung Russell diagram, a plot of the brightnesses of stars against their colours.
[2] For a short period of time this ejected material is lit up by the strong ultraviolet radiation from the star and creates a planetary nebula (see for instance eso1317 - http://www.eso.org/public/news/eso1317/).
[3] Although the stars in a globular cluster all formed at about the same time, it is now well established that these systems are not as simple as they once thought to be. They usually contain two or more populations of stars with different amounts of light chemical elements such as carbon, nitrogen and - crucially for this new study - sodium.
[4] It is thought that stars which skip the AGB phase will evolve directly into helium white dwarf stars and gradually cool down over many billions of years.
[5] It is not thought that the sodium itself is the cause of the different behaviour, but must be strongly linked to the underlying cause - which remains mysterious.

More information

This research was presented in a paper entitled "Sodium content as a predictor of the advanced evolution of globular cluster stars" by Simon Campbell et al., to appear online in the journal Nature on 29 May 2013.
The team is composed of Simon W. Campbell (Monash University, Melbourne, Australia), Valentina D'Orazi (Macquarie University, Sydney, Australia; Monash University), David Yong (Australian National University, Canberra, Australia [ANU]), Thomas N. Constantino (Monash University), John C. Lattanzio (Monash University), Richard J. Stancliffe (ANU; Universitat Bonn, Germany), George C. Angelou (Monash University), Elizabeth C. Wylie-de Boer (ANU), Frank Grundahl (Aarhus University, Denmark).

http://www.bbc.co.uk/news/world-europe-22699975

Pencil extracted from Afghan man's head

A scan revealed the pencil's location so that doctors could operate

German doctors say an Afghan man who for years suffered from headaches, a runny nose and eyesight problems was found to have a 10-centimetre (four-inch) pencil lodged in his head.
Surgeons at Aachen University Hospital removed the pencil and the 24-year-old is reported to be recovering.
The pencil had injured the man's sinuses and right eye socket. When asked how the pencil had got there he recalled that as a boy he had once fallen and had a serious nosebleed.
The case was presented at a medical conference in Essen on Tuesday by Prof Frank Hoelzle of Aachen University. The pencil was found only after a detailed medical examination using computer tomography - an image scanning technique, German media report.

http://www.eurekalert.org/pub_releases/2013-05/mu-ank052713.php

A new kind of cosmic glitch

Astronomers led by McGill research group discover new phenomenon in neutron star

The physics behind some of the most extraordinary stellar objects in the Universe just became even more puzzling. A group of astronomers led by McGill researchers using NASA's Swift satellite have discovered a new kind of glitch in the cosmos, specifically in the rotation of a neutron star.
Neutron stars are among the densest objects in the observable universe; higher densities are found only in their close cousins, black holes. A typical neutron star packs as much mass as half-a-million Earths within a diameter

of only about 20 kilometers. A teaspoonful of neutron star matter would weigh approximately 1 billion tons, roughly the same as 100 skyscrapers made of solid lead.
Neutron stars are known to rotate very rapidly, from a few revolutions per minute to as fast as several hundred times per second. A neutron star glitch is an event in which the star suddenly begins rotating faster. These sudden spin-up glitches have long been thought to demonstrate that these exotic ultra-dense stellar objects contain some form of liquid, likely a superfluid.
This new cosmic glitch was detected in a special kind of neutron star – a magnetar - an ultra-magnetized neutron star that can exhibit dramatic outbursts of X-rays, sometimes so strong they can affect the Earth's atmosphere from clear across the galaxy. A magnetar's magnetic field is so strong that, if one were located at the distance of the Moon, it could wipe clean a credit card magnetic strip here on Earth.
Now astronomers led by a research group at McGill University have discovered a new phenomenon: they observed a magnetar suddenly rotate slower - a cosmic braking act they've dubbed an "anti-glitch." The result is reported in the May 30 issue of Nature.
The magnetar in question, 1E 2259+586 located roughly 10,000 light years away in the constellation of Cassiopeia, was being monitored by the McGill group using the Swift X-ray telescope in order to study the star's rotation and try to detect the occasional giant X-ray explosions that are often seen from magnetars.
"I looked at the data and was shocked - the neutron star had suddenly slowed down," says Rob Archibald, lead author and MSc student at McGill University. "These stars are not supposed to behave this way."
Accompanying the sudden slowdown, which rang in at one third of a part per million of the 7-second rotation rate, was a large increase in the X-ray output of the magnetar, telltale evidence of a major event inside or near the surface of the neutron star.
"We've seen huge X-ray explosions from magnetars before," says Victoria Kaspi, Professor of Physics at McGill and leader of the Swift magnetar monitoring program, "but an anti-glitch was quite a surprise. This is telling us something brand new about the insides of these amazing objects." In 2002, NASA's Rossi X-ray Timing Explorer satellite also saw a large X-ray outburst from the source, but in that case, it was accompanied by a more usual spin-up glitch.
The internal structure of neutron stars is a long-standing puzzle, as the matter inside these stars is subject to forces so intense that they are presently not re-creatable in terrestrial laboratories. The densities at the hearts of neutron stars are thought to be upwards of 10 times higher than in the atomic nucleus, far beyond what current theories of matter can describe.
The reported anti-glitch strongly suggests previously unrecognized behaviour inside neutron stars, possibly with pockets of superfluid rotating at different speeds. The researchers further point out in the Nature paper that some properties of conventional glitches have been noted to be puzzling and suggestive of flaws in the existing theory to explain them. They are hoping that the discovery of a new phenomenon will open the door to renewed progress in understanding neutron star interiors.
The research was funded in part by the Natural Sciences and Engineering Research Council of Canada, the Canadian Institute for Advance Research, the Fonds de recherche du Québec - Nature et technologies, the Canada Research Chairs program, the Lorne Trottier Chair in Astrophysics and Cosmology, and the Centre de recherche en Astrophysique du Québec.

http://phys.org/news/2013-05-million-km-earth-venus-like-fate.html

42 million km saved Earth from dry, Venus-like fate, study reports

Similar in size and often referred to as twin planets, Earth and Venus evolved from common origins into two contrasting worlds - one dry and inhospitable, the other wet and teeming with life.

The reason has had science stumped, until now. Writing in the journal Nature on Wednesday, a Japanese research team said the answer was to be found in the planets' respective proximity to the Sun.
Though relatively close on a cosmic scale (Earth is 150 million kilometres or 93 million miles from the Sun and Venus 108 million km), the planets most likely orbit on either side of a "critical distance" from their central star, the team wrote.
This would explain, the researchers contended, why two similar-sized planets, almost identical in their molten state at the moment of creation about 4.5 billion years ago, can look so different once solidified.
At some 12,000 km, Venus' diameter is about 95 percent that of Earth, and its mass about 80 percent. It orbits between Earth and Mercury, the closest planet to the Sun. As for their differences: Venus has no surface water and a heavy, toxic atmosphere comprising almost exclusively carbon dioxide. Its average surface temperature is a searing 477 degrees Celsius (890 deg Fahrenheit).
The study authors said a type I planet like the Earth, formed beyond the "critical distance" from its host star, would have time to solidify from its molten magma state within several million years, trapping water in rock and under its hard surface.

However, type II planets, of which Venus may be an example, would remain in a molten state for longer, as much as 100 million years, as it got more of the Sun's heat - with more time for any water to escape.
Venus has not yet been categorised because it is so near to the line of critical distance, though its dryness would be characteristic of a type II planet, said the team.
The new method may be useful in the study of planets beyond our own solar system - helping to determine which ones would be most likely to host life, the researchers added.
"The present results indicate that for habitable planets, rapid ocean formation would have occurred within several million years of planet formation," they wrote.
More information: Nature paper: dx.doi.org/10.1038/nature12163

http://www.eurekalert.org/pub_releases/2013-05/nuos-esb052913.php

Even short bouts of high intensity training improve fitness in inactive men

12 minutes of high-intensity training resulted in statistically significant improvements in fitness

It is a commonly held perception that getting in shape and staying there requires hard work and hours upon hours of training. New research shows the opposite – it seems that only four minutes of vigorous activity three times per week is enough to be fit and healthy.
Regular training improves maximal oxygen uptake (VO2max), which is a well-established measure of physical fitness. However, just how much exercise, and how intense that exercise should be to deliver the biggest benefit remains to be defined. Now, researchers from the KG Jebsen – Centre of Exercise in Medicine at the Norwegian University of Science and Technology (NTNU) in Trondheim have found that just three short high-intensity sessions (AIT) per week can make for substantial differences in the fitness of inactive men.
"Our data suggest that a single bout of AIT performed three times per week may be a time-efficient strategy to improve VO2max", says Arnt Erik Tjønna, a postdoctoral fellow at the center and lead author of the study.
Tjønna says one of the advantages of this approach is that it is easy for people to incorporate into their daily lives.
The researchers measured changes in VO2max and traditional cardiovascular risk factors in 24 inactive but otherwise healthy overweight men after they completed a 10-week training session that involved three weekly high-intensity interval sessions. One group of 13 followed a protocol that has previously shown to be effective, consisting of four intervals of 4 minutes of high intensity exercise at 90% of maximal heart rate (HRmax) interspersed with 3 minutes of active recovery at 70% HRmax (4-AIT), commonly known as 4x4 training.
The other group followed a protocol that consisted of one 4-minute interval at 90% HRmax (1-AIT).
After training, VO2max increased by 10% in the group that had just one high-intensity session three times a week (1-AIT), while the group that followed the 4x4 regime increased its VO2max by 13%. Both groups saw decreases in their blood pressure, but the 1-AIT the group's blood pressures showed greater decreases than their 4-AIT counterparts for both systolic and diastolic readings.
Tjønna says while the results look promising, the number of study participants was small, which limits the scientists' ability to extrapolate their findings. He also noted that people who are active probably won't benefit as much as the inactive participants did from the 1-AIT training regime.
"It has to be noted that the subjects were previously inactive, and the same effect on physical fitness cannot be expected in active individuals," he said. "Nevertheless, since we know that more and more people are inactive and overweight, the kind of improvement in physical fitness that we saw in this study may provide a real boost for inactive people who are struggling to find the motivation to exercise."
Their invited manuscript, written by Arnt Erik Tjønna, NTNU; Ingeborg Megård Leinan, NTNU; Anette Thoresen Bartnes, University of Oslo; Bjørn M Jenssen, NTNU; Martin J Gibala, McMaster University; Richard A Winett, Virginia Tech; and Ulrik Wisløff, NTNU, appears in PLOS ONE on 29 May. The article will be available from PLOS ONE at this link: http://dx.plos.org/10.1371/journal.pone.0065382 after the embargo is lifted on May 29.

http://www.eurekalert.org/pub_releases/2013-05/wuso-asm052913.php

Artificial sweeteners may do more than sweeten

Artificial sweeteners are thought to make foods and drinks taste sweet without any of the other consequences that come from sugar.

AUDIO

Researchers at Washington University School of Medicine in St. Louis have found that a popular artificial sweetener can modify how the body handles sugar. In a small study, the researchers analyzed the sweetener sucralose (Splenda®) in 17 severely obese people who do not have diabetes and don't use artificial sweeteners regularly
"Our results indicate that this artificial sweetener is not inert - it does have an effect," said first author M. Yanina Pepino, PhD, research assistant professor of medicine. "And we need to do more studies to determine

whether this observation means long-term use could be harmful." The study is available online in the journal Diabetes Care.

Pepino's team studied people with an average body mass index (BMI) of just over 42; a person is considered obese when BMI reaches 30. The researchers gave subjects either water or sucralose to drink before they consumed a glucose challenge test. The glucose dosage is very similar to what a person might receive as part of a glucose-tolerance test. The researchers wanted to learn whether the combination of sucralose and glucose would affect insulin and blood sugar levels. "We wanted to study this population because these sweeteners frequently are recommended to them as a way to make their diets healthier by limiting calorie intake," Pepino said.

Every participant was tested twice. Those who drank water followed by glucose in one visit drank sucralose followed by glucose in the next. In this way, each subject served as his or her own control group.

"When study participants drank sucralose, their blood sugar peaked at a higher level than when they drank only water before consuming glucose," Pepino explained. "Insulin levels also rose about 20 percent higher. So the artificial sweetener was related to an enhanced blood insulin and glucose response."

The elevated insulin response could be a good thing, she pointed out, because it shows the person is able to make enough insulin to deal with spiking glucose levels. But it also might be bad because when people routinely secrete more insulin, they can become resistant to its effects, a path that leads to type 2 diabetes.

It has been thought that artificial sweeteners, such as sucralose, don't have an effect on metabolism. They are used in such small quantities that they don't increase calorie intake. Rather, the sweeteners react with receptors on the tongue to give people the sensation of tasting something sweet without the calories associated with natural sweeteners, such as table sugar.

But recent findings in animal studies suggest that some sweeteners may be doing more than just making foods and drinks taste sweeter. One finding indicates that the gastrointestinal tract and the pancreas can detect sweet foods and drinks with receptors that are virtually identical to those in the mouth. That causes an increased release of hormones, such as insulin. Some animal studies also have found that when receptors in the gut are activated by artificial sweeteners, the absorption of glucose also increases.

Pepino, who is part of Washington University's Center for Human Nutrition, said those studies could help explain how sweeteners may affect metabolism, even at very low doses. But most human studies involving artificial sweeteners haven't found comparable changes. "Most of the studies of artificial sweeteners have been conducted in healthy, lean individuals," Pepino said. "In many of these studies, the artificial sweetener is given by itself. But in real life, people rarely consume a sweetener by itself. They use it in their coffee or on breakfast cereal or when they want to sweeten some other food they are eating or drinking."

Just how sucralose influences glucose and insulin levels in people who are obese is still somewhat of a mystery. "Although we found that sucralose affects the glucose and insulin response to glucose ingestion, we don't know the mechanism responsible," said Pepino. "We have shown that sucralose is having an effect. In obese people without diabetes, we have shown sucralose is more than just something sweet that you put into your mouth with no other consequences."

She said further studies are needed to learn more about the mechanism through which sucralose may influence glucose and insulin levels, as well as whether those changes are harmful. A 20 percent increase in insulin may or may not be clinically significant, she added. "What these all mean for daily life scenarios is still unknown, but our findings are stressing the need for more studies," she said. "Whether these acute effects of sucralose will influence how our bodies handle sugar in the long term is something we need to know."

Funding for this research comes from a National Center for Advancing Translational Sciences (NCATS) Clinical and Translational Sciences Award and subaward and from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) of the National Institutes of Health (NIH). Tate & Lyle provided the sucralose. NIH grant numbers: UL1 R000448, KL2 TR000450, DK0088126, DK37948 and DK56341.

Pepino MY, Tiemann CD, Patterson BW, Wice BM, Klein S. Sucraolse affects glycemic and hormonal response to an oral glucose load. Diabetes Care. Published online before print April 30, 2013 doi: 10.2337/dc12-2221

http://www.eurekalert.org/pub_releases/2013-05/uoc--mss052913.php

MRSA study slashes deadly infections in sickest hospital patients

Bloodstream infections cut by more than 40 percent in study of over 74,000 patients

Using germ-killing soap and ointment on all intensive-care unit (ICU) patients can reduce bloodstream infections by up to 44 percent and significantly reduce the presence of methicillin-resistant Staphylococcus aureus (MRSA) in ICUs. A new Department of Health and Human Services-funded study released today tested three MRSA prevention strategies and found that using germ-killing soap and ointment on all ICU patients was more effective than other strategies.

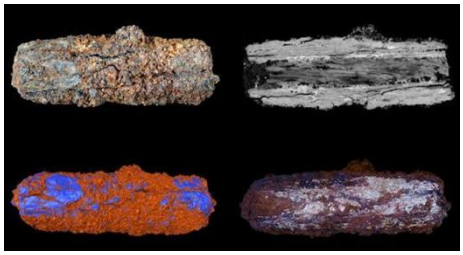
"Patients in the ICU are already very sick, and the last thing they need to deal with is a preventable infection," said Agency for Healthcare Research and Quality (AHRQ) Director Carolyn M. Clancy, M.D. "This research has the potential to influence clinical practice significantly and create a safer environment where patients can heal without harm."
The study, REDUCE MRSA trial, was published in today's New England Journal of Medicine and took place in two stages from 2009-2011. A multidisciplinary team from the University of California, Irvine, Harvard Pilgrim Health Care Institute, Hospital Corporation of America (HCA) and the Centers for Disease Control and Prevention (CDC) carried out the study. A total of 74 adult ICUs and 74,256 patients were part of the study, making it the largest study on this topic. Researchers evaluated the effectiveness of three MRSA prevention practices: routine care, providing germ-killing soap and ointment only to patients with MRSA, and providing germ-killing soap and ointment to all ICU patients. In addition to being effective at stopping the spread of MRSA in ICUs, the study found the use of germ-killing soap and ointment on all ICU patients was also effective for preventing infections caused by germs other than MRSA.
"CDC invested in these advances in order to protect patients from deadly drug-resistant infections," said CDC Director Dr. Tom Frieden, M.D., M.P.H. "We need to turn science into practical action for clinicians and hospitals. CDC is working to determine how the findings should inform CDC infection prevention recommendations."
MRSA is resistant to first-line antibiotic treatments and is an important cause of illness and sometimes death, especially among patients who have had medical care. Three-quarters of Staphylococcus aureus infections in hospital ICUs are considered methicillin-resistant. In 2012, encouraging results from a CDC report showed that invasive (life-threatening) MRSA infections in hospitals declined by 48 percent from 2005 through 2010.
"This study helps answer a long-standing debate in the medical field about whether we should tailor our efforts to prevent infection to specific pathogens, such as MRSA, or whether we should identify a high-risk patient group and give them all special treatment to prevent infection," said lead author Susan Huang, M.D., M.P.H., associate professor at the UCI School of Medicine and medical director of epidemiology and infection prevention at UC Irvine Health. "The universal decolonization strategy was the most effective and the easiest to implement. It eliminates the need for screening ICU patients for MRSA."
REDUCE MRSA trial was conducted through AHRQ and CDC research programs. The research was conducted in partnership with the HCA and nearly four dozen of its affiliated facilities.

http://www.sciencedaily.com/releases/2013/05/130530094635.htm

Ancient Egyptians Accessorized With Meteorites

Researchers at The Open University (OU) and The University of Manchester have found conclusive proof that Ancient Egyptians used meteorites to make symbolic accessories for their dead.

The evidence comes from strings of iron beads which were excavated in 1911 at the Gerzeh cemetery, a burial site approximately 70km south of Cairo. Dating from 3350 to 3600 BC, thousands of years before Egypt's Iron Age, the bead analysed was originally assumed to be from a meteorite owing to its composition of nickel-rich iron. But this hypothesis was challenged in the 1980s when academics proposed that much of the early worldwide examples of iron use originally thought to be of meteorite-origin were actually early smelting attempts.



Gerzeh bead. **(Credit: Image courtesy of Open University)**

Subsequently, the Gerzeh bead, still the earliest discovered use of iron by the Egyptians, was loaned by The Manchester Museum to the OU and Manchester's School of Materials for further testing. Researchers used a combination of the OU's electron microscope and the University's X-Ray CT scanner to demonstrate that the nickel-rich chemical composition of the bead confirms its meteorite origins.
OU Project Officer Diane Johnson, who led the study, said: "This research highlights the application of modern technology to ancient materials not only to understand meteorites better but also to help us understand what ancient cultures considered these materials to be and the importance they placed upon them."
Meteorite iron had profound implications for the Ancient Egyptians, both in their perception of the iron in the context of its celestial origin and in early metallurgy attempts.
Dr Joyce Tyldesley is a Senior Lecturer in Egyptology at The University of Manchester and worked on the research. She said: "Today, we see iron first and foremost as a practical, rather dull metal. To the ancient Egyptians, however, it was a rare and beautiful material which, as it fell from the sky, surely had some magical/religious properties. They therefore used this remarkable metal to create small objects of beauty and religious significance which were so important to them that they chose to include them in their graves."

Philip Withers, Professor of Materials Science at The University of Manchester, added: "Meteorites have a unique microstructural and chemical fingerprint because they cooled incredibly slowly as they travelled through space. It was really interesting to find that fingerprint turn up in Egyptian artefacts."
The results of the study of the bead can be obtained in the paper, 'Analysis of a Prehistoric Egyptian Iron Bead with Implications for the use and perception of meteorite iron in ancient Egypt.' published in the Meteoritics and Planetary Science journal.
Diane Johnson, Joyce Tyldesley, Tristan Lowe, Philip J. Withers, Monica M. Grady. Analysis of a prehistoric Egyptian iron bead with implications for the use and perception of meteorite iron in ancient Egypt. Meteoritics & Planetary Science, 2013; DOI: 10.1111/maps.12120

http://www.eurekalert.org/pub_releases/2013-05/foas-and053013.php

A newly discovered hormone makes ovaries grow

The FASEB Journal suggests that human female eggs produce a previously unknown hormone, called R-spondin2, which promotes follicle development and stimulates ovary growth

Bethesda, MD - A newly discovered hormone produced by the eggs of human females may improve the effectiveness of current fertility treatments for women and possibly lead to entirely new treatments altogether. According to new research published in the June 2013 issue of The FASEB Journal, researchers from Stanford and Akira University in Japan identified a new hormone called "R-spondin2" that promotes follicle development and stimulates ovary growth.
"The finding of a new ovarian hormone produced by the oocytes capable of stimulating ovarian follicle growth could lead to new infertility treatments," said Aaron J. W. Hsueh, Ph.D., a researcher involved in the work from the Division of Reproductive and Stem Cell Biology in the Department of Obstetrics and Genecology at Stanford University Medical School in Stanford, California.
To make this discovery, Hsueh and colleagues analyzed all the proteins likely made by the eggs, and discovered a previously unknown hormone, called R-spondin2. The researchers then replicated this new hormone in test tubes and injected it into mice. The hormone stimulated growth of mouse ovarian cells, leading to the generation of mature eggs. These eggs were fertilized and led to successful pregnancies and the delivery of healthy pups. Then, human ovarian tissue was grafted into mice, and this also grew after treatment with this newly identified ovarian hormone, suggesting that the hormone could work in humans. The researchers speculate that when used in conjunction with the traditional Follicle Stimulating Hormone (FSH), this newly discovered ovarian hormone could lead to new infertility treatment options for those not responding well to FSH treatment alone.
"Infertility can be very frustrating for couples who have been trying to conceive for a very long time. The discovery of this new hormone is a potential game-changer in human fertility treatment," said Gerald Weissmann, M.D., Editor-in-Chief of The FASEB Journal, "but further research is needed to determine its efficacy and safety in humans."
Details: Yuan Cheng, Kazuhiro Kawamura, Seido Takae, Masashi Deguchi, Qing Yang, Calvin Kuo, and Aaron J. W. Hsueh. Oocyte-derived R-spondin2 promotes ovarian follicle development. FASEB J June 2013 27:2175-2184 ; doi:10.1096/fj.12-223412 ; http://www.fasebj.org/content/27/6/2175.abstract

http://www.eurekalert.org/pub_releases/2013-05/asfm-nai053013.php

New agent inhibits HCV replication in mouse models - No resistance seen

Treatments against hepatitis C virus have only been partially successful. A major problem is that antivirals generate drug resistance.

Now Seong-Wook Lee of Dankook University, Yongin, Republic of Korea and his collaborators have developed agents that bind to the business end of a critical protein, disabling it so successfully that no resistance has arisen. The research is published in the June 2013 issue of the Journal of Virology.
The target protein for the new agents is the NS5B replicase protein, which is the central catalytic enzyme in HCV replication. The researchers developed "RNA aptamers" which bind tightly to the part of that protein that performs the catalysis, disabling the replicase. Aptamers are short nucleic acids or peptides that provide the same level of recognition and binding ability that is common to antibodies.
The aptamers inhibited HCV replication without generating escape mutants, says Lee. Moreover, the aptamers inhibited diverse genotypes of HCV, neither causing toxicity nor inducing innate immunity, he says. Lee notes that in the study, therapeutic quantities of ligand-conjugated aptamer penetrated the liver tissue in the mice, raising the likelihood that therapeutically effective quantities could ultimately be achieved in HCV patients.
Roughly 170 million people worldwide are infected with HCV, says Lee, and it is the major cause of chronic hepatitis, cirrhosis, and hepatocellular carcinoma. There is as yet "no efficient and specific single regimen against HCV," says Lee. Current treatments are associated with many side effects, partly because rapid

generation of drug-resistant virus has forced clinicians to use combinations of several drugs, resulting in greater numbers of side effects in patients than if a single agent could be used. And even with the drug combinations only some patients can generate a sustained antiviral response.

A copy of the article can be found online at http://bit.ly/asmtip0513c.

(C.H. Lee, Y.J. Lee, S.-W. Lee et al. Inhibition of hepatitis C virus (HCV) replication by specific RNA aptamers against HCV NS5B RNA replicase. J. Virol. June 2013 87:7064-7074; published ahead of print 17 April 2013 ,doi:10.1128/JVI.00405-13)

http://www.eurekalert.org/pub_releases/2013-05/sumc-bm052313.php

Brain makes its own version of Valium, Stanford scientists discover

Researchers at the Stanford University School of Medicine have found that a naturally occurring protein secreted only in discrete areas of the mammalian brain may act as a Valium-like brake on certain types of epileptic seizures.

STANFORD, Calif. - The protein is known as diazepam binding inhibitor, or DBI. It calms the rhythms of a key brain circuit and so could prove valuable in developing novel, less side-effect-prone therapies not only for epilepsy but possibly for anxiety and sleep disorders, too. The researchers' discoveries will be published May 30 in Neuron.

"This is one of the most exciting findings we have had in many years," said John Huguenard, PhD, professor of neurology and neurological sciences and the study's senior author. "Our results show for the first time that a nucleus deep in the middle of the brain generates a small protein product, or peptide, that acts just like benzodiazepines." This drug class includes not only the anti-anxiety compound Valium (generic name diazepam), first marketed in 1965, but its predecessor Librium, discovered in 1955, and the more recently developed sleep aid Halcyon.

Valium, which is notoriously addictive, prone to abuse and dangerous at high doses, was an early drug treatment for epilepsy, but it has fallen out of use for this purpose because its efficacy quickly wears off and because newer, better anti-epileptic drugs have come along.

For decades, DBI has also been known to researchers under a different name: ACBP. In fact, it is found in every cell of the body, where it is an intracellular transporter of a metabolite called acyl-CoA. "But in a very specific and very important brain circuit that we've been studying for many years, DBI not only leaves the cells that made it but is - or undergoes further processing to become - a natural anti-epileptic compound," Huguenard said. "In this circuit, DBI or one of its peptide fragments acts just like Valium biochemically and produces the same neurological effect."

Other endogenous (internally produced) substances have been shown to cause effects similar to psychoactive drugs. In 1974, endogenous proteins called endorphins, with biochemical activity and painkilling properties similar to that of opiates, were isolated. A more recently identified set of substances, the endocannabinoids, mimic the memory-, appetite- and analgesia-regulating actions of the psychoactive components of cannabis, or marijuana.

DBI binds to receptors that sit on nerve-cell surfaces and are responsive to a tiny but important chemical messenger, or neurotransmitter, called GABA. The roughly one-fifth of all nerve cells in the brain that are inhibitory mainly do their job by secreting GABA, which binds to receptors on nearby nerve cells, rendering those cells temporarily unable to fire any electrical signals of their own.

Benzodiazepine drugs enhance GABA-induced inhibition by binding to a different site on GABA receptors from the one GABA binds to. That changes the receptor's shape, making it hyper-responsive to GABA. These receptors come in many different types and subtypes, not all of which are responsive to benzodiazepines. DBI binds to the same spot to which benzodiazepines bind on benzodiazepine-responsive GABA receptors. But until now, exactly what this means has remained unclear.

Huguenard, along with postdoctoral scholar and lead author Catherine Christian, PhD, and several Stanford colleagues zeroed in on DBI's function in the thalamus, a deep-brain structure that serves as a relay station for sensory information, and which previous studies in the Huguenard lab have implicated on the initiation of seizures. The researchers used single-nerve-cell-recording techniques to show that within a GABA-secreting nerve-cell cluster called the thalamic reticular nucleus, DBI has the same inhibition-boosting effect on benzodiazepine-responsive GABA receptors as do benzodiazepines. Using bioengineered mice in which those receptors' benzodiazepine-binding site was defective, they showed that DBI lost its effect, which Huguenard and Christian suggested makes these mice seizure-prone.

In another seizure-prone mouse strain in which that site is intact but the gene for DBI is missing, the scientists saw diminished inhibitory activity on the part of benzodiazepine-responsive GABA receptors. Re-introducing the DBI gene to the brains of these mice via a sophisticated laboratory technique restored the strength of the GABA-induced inhibition. In normal mice, a compound known to block the benzodiazepine-binding site

weakened these same receptors' inhibitory activity in the thalamic reticular nucleus, even in the absence of any administered benzodiazepines. This suggested that some naturally occurring benzodiazepine-like substance was being displaced from the benzodiazepine-binding site by the drug. In DBI-gene-lacking mice, the blocking agent had no effect at all.

Huguenard's team also showed that DBI has the same inhibition-enhancing effect on nerve cells in an adjacent thalamic region - but also that, importantly, no DBI is naturally generated in or near this region; in the corticothalamic circuit, at least, DBI appears to be released only in the thalamic reticular nucleus. So, the actions of DBI on GABA receptors appear to be tightly controlled to occur only in specific brain areas.

Huguenard doesn't know yet whether it is DBI per se, or one of its peptide fragments (and if so which one), that is exerting the active inhibitory role. But, he said, by finding out exactly which cells are releasing DBI under what biochemical circumstances, it may someday be possible to develop agents that could jump-start and boost its activity in epileptic patients at the very onset of seizures, effectively nipping them in the bud.

The study received funding from the National Institute of Neurological Disorders and Stroke (grants NS034774, NS006477 and T32NS007280), the Epilepsy Foundation and a Katharine McCormick Advanced Postdoctoral Fellowship at the School of Medicine. Other Stanford co-authors were postdoctoral scholar Susanne Pangratz-Fuehrer, DVM; neurology resident Rebecca Holt; and research assistants Anne Herbert, MD, Kathy Peng and Kyla Sherwood.

http://www.eurekalert.org/pub_releases/2013-05/cp-htt052313.php

How the turtles got their shells

Through careful study of an ancient ancestor of modern turtles, researchers now have a clearer picture of how the turtles' most unusual shell came to be.

The findings, reported on May 30 in Current Biology, a Cell Press publication, help to fill a 30- to 55-million-year gap in the turtle fossil record through study of an extinct South African reptile known as Eunotosaurus.

"The turtle shell is a complex structure whose initial transformations started over 260 million years ago in the Permian period," says Tyler Lyson of Yale University and the Smithsonian. "Like other complex structures, the shell evolved over millions of years and was gradually modified into its present-day shape."

The turtle shell isn't really just one thing - it is made up of approximately 50 bones. Turtles are the only animals that form a shell through the fusion of ribs and vertebrae. In all other animals, shells are formed from bony scales on the surface; they don't stick their bones on the outsides of their bodies.

The skeleton of the South African reptile Eunotosaurus africanus fills a gap in the early evolution of turtles and their enigmatic shell. **Tyler Lyson**

"The reason, I think, that more animals don't form a shell via the broadening and eventually suturing together of the ribs is that the ribs of mammals and lizards are used to help ventilate the lungs," Lyson says. "If you incorporate your ribs into a protective shell, then you have to find a new way to breathe!" Turtles have done just that, with the help of a muscular sling.

Until recently, the oldest known fossil turtles, dating back about 215 million years, had fully developed shells, making it hard to see the sequence of evolutionary events that produced them. That changed in 2008 with the discovery of Chinese Odontochelys semitestacea, a reptile about 220 million years old, which had a fully developed plastron - the belly side of the shell - but only a partial carapace on its back.

Eunotosaurus takes the turtle and its shell back another 40 million years or so. It had nine broadened ribs found only in turtles. And like turtles, it lacked the intercostal muscles running between its ribs. But Eunotosaurus didn't have other features common to Odontochelys and turtles, including broad spines on their vertebrae.

Lyson says he and his colleagues now plan to investigate various other aspects of turtles' respiratory systems, which allow them to manage with their ribs locked up into a protective outer shell. "It is clear that this novel lung ventilation mechanism evolved in tandem with the origin of the turtle shell," he says.

Current Biology, Lyson et al.: "Evolutionary Origin of the Turtle Shell."

http://www.sciencedaily.com/releases/2013/05/130530132443.htm

Global Warming Caused by CFCs, Not Carbon Dioxide, Researcher Claims in Controversial Study

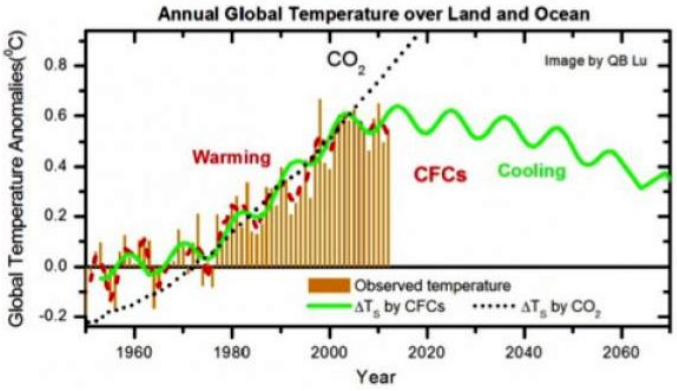
Researcher claims CFCs are to blame for global warming since the 1970s and not carbon dioxide

Chlorofluorocarbons (CFCs) are to blame for global warming since the 1970s and not carbon dioxide, according to a researcher from the University of Waterloo in a controversial new study published in the International Journal of Modern Physics B this week.

CFCs are known to deplete ozone, but in-depth statistical analysis now suggests that CFCs are also the key driver in global climate change, rather than carbon dioxide (CO2) emissions, the researcher argues.

"Conventional thinking says that the emission of human-made non-CFC gases such as carbon dioxide has mainly contributed to global warming. But we have observed data going back to the Industrial Revolution that convincingly shows that conventional understanding is wrong," said Qing-Bin Lu, a professor of physics and astronomy, biology and chemistry in Waterloo's Faculty of Science. "In fact, the data shows that CFCs conspiring with cosmic rays caused both the polar ozone hole and global warming."

"Most conventional theories expect that global temperatures will continue to increase as CO2 levels continue to rise, as they have done since 1850. What's striking is that since 2002, global temperatures have actually declined - matching a decline in CFCs in the atmosphere," Professor Lu said. "My calculations of CFC greenhouse effect show that there was global warming by about 0.6 °C from 1950 to 2002, but the earth has actually cooled since 2002. The cooling trend is set to continue for the next 50-70 years as the amount of CFCs in the atmosphere continues to decline."



Annual global temperature over land and ocean. **(Credit: Image by Q.-B. Lu)**

The findings are based on in-depth statistical analyses of observed data from 1850 up to the present time, Professor Lu's cosmic-ray-driven electron-reaction (CRE) theory of ozone depletion and his previous research into Antarctic ozone depletion and global surface temperatures.

"It was generally accepted for more than two decades that the Earth's ozone layer was depleted by the sun's ultraviolet light-induced destruction of CFCs in the atmosphere," he said. "But in contrast, CRE theory says cosmic rays - energy particles originating in space - play the dominant role in breaking down ozone-depleting molecules and then ozone."

Lu's theory has been confirmed by ongoing observations of cosmic ray, CFC, ozone and stratospheric temperature data over several 11-year solar cycles. "CRE is the only theory that provides us with an excellent reproduction of 11-year cyclic variations of both polar ozone loss and stratospheric cooling," said Professor Lu. "After removing the natural cosmic-ray effect, my new paper shows a pronounced recovery by ~20% of the Antarctic ozone hole, consistent with the decline of CFCs in the polar stratosphere."

By demonstrating the link between CFCs, ozone depletion and temperature changes in the Antarctic, Professor Lu was able to draw almost perfect correlation between rising global surface temperatures and CFCs in the atmosphere. "The climate in the Antarctic stratosphere has been completely controlled by CFCs and cosmic rays, with no CO2 impact. The change in global surface temperature after the removal of the solar effect has shown zero correlation with CO2 but a nearly perfect linear correlation with CFCs - a correlation coefficient as high as 0.97."

Data recorded from 1850 to 1970, before any significant CFC emissions, show that CO2 levels increased significantly as a result of the Industrial Revolution, but the global temperature, excluding the solar effect, kept nearly constant. The conventional warming model of CO2, suggests the temperatures should have risen by 0.6°C over the same period, similar to the period of 1970-2002. The analyses support Lu's CRE theory and point to the success of the Montreal Protocol on Substances that Deplete the Ozone Layer.

"We've known for some time that CFCs have a really damaging effect on our atmosphere and we've taken measures to reduce their emissions," Professor Lu said. "We now know that international efforts such as the Montreal Protocol have also had a profound effect on global warming but they must be placed on firmer scientific ground."

"This study underlines the importance of understanding the basic science underlying ozone depletion and global climate change," said Terry McMahon, dean of the faculty of science. "This research is of particular importance not only to the research community, but to policy makers and the public alike as we look to the future of our climate."

Professor Lu's paper, "Cosmic-Ray-Driven Reaction and Greenhouse Effect of Halogenated Molecules: Culprits for Atmospheric Ozone Depletion and Global Climate Change," also predicts that the global sea level will continue to rise for some years as the hole in the ozone recovers increasing ice melting in the polar regions. "Only when the effect of the global temperature recovery dominates over that of the polar ozone hole recovery, will both temperature and polar ice melting drop concurrently," says Lu.

The peer-reviewed paper published this week not only provides new fundamental understanding of the ozone hole and global climate change but has superior predictive capabilities, compared with the conventional sunlight-driven ozone-depleting and CO2-warming models, Lu argues.
Q.-B. Lu. Cosmic-Ray-Driven Reaction and Greenhouse Effect of Halogenated Molecules: Culprits for Atmospheric Ozone Depletion and Global Climate Change. International Journal of Modern Physics B, 2013; 1350073 DOI: 10.1142/S0217979213500732

http://mars.jpl.nasa.gov/msl/news/whatsnew/index.cfm?FuseAction=ShowNews&NewsID=1360

NASA Rover Finds Old Streambed On Martian Surface

NASA's Curiosity rover found evidence for an ancient, flowing stream on Mars at a few sites, including the rock outcrop pictured here, which the science team has named "Hottah" after Hottah Lake in Canada's Northwest Territories.

PASADENA, Calif. - NASA's Curiosity rover mission has found evidence a stream once ran vigorously across the area on Mars where the rover is driving. There is earlier evidence for the presence of water on Mars, but this evidence - images of rocks containing ancient streambed gravels - is the first of its kind.
Scientists are studying the images of stones cemented into a layer of conglomerate rock. The sizes and shapes of stones offer clues to the speed and distance of a long-ago stream's flow.
"From the size of gravels it carried, we can interpret the water was moving about 3 feet per second, with a depth somewhere between ankle and hip deep," said Curiosity science co-investigator William Dietrich of the University of California, Berkeley. "Plenty of papers have been written about channels on Mars with many different hypotheses about the flows in them. This is the first time we're actually seeing water-transported gravel on Mars. This is a transition from speculation about the size of streambed material to direct observation of it."

The finding site lies between the north rim of Gale Crater and the base of Mount Sharp, a mountain inside the crater. Earlier imaging of the region from Mars orbit allows for additional interpretation of the gravel-bearing conglomerate. The imagery shows an alluvial fan of material washed down from the rim, streaked by many apparent channels, sitting uphill of the new finds.
This set of images compares the Link outcrop of rocks on Mars (left) with similar rocks seen on Earth (right).
The rounded shape of some stones in the conglomerate indicates long-distance transport from above the rim, where a channel named Peace Vallis feeds into the alluvial fan. The abundance of channels in the fan between the rim and conglomerate suggests flows continued or repeated over a long time, not just once or for a few years.
The discovery comes from examining two outcrops, called "Hottah" and "Link," with the telephoto capability of Curiosity's mast camera during the first 40 days after landing. Those observations followed up on earlier hints from another outcrop, which was exposed by thruster exhaust as Curiosity, the Mars Science Laboratory Project's rover, touched down.
"Hottah looks like someone jack-hammered up a slab of city sidewalk, but it's really a tilted block of an ancient streambed," said Mars Science Laboratory Project Scientist John Grotzinger of the California Institute of Technology in Pasadena.
The gravels in conglomerates at both outcrops range in size from a grain of sand to a golf ball. Some are angular, but many are rounded. "The shapes tell you they were transported and the sizes tell you they couldn't be transported by wind. They were transported by water flow," said Curiosity science co-investigator Rebecca Williams of the Planetary Science Institute in Tucson, Ariz.
The science team may use Curiosity to learn the elemental composition of the material, which holds the conglomerate together, revealing more characteristics of the wet environment that formed these deposits. The stones in the conglomerate provide a sampling from above the crater rim, so the team may also examine several of them to learn about broader regional geology.
The slope of Mount Sharp in Gale Crater remains the rover's main destination. Clay and sulfate minerals detected there from orbit can be good preservers of carbon-based organic chemicals that are potential ingredients for life.
"A long-flowing stream can be a habitable environment," said Grotzinger. "It is not our top choice as an environment for preservation of organics, though. We're still going to Mount Sharp, but this is insurance that we have already found our first potentially habitable environment." During the two-year prime mission of the

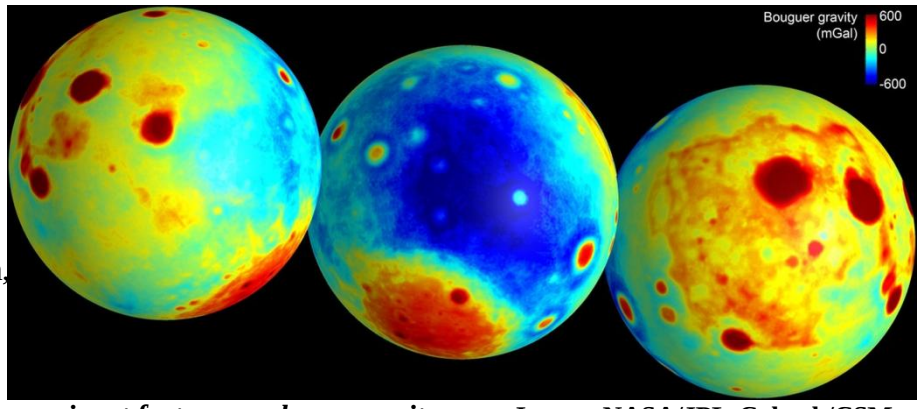
Mars Science Laboratory, researchers will use Curiosity's 10 instruments to investigate whether areas in Gale Crater have ever offered environmental conditions favorable for microbial life.
NASA's Jet Propulsion Laboratory, a division of Caltech, built Curiosity and manages the Mars Science Laboratory Project for NASA's Science Mission Directorate, Washington.
For more about Curiosity, visit: http://www.nasa.gov/msl and http://mars.jpl.nasa.gov/msl . You can follow the mission on Facebook and Twitter at: http://www.facebook.com/marscuriosity and http://www.twitter.com/marscuriosity.

http://www.eurekalert.org/pub_releases/2013-05/pu-tso052913.php

Team solves one of the moon's mysteries

A mystery of the moon that imperiled astronauts and spacecraft on lunar missions has been solved by a Purdue University-led team of scientists as part of NASA's GRAIL mission.

WEST LAFAYETTE, Ind. - Large concentrations of mass lurk on the lunar surface hidden like coral reefs beneath the ocean waves - an unseen and devastating hazard. These concentrations change the gravity field and can either pull a spacecraft in or push it off course, sealing its fate to a crash on the face of the moon.
"In 1968 these mass concentrations were an unwelcome discovery as scientists prepared for the Apollo landings, and they have remained a mystery ever since," said Jay Melosh, a member of the Gravity Recovery and Interior Laboratory, or GRAIL, science team who led the research. "GRAIL has now mapped where they lay, and we have a much better understanding of how they developed. If we return to the moon, we can now navigate with great precision."
A better understanding of these features also adds clues to the moon's origin and evolution and will be useful in studying other planets where mass concentrations also are known to exist including Mars and Mercury, said Melosh, who is a distinguished professor of earth, atmospheric and planetary sciences and physics.
"We now know the ancient moon must have been much hotter than it is now and the crust thinner than we thought," he said. "For the first time we can figure out what size asteroids hit the moon by looking at the basins left behind and the gravity signature of the areas. We now have tools to figure out more about the heavy asteroid bombardment and what the ancient Earth may have faced."
The team confirmed the standing theory that the concentrations of mass were caused by massive asteroid impacts billions of years ago and determined how these impacts changed the density of material on the moon's surface and, in turn, its gravity field. A paper detailing the results will be published online by the journal Science on Thursday (May 30).



Mascons are prominent features on lunar gravity maps **Image: NASA/JPL-Caltech/CSM**

In addition to Melosh, Purdue team members include Andrew Freed, associate professor of earth, atmospheric and planetary sciences, and graduate students Brandon Johnson and David Blair. Additional team members include Maria Zuber, GRAIL principal investigator and professor at the Massachusetts Institute of Technology; J. Andrews-Hanna of the Colorado School of Mines; S. Solomon of Columbia University; and the GRAIL Science Team.
"The explanation of mascons has eluded scientists for decades," Zuber said. "Since their initial discovery they have also been observed on Mars and Mercury, and by understanding their formation on the moon we have greatly advanced knowledge of how major impacts modified planetary crusts."
The mass concentrations form a target pattern with a gravity surplus at the bulls-eye surrounded by a ring of gravity deficit and an outer ring of gravity surplus. The team found that this pattern arises as a natural consequence of crater excavation, collapse and cooling following an impact.
The team determined that the increase in density and gravitational pull at the bulls-eye was caused by lunar material melted from the heat of the asteroid impact. The melting causes the material to become more concentrated, stronger and denser, and pulls in additional material from the surrounding areas, Melosh said.
The large asteroid impacts also caused big holes into which the surrounding lunar material collapsed. As the cool, strong lunar crust slid into the holes it bent downward, forming a rigid, curved edge that held down the material beneath it and prevented it from fully rebounding to its original surface height. This causes a ring with less gravitational pull because the mass is held farther below the surface, the top of which is what most influences the gravitational signature, he said. The outer ring of increased gravitational pull comes from the added mass of the material ejected by the initial impact that then piles on top of the lunar surface.

The team combined expertise in specialized computer analysis methods called hydrocodes and finite element codes to create computer simulations that could show the physical changes occurring from microseconds to millions of years. The team analyzed the Freundlich-Sharanov and Humorum mascon basins.
Melosh is a pioneer in adapting computer hydrocodes - computer programs originally created to analyze the flow of liquids - to simulate how complex materials move when high-speed collisions occur, like that of a planetary collision. Hydrocodes can be used to study such phenomena on a time scale of microseconds to hours, but are not practical from time scales much longer than that, he said.
Freed is a leader in adapting finite element codes, like those used to study car crashes, to simulate the changes in density of complex materials upon cooling and the evolution of Earth and other planets on the time scale of hours to millions of years.
Using the GRAIL data set, which offers an unprecedented, detailed map of the distribution of masses in the moon, the team was able to put together a picture of how the moon's crust and mantle behaved and the development of the concentrations of mass in the aftermath of large asteroid impacts.
During their prime and extended missions, the two GRAIL spacecraft transmitted radio signals precisely defining the rate of change of distance between them. The distance between the crafts Ebb and Flow changed slightly as they flew over areas of greater and lesser gravity caused by visible features, such as mountains and craters, and by masses hidden beneath the lunar surface. GRAIL scientists are using this data to learn detailed information about the moon's internal structure and composition.

http://bit.ly/1aPIv8c

Fact Check: Does That New Mammoth Carcass Really Preserve Flowing Blood and Possibly Live Cells?

Liquid blood? The possibility of live cells? Sounds amazing, right?

By Kate Wong | May 30, 2013 | 4

Yesterday brought a flurry of news stories trumpeting a mind-blowing discovery from the lost world of the last ice age: a 10,000-year-old woolly mammoth carcass that preserves muscle tissue the color of fresh meat and blood in liquid form, despite the -10 degrees Celsius temperatures in the Novosibirsk Islands, where Russian researchers discovered the beast. The *Siberian Times* obtained striking photos of the specimen showing the reddish tissues and a vial of the dark brown liquid said to be blood that was found in ice cavities under the animal's belly, as well as additional details of the discovery. The story quotes mammoth researcher Semyon Grigoriev of the North-Eastern Federal University in Yakutsk, who led the recovery of the mammoth, as speculating that the blood contains "a kind of natural anti-freeze" and declaring the specimen–a female that was between 50 and 60 years old when she died–to be "the best preserved mammoth in the history of paleontology." An *AFP* report, meanwhile, referred to the animal as the first old female mammoth ever found and quotes Grigoriev as saying "this find gives us a really good chance of finding live cells," which would be a windfall for his institution's project with South Korea's Sooam Biotech Research Foundation to clone a mammoth.
Wow! I mean, there have been some spectacular mammoths to emerge from this part of the world - the baby mammoth Lubya, discovered in 2007, for example. But muscle tissue like fresh meat? Liquid blood? The possibility of live cells? Sounds amazing, right? Yet with only the news reports to go on (the find was announced in the popular press rather than in a peer-reviewed scientific journal), I wondered if it might be too good to be true. So I contacted a couple of experts not involved in the discovery to get their read on the development. The upshot: it really does appear to be an incredible find, but some of the claims about it are incorrect as reported or have yet to be established as fact.
Daniel Fisher of the University of Michigan, a leading authority on mammoths who has worked with Grigoriev in the past and considers him a close colleague, comments that the news reports appear to be mostly legit. But he noted via email:
"…a few points have gone astray in the story, perhaps just the usual result of language differences and reporters and scientists getting a little out of sync. For instance, this is not the first old female mammoth found, just the first time we have found this much of the carcass (i.e., soft tissues) of an old female. Likewise, they have not found any 'living cell' - at most they could hope to find what the cloning enthusiasts might call a cell with 'viable' DNA, meaning that it would be intact enough to use in the context of a cloning effort. In fact, although

there is much talk of 'viability' of this sort, I think it remains to be demonstrated that any DNA from a mammoth meets this criterion. In general, ancient DNA is highly fragmented and by no means 'ready to go' into the next mammoth embryo.

As for the blood, I have no doubt that they have something interesting, but what exactly it is … is hard to say at this moment. Whether it is exactly blood, and only blood, will of course require a little more analysis, including some microscopic examination. I have previously seen coagulated blood in mammoth blood vessels, which is very close to what has been reported here, so that much is entirely reasonable. At the moment, I must reserve judgment on the specific nature of this new sample, but I am sure it will be of interest."

I also reached out to physiologist Kevin Campbell of the University of Manitoba, who, working with colleagues, has used ancient DNA to recreate the red blood cell protein hemoglobin from a woolly mammoth and then observed how that protein functioned. Their efforts, which he and molecular biologist Michael Hofreiter of the University of York in England described last year in an article for *Scientific American*, revealed that the temperature-sensitive protein evolved adaptations that enabled it to perform its job of delivering oxygen to body tissues in the frigid conditions mammoths faced. Campbell noted via email that "If the fluid ('blood') sample is as well preserved as the muscle (which, judging from the pictures seems to be amazingly well), there is the possibility that red blood cells are still intact." He told me he is interested in studying the substance to evaluate its oxygen-binding properties.

"The first step–from an oxygen-binding study perspective–is to look for red blood cells and then isolate hemoglobin from all the other proteins/cell debris in the sample. Since the sample was collected from outside the body, it is likely that there is also 'contamination' from myoglobin and possibly bacteria (for example). Based on the color alone, I think it is pretty safe to say that there is indeed a fair amount of hemoglobin (and possibly myoglobin) in the vials."

Campbell says Grigoriev told him by email that the "blood" did not even freeze when placed in a museum freezer kept at -17 degrees C. Campbell would like to examine why the substance is not frozen solid at -17 degrees C, noting that he was initially very skeptical about the claim that the supposed blood contains so-called cryoprotectants that have maintained it in a fluid state. He writes:

"Given that the sample is still fluid at -17C indicates that it is in a 'supercooled' state, as we expect blood and other body fluids to freeze at about -0.6C. Many insects (and some vertebrates) are able to avoid freezing at far colder temperatures via the expression of antifreeze peptides/glycoproteins and (largely carbohydrate based) cryoprotectants, which can dramatically lower the supercooling point (roughly equivalent with the freezing point). If mammoth blood had this trait, they would be the only known mammalian example of this to my knowledge (however, the abdomens of arctic ground squirrels have been shown to supercool down to -2.9C, though the mechanism allowing this ability is still unknown [I think]). At any rate, I highly (very highly) doubt that circulating mammoth blood was able to supercool to -17C–though it is worth testing the samples to see why they are still 'fluid'. For instance, maybe they did have some sort of cryoprotectant (arctic ground squirrels certainly seem to), and this became concentrated during the long period of preservation. Conversely, maybe they had absolutely no 'antifreezes' and instead most of the water in the sample was taken up by the surrounding ice, such that the remaining 'blood' became extremely concentrated–which would lower its freezing point. Alternatively, perhaps the sample was contaminated by ice-living bacteria which secreted cryoprotectants, or maybe there is some other explanation? Another question is how were these samples preserved in this state for so long? Also, why, given the many recent mammoth finds, is this the only one (that I know of) with 'fluid' blood? Regardless, this–on balance–appears to be a remarkable finding [if of course it is true--and I have no way to assess that at this point] and something worth pursuing."

Both Campbell and Fisher are now in discussions with Grigoriev about studying the new specimen. From the sound of things, these remains may well revolutionize scientists' understanding of mammoth physiology, which would be thrilling indeed. As for resurrecting this long-vanished creature, well, let's hope it doesn't come to that. As my colleagues and I argue in the June issue of *Scientific American*, de-extinction is a bad idea.

Update 05/30/13 2:00 p.m.: I asked Daniel Fisher about the claim that this new mammoth is the best preserved one yet and how it compares to other finds like the baby mammoth dubbed Lubya. I also asked him where he stands on the issue of resurrecting the mammoth. Although he was unable to reply to these questions before my deadline, he has since emailed me with this response:

"When we talk about comparative 'quality' of preservation, there is a whole spectrum of spatial scales involved, from the gross (in the medical/anatomical sense of the word) morphology of the whole body to the subcellular level. We say that Lyuba is well preserved … and she is … but when digging a little deeper, we say she is the most complete mammoth carcass ever recovered … and in fact, she was ALL THERE, and intact, from her dermis (and some of her woolly coat) to her internal organs. In point of fact, however, she owed this high level

of completeness to some chemical and bacterially mediated processes that had affected her tissue, essentially 'pickling' it (i.e., this is why she was not scavenged upon initial exposure). As a result, there was some internal breakdown of certain tissues (especially ones including what is called Type 1 collagen), with the result that at the histological and cellular level (extending to her DNA), she is not as well preserved as she would appear from the 'outside.' In contrast, other specimens, such as Khroma and Yuka, are less intact as whole bodies, but better preserved at the tissue level and below, as they did not undergo this 'pickling' process. They simply froze, more or less quickly, following death. This new mammoth would be more like these, except that its quality of preservation also varies from one part of the body to another–it's well preserved in parts of its body, at least at the tissue level and below, and is much more degraded in other parts of its body. Assuming the descriptions are accurate, it might be one of the best preserved at the tissue level, in those areas that are best preserved, but it will take some histological investigation to really demonstrate this.

…My 'feeling' about mammoth cloning is that it is not likely to happen anytime soon because of massive gaps in the chain of technical abilities required to achieve this goal and the unfavorable nature of probabilities for even those aspects of the process that we have made some progress in handling. Would I like to see a mammoth, imagining that it were possible? Of course I would! However, we're talking about complex, social organisms that are what they are (or were what they were) as much because of how they grew up within a family unit as because of their genetic structure. Could we really provide for such an animal, fresh from its surrogate mother? I doubt that we could really do enough in this direction. It's not a matter of food–we can handle that–it's more the whole social environment of the family unit. I'm not sure what we would learn from such an experiment, or what bearing it would really have on the lives of 'real' mammoths. And finally, doing anything like this requires choices, selection among priorities, and with all the conservation challenges we face, let alone other problems, I'm not sure that this goal deserves first place among our alternatives. I'm sure there will be other arguments in favor of the effort, arguments citing tangential benefits and such, but for all I want to learn about the lives of mammoths, I have more confidence in our ability to generate new knowledge from the fossil record than in our ability to learn from cloned mammoths."

http://www.eurekalert.org/pub_releases/2013-05/afot-ldo053013.php

Low doses of THC can halt brain damage

Extremely low doses of marijuana's psychoactive component protect brain before and after injury, says Tel Aviv University researcher

Though marijuana is a well-known recreational drug, extensive scientific research has been conducted on the therapeutic properties of marijuana in the last decade. Medical cannabis is often used by sufferers of chronic ailments, including cancer and post-traumatic stress disorder, to combat pain, insomnia, lack of appetite, and other symptoms.

Now Prof. Yosef Sarne of Tel Aviv University's Adelson Center for the Biology of Addictive Diseases at the Sackler Faculty of Medicine says that the drug has neuroprotective qualities as well. He has found that extremely low doses of THC - the psychoactive component of marijuana - protects the brain from long-term cognitive damage in the wake of injury from hypoxia (lack of oxygen), seizures, or toxic drugs. Brain damage can have consequences ranging from mild cognitive deficits to severe neurological damage.

Previous studies focused on injecting high doses of THC within a very short time frame – approximately 30 minutes – before or after injury. Prof. Sarne's current research, published in the journals Behavioural Brain Research and Experimental Brain Research, demonstrates that even extremely low doses of THC – around 1,000 to 10,000 times less than that in a conventional marijuana cigarette – administered over a wide window of 1 to 7 days before or 1 to 3 days after injury can jumpstart biochemical processes which protect brain cells and preserve cognitive function over time.

This treatment, especially in light of the long time frame for administration and the low dosage, could be applicable to many cases of brain injury and be safer over time, Prof. Sarne says.

Conditioning the brain

While performing experiments on the biology of cannabis, Prof. Sarne and his fellow researchers discovered that low doses of the drug had a big impact on cell signalling, preventing cell death and promoting growth factors. This finding led to a series of experiments designed to test the neuroprotective ability of THC in response to various brain injuries.

In the lab, the researchers injected mice with a single low dose of THC either before or after exposing them to brain trauma. A control group of mice sustained brain injury but did not receive the THC treatment. When the mice were examined 3 to 7 weeks after initial injury, recipients of the THC treatment performed better in

behavioral tests measuring learning and memory. Additionally, biochemical studies showed heightened amounts of neuroprotective chemicals in the treatment group compared to the control group.
The use of THC can prevent long-term cognitive damage that results from brain injury, the researchers conclude. One explanation for this effect is pre- and post-conditioning, whereby the drug causes minute damage to the brain to build resistance and trigger protective measures in the face of much more severe injury, explains Prof. Sarne. The low dosage of THC is crucial to initiating this process without causing too much initial damage.

Preventative and long-term use

According to Prof. Sarne, there are several practical benefits to this treatment plan. Due to the long therapeutic time window, this treatment can be used not only to treat injury after the fact, but also to prevent injury that might occur in the future. For example, cardiopulmonary heart-lung machines used in open heart surgery carry the risk of interrupting the blood supply to the brain, and the drug can be delivered beforehand as a preventive measure. In addition, the low dosage makes it safe for regular use in patients at constant risk of brain injury, such as epileptics or people at a high risk of heart attack.
Prof. Sarne is now working in collaboration with Prof. Edith Hochhauser of the Rabin Medical Center to test the ability of low doses of THC to prevent damage to the heart. Preliminary results indicate that they will find the same protective phenomenon in relation to cardiac ischemia, in which the heart muscle receives insufficient blood flow.

http://ars.to/11MslNi

Slow-motion 7.0 earthquake drags on for 5 months under New Zealand

Pacific Plate slides under NZ's North Island without so much as a rumble.

by John Timmer - May 31 2013, 6:00am TST

New Zealand's GeoNet, a public-private partnership that monitors the islands' seismic activity, has put up a blog post that describes a rather interesting event going on near the country's capital. Since January (and at last check, ongoing), the city of Wellington has most decidedly not been shaken by a magnitude 7 earthquake. And yet if you track the ground movement, that's about the size of the seismic energy that has been released.
How is that possible? We tend to pay attention to plate movements when they break things, especially when said things are entire cities. Those events occur when two plates get stuck as they try to move past each other and then release the built-up tension in a sudden lurch of motion. But not all tectonic shifts occur violently. Some plates move with such little friction that the resulting energy is released in ways that are barely perceptible.
Slow-slip earthquakes are somewhere in between. They tend to happen at subduction zones when plates get stuck as they slide past each other. But rather than releasing the energy in a sudden lurch, the tension goes through a period of smooth motion that can last for weeks or even months. New Zealand, which sits on top of a fault where the Pacific Plate slides under the Australian, has at least four regions that undergo slow-slip quakes, and all four of them seem to experience them very regularly, with periods ranging from two to five years between events. None of these are noticeable to the local residents but can be followed using GPS monitoring of ground locations.
Although the slow-slip events don't cause damage themselves, they do distribute stress to neighboring segments of the faults, some of which won't release it gently. So the activity is definitely worth keeping a careful eye on.
Found via the Smithsonian's Smart News blog.

http://www.eurekalert.org/pub_releases/2013-05/eso-etg052913.php

Exposure to general anaesthesia could increase the risk of dementia in elderly by 35 percent

Exposure to general anaesthesia increases the risk of dementia in the elderly by 35%

Exposure to general anaesthesia increases the risk of dementia in the elderly by 35%, says new research presented at Euroanaesthesia, the annual congress of the European Society of Anaesthesiology (ESA). The research is by Dr Francois Sztark, INSERM and University of Bordeaux, France, and colleagues.
Postoperative cognitive dysfunction, or POCD, could be associated with dementia several years later. POCD is a common complication in elderly patients after major surgery. It has been proposed that there is an association between POCD and the development of dementia due to a common pathological mechanism through the amyloid β peptide. Several experimental studies suggest that some anaesthetics could promote inflammation of neural tissues leading to POCD and/or Alzheimer's disease (AD) precursors including β-amyloid plaques and neurofibrillary tangles. But it remains uncertain whether POCD can be a precursor of dementia.

In this new study, the researchers analysed the risk of dementia associated with anaesthesia within a prospective population-based cohort of elderly patients (aged 65 years and over). The team used data from the Three-City study, designed to assess the risk of dementia and cognitive decline due to vascular risk factors. Between 1999 and 2001, the 3C study included 9294 community-dwelling French people aged 65 years and over in three French cities (Bordeaux, Dijon and Montpellier).
Participants aged 65 years and over were interviewed at baseline and subsequently 2, 4, 7 and 10 years after. Each examination included a complete cognitive evaluation with systematic screening of dementia. From the 2-year follow-up, 7008 non-demented participants were asked at each follow-up whether they have had a history of anaesthesia (general anaesthesia (GA) or local/locoregional anaesthesia (LRA)) since the last follow-up. The data were adjusted to take account of potential confounders such as socioeconomic status and comorbidities.
The mean age of participants was 75 years and 62% were women. At the 2-year follow-up, 33% of the participants (n=2309) reported an anaesthesia over the 2 previous years, with 19% (n=1333) reporting a GA and 14% (n=948) a LRA. A total of 632 (9%) participants developed dementia over the 8 subsequent years of follow-up, among them 284 probable AD and 228 possible AD, and the remaining 120 non-Alzheimer's dementia. The researchers found that demented patients were more likely to have received anaesthesia (37%) than non-demented patients (32%). This difference in anaesthesia was due to difference in numbers receiving general anaesthetics, with 22% of demented patients reporting a GA compared with 19% of non-demented patients. After adjustment, participants with at least one GA over the follow-up had a 35% increased risk of developing a dementia compared with participants without anaesthesia.
Dr Sztark concludes: "These results are in favour of an increased risk for dementia several years after general anaesthesia. Recognition of POCD is essential in the perioperative management of elderly patients. A long-term follow-up of these patients should be planned."
Notes to editors: Avidan et al. J Alzheimers Dis 2011; 24: 201-16. (2) André D et al. Ann Fr Anesth Reanim 2011; 30: 37-46.

http://www.eurekalert.org/pub_releases/2013-05/cbs-nrs053113.php

New research shows that asking for a precise number during negotiations can give you the upper hand

Columbia Business School professors say research can be used in everyday life, from car and home buying to salary negotiations

NEW YORK - With so much on the line for job seekers in this difficult economic climate, a lot of new hires might be wondering how - or whether at all - to negotiate salary when offered a new position. A recently published study on the art of negotiation by two professors at Columbia Business School could help these new hires - and all negotiators - seal a stronger deal than before.
Research conducted by Professors Malia Mason and Daniel Ames and doctoral students Alice Lee and Elizabeth Wiley finds that asking for a specific and precise dollar amount versus a rounded-off dollar amount can give you the upper hand during any negotiation over a quantity.
"What we discovered is there is a big difference in what most people think is a good strategy when negotiating and what research shows is a good strategy," said Professor Mason. "Negotiators should remember that in this case, zero's really do add nothing to the bargaining table." The research, forthcoming in the Journal of Experimental Social Psychology, looks at the two-way flow of communication between 1,254 fictitious negotiators.
The negotiators were placed in everyday scenarios such as buying jewelry or negotiating the sale of a used car. Some people were asked to make an opening offer using a rounded-off dollar amount, while other people were asked to use a precise dollar amount; let's say for example $5,000 vs. $5,015.
The results showed that overall, people making an offer using a precise dollar amount such as $5,015 versus a rounded-off dollar amount such as $5,000 were perceived to be more informed about the true value of the offer being negotiated. This perception, in turn, led precise-offer recipients to concede more value to their counterpart. In their negotiation scenarios, the professors concluded the person making a precise offer is successfully giving the illusion they have done their homework. When perceived as better informed, the person on the opposite end believes there is less room to negotiate.
To determine whether people make round offers more often than not, the researchers looked at the real estate market. Research done on Zillow, the online real estate marketplace, showed the overwhelming majority of displayed prices were rounded numbers, and that only two percent of people listed their homes with precise dollar amounts. "The practical application of these findings – signaling that you are informed and using a precise number - can be used in any negotiation situation to imply you've done your homework," Mason concluded.

The study, Precise Offers Are Potent Anchors: Conciliatory Counteroffers and Attributions of Knowledge in Negotiations was authored by Malia Mason, the Gantcher Associate Professor of Business; doctoral students Alice Lee and Elizabeth Wiley; and Daniel Ames, professor. Download the full report.

http://www.medscape.com/viewarticle/805012?src=wnl_edit_medn_wir&uac=82861MT&spon=34

Probiotics Affect Brain Activity

A new study provides the first evidence in humans that probiotics in the diet can modulate brain activity.

Megan Brooks

In a proof-of-concept study using functional MRI (fMRI), researchers found that women who regularly consumed probiotic-containing yogurt showed altered activity of brain regions that control central processing of emotion and sensation. The study was funded by Danone Research.

"This study is unique because it is the first to show an interaction between a probiotic and the brain in humans," lead author Kirsten Tillisch, MD, associate professor, Oppenheimer Family Center for Neurobiology of Stress, David Geffen School of Medicine, University of California Los Angeles, told Medscape Medical News.

"We can't say whether the effects are beneficial; that will take larger studies with more complex designs. One of the areas this will move to is study of disease groups like irritable bowel syndrome and anxiety," she added.

The results appear in the June issue of Gastroenterology.

Modulating Brain Function

"This is a very important study as up to now most of the evidence that the gut microbiota can influence brain and behavior have emerged from studies in mouse models including our own work (Bravo et al., PNAS 2011)," John Cryan, PhD, professor and head of the Department of Anatomy and Neuroscience, University College Cork, Ireland, who was not involved in the study, told Medscape Medical News.

"Tillisch and colleagues now have neatly shown that probiotics can also affect resting brain activity in human subjects using neuroimaging techniques. This gives credence to the idea that we may eventually modulate brain function in disease states using probiotics. That said, it is a small study, only in women, and the mechanism as to how the bacteria are inducing their effects remains unclear," Dr. Cryan said.

The study involved 36 healthy women with no gastrointestinal or psychiatric symptoms. Twice daily for 4 weeks, 12 women ate a fermented yogurt product containing the probiotics Bifidobacterium animalis subsp Lactis, Streptococcus thermophiles, Lactobacillus bulgaricus, and Lactococcus lactis subsp Lactis; 11 women ate a nonfermented milk product (controls), and 13 received no intervention.

The women underwent fMRI before and after the intervention to measure resting brain activity and brain responses to an emotion-recognition task in which they viewed a series of pictures of people with angry or scared faces and matched them to other faces showing the same emotions.

The researchers say they chose this task because studies in animals have linked changes in gut flora to changes in affective behaviors.

During the emotional reactivity task, the probiotic group showed significantly reduced activity ($P = .004$) in a widely distributed functional network containing affective, viscerosensory, and somatosensory cortices.

During resting fMRI, the probiotic group showed greater connectivity between the periaqueductal grey matter of the midbrain and cognition-associated areas of the prefrontal cortex.

These changes were not observed in the group that consumed the nonfermented milk product; "thus the findings appear to be related to the ingested bacteria strains and their effects on the host," the authors say.

Gut-Brain Interactions

This study, they say, "clearly demonstrates" an effect of probiotic ingestion on evoked brain responses and resting-state networks in women. However, it was not designed to address the mechanisms mediating this effect.

Going forward, they say, "identification of the signaling pathways between the microbiota and the brain in humans is needed to solidify our understanding of microbiota gut-brain interactions. If confirmed, modulation of the gut flora can provide novel targets for the treatment of patients with abnormal pain and stress responses associated with gut dysbiosis."

"The knowledge that signals are sent from the intestine to the brain and that they can be modulated by a dietary change is likely to lead to an expansion of research aimed at finding new strategies to prevent or treat digestive, mental and neurological disorders," Emeran Mayer, MD, professor of medicine, physiology, and psychiatry at the David Geffen School of Medicine at UCLA and the study's senior author, told Medscape Medical News.

The study was supported by Danone Research. Dr. Tillisch received grant funding for this project from the company. Two of the authors are employed by Danone Research. Dr. Mayer and Dr. Cryan have disclosed no relevant financial relationships. *Gastroenterology. 2013;144:1394-1401. Abstract*

http://bit.ly/11acO3W

Tokyo urged to aid disease eradication battle

World on the verge of a breakthrough in quest to eradicate infectious diseases and Japan needs to be a key player

by Tomohiro Osaki

The world may be on the verge of a historic breakthrough in the quest to eradicate infectious diseases once thought incurable, and Japan needs to be a key player, said Mark Dybul, an executive of the Global Fund to Fight AIDS, Tuberculosis and Malaria.

"For the first time in history, we have the ability to not (only reduce) but end public health threats such as malaria and tuberculous, diseases that have been with us for thousands of years," Dybul, executive director of the Geneva-based nonprofit organization, told The Japan Times on Friday.

"Basically, the current generation has the opportunity to end these diseases for their grandchildren — or to be known as the generation that had the opportunity and let it go," he said.

But it all depends on whether donors, including Japan, continue providing funding. In terms of governmental aid, Tokyo has provided the fifth-largest amount of financial support to the NPO over an 11-year period through last December, at around $1.74 billion (¥175 billion).

And Japan still has an important role to play in wiping out infectious diseases, Dybul said, voicing gratitude for the assistance to date and acknowledging he is aware that the nation's economic downturn poses constraints.

"In the past couple of years, understandably, there have been difficult financial times," he said. "(Japan's support is) not as strong as it once was, but the relationship (with us) is very strong, and we're hopeful that we'll continue that relationship."

The present situation offers "a tremendous chance for countries like Japan to be part of (the) historic moment (when major diseases can be eradicated)" and have a huge impact in Africa, he said, who previously served as the U.S. global AIDS coordinator from 2006 to 2009.

In the past few years, the world has made drastic medical headway in combatting malaria, including, for instance, the development of insecticide-coated bedding nets that not only prevent the disease-carrying mosquitoes from getting inside but actually kill them, he noted.

According to a 2011 World Heath Organization report, the global mortality rate from malaria in Africa dropped some 33 percent from 2005 — an achievement the U.N. entity attributed to beefed up preventive measures and more widespread use of special medicines to fight the disease.

Diagnostic tests also have improved. The advent of so-called dried blood spots now allows scientists to determine from a single drop of blood whether children have been infected with malaria. Anti-HIV drugs have progressed as well, with one dose per day considered sufficient.

According to a UNAIDS report, worldwide AIDS-related deaths in 2011 amounted to 1.7 million, down 24 percent from 2005. But the situation remains particularly worrisome in sub-Saharan Africa, where an estimated 1.2 million people died of AIDS-related complications in 2011 — accounting for 70 percent of deaths from the disease worldwide.

At the Tokyo International Conference on African Development that started Saturday in Yokohama, Dybul's global fund is co-organizing a side event to call on the world to continue the fight against lethal infections.

"I hope (Tokyo) could provide us with (the) maximum amount of financial support that is allowable within its system," Dybul said, "because this is what the heads of states from Africa are saying is important to them."

http://phys.org/news/2013-06-japan-international-shark.html

Japan to reject international shark trade regulation

The Japanese government has decided to reject landmark rules on the trade in sharks, an official said Friday

The Japanese government has decided to reject landmark rules on the trade in sharks, an official said Friday, opting for status quo despite a global push to protect the predators. Japan is filing a "reservation" about the regulation under the 178-member Convention on International Trade in Endangered Species (CITES), to restrict cross-border trade in the oceanic whitetip, the porbeagle and three types of hammerhead shark.

"It is the Japanese government's position that the species should be managed under the existing management bodies," said a Japanese diplomat assigned to the issue.

Asian nations led by Japan and China - where shark fin soup is considered a delicacy - tried to block the regulations in March at a Bangkok convention, but greater support for the measure from the rest of the world overwhelmed them. Global shark populations have been decimated over recent decades. According to the UN Food and Agriculture Organisation (FAO), humans kill about 100 million sharks each year, mostly for their fins.

Conservationists warn that dozens of species are under threat. Over the past 100 years, 90 percent of the world's sharks have disappeared, mostly because of overfishing, the FAO says.
Tokyo's move, Kyodo News said, risks global criticism of Japan, whose appetite for seafood has been seen as pushing some oceanic creatures, most notably tuna, toward extinction. Japan has long faced criticism from maritime conservationists for its regular whale hunting programmes, which Tokyo claims are carried out for scientific purposes while making no secret that the meat ends up on dinner plates.

http://www.scientificamerican.com/article.cfm?id=forgetting-is-harder-for-older-brains

Forgetting Is Harder for Older Brains

Adults hang on to useless information, which impedes learning

By Ian Chant

Kids are wildly better than adults at most types of learning—most famously, new languages. One reason may be that adults' brains are "full," in a way. Creating memories relies in part on the destruction of old memories, and recent research finds that adults have high levels of a protein that prevents such forgetting.
Whenever we learn something, brain cells become wired together with new synapses, the connections between neurons that enable communication. When a memory fades, those synapses weaken. Researchers led by Joe Tsien, a neuroscientist at the Medical College of Georgia, genetically engineered mice to have high levels of NR2A, part of a receptor on the surface of some neurons that regulates the flow of chemicals such as magnesium and calcium in and out of a cell. NR2A is known to be more prevalent in the brains of mammals as they age. The engineered mice, though young, had adult levels of NR2A, and they showed some difficulty forming long-term memories. More dramatically, their brains could barely weaken their synapses, a process that allows the loss of useless information in favor of more recent data.
A similar process may govern short-term memories as well. When you hear a friend ask for coffee, the details of her order don't just slip away in your mind—your brain must produce a protein that actively destroys the synapses encoding that short-term memory, according to a 2010 paper in Cell.
Much psychological research supports the idea that forgetting is essential to memory and emotional health [see "Trying to Forget," by Ingrid Wickelgren; Scientific American Mind, January/February 2012]. Tsien's new work, published January 8 in Scientific Reports, suggests that older brains hold on to their connections more dearly—which helps to explain why learning is more laborious as we age and why memory trouble later in life so often involves the accidental recall of outdated information.

How to intentionally forget a memory

Direct Suppression

Try to block out all thoughts of a certain memory.

Increases activity in the right dorsolateral prefrontal cortex, which mediates working memory and cognitive control.

Reduces activity in the hippocampus, an area important for conscious recollection.

Thought Substitution

Try to forget by substituting the unwanted memory with a more desired one.

Increases activity in the left caudal prefrontal cortex, thought to decrease saliency of intrusive memories, and the midventrolateral prefrontal cortex , which helps to retrieve a specific memory.

http://bit.ly/11jPqh4

Summer is Lyme Disease Season. The Price Of The Drug To Treat It Just Exploded.

If you've been reading for a while, you might remember some posts about nationwide shortages of drugs.

By Maryn McKenna

The Food and Drug Administration was concerned, and so were very senior physicians working in infectious disease, cancer, everyday emergency medicine and even veterinary care.
The crisis faded from view, as they do. So it wasn't much noticed that back in March, the American Academy of Pediatrics warned of an FDA alert over an apparent shortage of doxycycline, an old and inexpensive drug that is used mostly for uncomplicated infections such as sexually transmitted diseases and acne. It is also used, though, as the first treatment for a new case of Lyme disease — and that more than anything has sparked alarm. Lyme is a problem mostly in the northeastern US and also the upper Midwest (though other little-noticed tickborne infections occur in the southeast and on the West Coast). Maine is one of Lyme's hotspots, and last week the Bangor Daily News reported:

"We've had availability, but the price is going up and that's obviously a concern, too," state epidemiologist Stephen Sears said. "And, sooner or later, if it's getting to be short nationally, it's going to get short here, just as other drugs have."

He said the department has heard Doxycycline's price is now five to 10 times higher than it used to be, but he said that is hard to gauge because pharmacies all price differently and insurance companies pay differently.

Senators from Maine and Minnesota urged the FDA last week to do what they can to alleviate the problem — which seems to be a combination of higher demand and reduced supply from the manufacturers. According to the FDA' s running tally on shortages, of the four distributors of doxycycline, one can't get any until September, and one has restricted its sales to its current contract customers only.

Last night, this issue showed up in my Twitter feed. Dr. Judy Stone, who practices in western Maryland and Maine (and blogs at Scientific American) announced the price of the drug at her hospital community pharmacy had gone from $20 to $3,000.

Here's the conversation that ensued. Participants are physicians Eli Perencevich and Amesh Adalja, and investigative journalist Katherine Eban, who knows more than anyone about the internal complexities of drug manufacturing.

Drug shortages driving up price of everyday antibiotics. Way up.

In practical terms, what does this mean? (Other than that drug manufacturing in the US is broken. But we knew that.) If you live in an area where you are likely to be exposed to tickborne diseases — which, frankly, is most of the US now — it's more important than ever to take the steps to protect yourself; the easy fix of a quick cure may not be available when you need it. After that, hope that no national disease emergency occurs; as Dr. Adalja pointed out in a paper last year, doxycycline is a key component of biodefense campaigns as well.

Meanwhile, if you're a physician or pharmacist who is experiencing these shortages or price increases, it would be great if you would let me or Dr. Stone know, in the comments here; through the email link under my byline up top; or via @marynmck or @drjudystone.