http://www.sciencedaily.com/releases/2013/09/130909105033.htm

Early Detection of Parkinson's Disease Through Handwriting

Identifying the changes in handwriting could lead to an early diagnosis of the illness and neurological intervention at a critical moment

Today's primary tool for diagnosing Parkinson's disease is the diagnostic ability of the physician, who can generally identify the clinical symptoms only when the disease is at a relatively advanced stage. A new joint study by researchers at the University of Haifa and Rambam Hospital that compared the handwriting of 40 sick and healthy subjects suggests an innovative and noninvasive method of diagnosing Parkinson's at a fairly early stage.

"Identifying the changes in handwriting could lead to an early diagnosis of the illness and neurological intervention at a critical moment," explains Prof. Sara Rosenblum, of the University of Haifa's Department of Occupational Therapy, who initiated the study.

The methods for diagnosing Parkinson's today are a physician evaluation or a test called SPECT, which uses radioactive material to image the brain. The latter, however, is no more effective in diagnosing the illness than an expert doctor and it exposes the patient to unnecessary radiation.

Studies from recent years show that there are unique and distinctive differences between the handwriting of patients with Parkinson's disease and that of healthy people. However, most studies that to date have focused on handwriting focused on motor skills (such as the drawing of spirals) and not on writing that involves cognitive abilities, such as signing a check, copying addresses, etc.

According to Prof. Rosenblum, Parkinson's patients report feeling a change in their cognitive abilities before detecting a change in their motor abilities and therefore a test of cognitive impairment like the one performed in this study could attest to the presence of the disease and offer a way to diagnose it earlier.

This research was conducted in cooperation with Dr. Ilana Schlesinger, head of the Center for Movement Disorders and Parkinson's Disease at Haifa's Rambam Medical Center and occupational therapists working in the hospital. In the study, the researchers asked the subjects to write their names and gave them addresses to copy, two everyday tasks that require cognitive abilities. Participants were 40 adults with at least 12 years of schooling, half healthy and half known to be in the early stages of Parkinson's disease (before obvious motor signs are visible).

The writing was done on a regular piece of paper that was placed on electronic tablet, using a special pen with pressure-sensitive sensors operated by the pen when it hit the writing surface. A computerized analysis of the results compared a number of parameters: writing form (length, width and height of the letters), time required, and the pressure exerted on the surface while performing the assignment.

Analysis of the results showed significant differences between the patients and the healthy group, and all subjects, except one, had their status correctly diagnosed (97.5% accuracy). The Parkinson's disease patients wrote smaller letters ("micrograph"), exerted less pressure on the writing surface, and took more time to complete the task. According to Prof. Rosenblum a particularly noticeable difference was the length of time the pen was in the air between the writing of each letter and each word.

"This finding is particularly important because while the patient holds the pen in the air, his mind is planning his next action in the writing process, and the need for more time reflects the subject's reduced cognitive ability. Changes in handwriting can occur years before a clinical diagnosis and therefore can be an early signal of the approaching disease," Prof. Rosenblum said.

According to Dr. Schlesinger, validating these findings in a broader study would allow this method to be used for a preliminary diagnosis of the disease in a safe and non-invasive fashion. "This study is a breakthrough toward an objective diagnosis of the disease," said Dr. Schlesinger, adding, "Publication of the study in the journal of the European Neurological Society aroused great interest at the International Congress of Parkinson's Disease and Movement held last week in Sydney, Australia."

The researchers note that this diagnostic method has the added benefit of reducing the load on the health system, because the test can be performed by a professional other than a doctor. After the results are in, patients can be referred to a doctor for further treatment and testing if necessary. The researchers are currently using the method in a new experiment, in which they use handwriting analysis to evaluate the degree of Parkinson's patients' improved functioning after they have brain pacemakers implanted.

Sara Rosenblum, Margalit Samuel, Sharon Zlotnik, Ilana Erikh, Ilana Schlesinger. Handwriting as an objective tool for Parkinson's disease diagnosis. Journal of Neurology, 2013; DOI: 10.1007/s00415-013-6996-x

http://phys.org/news/2013-09-cancer.html

New way to put the brakes on cancer found

While great strides have been achieved in cancer treatment, scientists are looking for the new targets and next generation of therapeutics to stop this second leading cause of death nationwide.

A new platform for drug discovery has been developed through a collaborative effort linking chemists at NYU and pharmacologists at USC.

In a study appearing in Proceedings of the National Academy of Sciences, the research groups of Paramjit Arora, a professor in NYU's Department of Chemistry, and Bogdan Olenyuk from the USC School of Pharmacy have developed a synthetic molecule, "protein domain mimetic," which targets the interaction between two proteins, called transcription factor-coactivator complex at the point where intracellular signaling cascade converges resulting in an up-regulation of genes that promote tumor progression.

This approach presents a new frontier in cancer research and is different from the typical search for small molecules that target cellular kinases.

The synthetic molecule that the paper describes—HBS 1—is based on chemically stabilized secondary structure of a protein that is mimicking specific fold, called ?-helix ,- and shows outstanding potential for suppression of tumor growth. This compound was specifically designed to interrupt the type of molecular conversation within cell (called cell signaling) that promotes growth of cancer cells. Creation of HBS 1 required a method for locking correct helical shapes in synthetic strings of amino acids – a method previously developed at NYU.

The studies conducted at NYU and USC show that the molecule disrupted the cancer cell signaling network and reached the correct target in the cell to provide a rapid blockade of tumor growth. Importantly, the compounds did not show any signs of toxicity or negative impact in the test host.

While the in vivo experiments in this research were conducted using renal carcinoma cells, the principles of this design are applicable to many human conditions, including other cancers, cardiovascular diseases, and diabetic complications. The general concept of the study, the interruption of the connection between genes as they conspire to promote cancer growth, is general and applicable to the protein cell to protein cell "conversations" implicated in a host of human diseases.

More information: Protein domain mimetics as in vivo modulators of hypoxia-inducible factor signaling, www.pnas.org/cgi/doi/10.1073/pnas.1312473110

http://www.medscape.com/viewarticle/810629?src=rss

Will a Spoonful of Cinnamon Help the Diabetes Meds Go Down?

In a new meta-analysis of 10 studies in patients with type 2 diabetes, taking cinnamon supplements improved fasting blood glucose and cholesterol levels, but not glycated hemoglobin (HbA_{1c}) levels.

Marlene Busko

HbA_{1c} likely was not affected because the studies were too short, and they were also very small and diverse, making it difficult to draw any clinical implications, caution Robert W. Allen (then a PharmD student at Western University of Health Sciences, Pomona, California) and coauthors in their paper published September 9 in the *Annals of Family Medicine*.

Based on this meta-analysis, "I wouldn't recommend cinnamon instead of [diabetes] medication," and long-term effects are unknown, senior author Olivia Phung, PharmD, from Western University of Health Sciences, told *Medscape Medical News*. However, small doses of a cinnamon supplement could be used along with traditional diabetes medication, she conceded.

Nicole White, PharmD, from Creighton University, in Omaha, Nebraska, who was not involved in this study, agrees that cinnamon might play a role as an adjunct to traditional medicine.

"Larger, long-term studies would definitely be beneficial in further elucidating the effects of cinnamon on glucose homeostasis," she told *Medscape Medical News* in an e-mail. "Until that time, cassia cinnamon in daily doses of 1 to 6 g appears to be a reasonable option for glucose lowering in conjunction with (and not precluding) the use of evidence-based therapies when clinically appropriate."

Cinnamomum cassia, either as natural supplement powder or capsule, was the most common form of cinnamon that was studied in the trials, and 1 tsp of cinnamon is approximately 3 g, according to Prof. Phung.

Updated Meta-Analysis Finds Some Benefits of Cinnamon

Despite an increasing body of literature focused on the use of natural supplements in the treatment of diabetes, the American Diabetes Association (ADA) does not recommend their use because clinical evidence showing efficacy is insufficient and they lack standardized formulations, explain Prof. Allen and colleagues in their paper.

Cinnamon is one of the natural products that are of interest for diabetes because some animal studies and small clinical trials have suggested that it may lower blood glucose, an effect attributed to its active component cinnamaldehyde.
But a 2008 meta-analysis by this same research group did not find a statistical benefit of cinnamon on glucose lowering. However, several randomized trials have been published since then, so the group conducted a new review to investigate a potential role for this spice in the treatment of type 2 diabetes.
They identified 10 randomized controlled trials published to February 2012, which evaluated cinnamon vs a control, in a total of 543 patients with type 2 diabetes. The studies each randomly assigned about 20 to 60 patients to receive either cinnamon or a control. In 5 of the trials, patients also received concomitant therapy with an oral hypoglycemic agent.
Cinnamon was taken with meals in 7 trials and around mealtime in 3 trials. The cinnamon dosage ranged from 120 mg/day to 6 g/day.
Six trials evaluated *C cassia* in capsule or powder form; 1 trial evaluated *C cassia* combined with zinc gluconate and tricalcium phosphate; 1 trial evaluated *C aromaticum;* and 2 trials did not specify the cinnamon type.
The meta-analysis found that after 4 to 18 weeks, the patients experienced a mean drop in plasma glucose (-24.59 mg/dL) that was less than the improvement reported with metformin therapy (-58 mg/dL) but slightly more than the improvement reported with sitagliptin (*Januvia*, Merck) (-16 to -21 mg/dL), the authors note.
The patients also had reductions in total cholesterol (-15.60 mg/dL), LDL cholesterol (-9.42 mg/dL), and triglycerides (-29.59), and an increase in HDL cholesterol (1.66 mg/dL; all mean values).
The trials did not find any significant side effects with cinnamon use.

Long-term Safety and Efficacy Remain to Be Determined

"The advantages of cinnamon are its cost, tolerability, and relatively safe profile," Prof. White said. On the other hand, "long-term administration of high-dose cinnamon may possibly be unsafe due to the coumarin content" of cinnamon, which has been associated with liver damage in animal studies, she noted. Long-term clinical efficacy also remains to be determined, she added.
Similarly, Prof. Phung and colleagues conclude that "caution should be exercised in applying the results of this analysis to patient care because of the [differences] of the dose and duration of cinnamon use and uncertainty of the ideal patient population."
The authors have reported no relevant financial relationships. Ann Fam Med. 2013;11:452-459.

http://www.sciencedaily.com/releases/2013/09/130909201248.htm

Copper Destroys Highly Infectious Norovirus

Copper and copper alloys rapidly destroy norovirus.

Scientists from the University of Southampton have discovered that copper and copper alloys rapidly destroy norovirus -- the highly-infectious sickness bug. Worldwide, norovirus is responsible for more than 267 million cases of acute gastroenteritis every year. In the UK, norovirus costs the National Health Service at least £100 million per year, in times of high incidence, and up to 3,000 people admitted to hospital per year in England.
The virus, for which there is no specific treatment or vaccine, 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.
The study, which was designed to simulate fingertip-touch contamination of surfaces, showed norovirus was rapidly destroyed on copper and its alloys, with those containing more than 60 per cent copper proving particularly effective. Copper alloys have previously been shown to be effective antimicrobial surfaces against a range of bacteria and fungi.
The Southampton research reported rapid inactivation of murine norovirus on alloys, containing over 60 per cent copper, at room temperature but no reduction of infectivity on stainless steel dry surfaces in simulated wet fomite and dry touch contamination. The rate of inactivation was initially very rapid and proportional to the copper content of alloy tested. Viral inactivation was not as rapid on brass as previously observed for bacteria but copper-nickel alloy was very effective.
One of the targets of copper toxicity was the viral genome and a reduced number of the gene for a viral encoded protein, VPg (viral-protein-genome-linked), which is essential for infectivity, was observed following contact with copper and brass dry surfaces.
Lead author Sarah Warnes, from the Centre for Biological Sciences at the University of Southampton, says: "The use of antimicrobial surfaces containing copper in clinical and community environments, such as cruise ships and care facilities, could help to reduce the spread of this highly infectious and costly pathogen.

"Copper alloys, although they provide a constant killing surface, should always be used in conjunction with regular and efficient cleaning and decontamination regimes using non-chelating reagents that could inhibit the copper ion activity."
Co-author Professor Bill Keevil, from the University's Institute for Life Sciences, adds: "Although the virus was identified over 40 years ago, the lack of methods to assess infectivity has hampered the study of the human pathogen.
"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."
The study 'Inactivation of norovirus on dry copper alloy surfaces' is published in the latest issue of the journal PLOS ONE. Previous laboratory studies by the University of Southampton have described the rapid death of bacterial, fungal and viral pathogens such as MRSA on copper alloy surfaces and also prevention of antibiotic resistance horizontal gene transfer between pathogens.
Sarah L. Warnes, C. William Keevil. Inactivation of Norovirus on Dry Copper Alloy Surfaces. PLoS ONE, 2013; 8 (9): e75017 DOI: 10.1371/journal.pone.0075017

http://phys.org/news/2013-09-analysis-sutter-mill-fragments-reveals.html

Analysis of Sutter's Mill fragments reveals organic compounds not seen in other meteorites

A team of researchers from Arizona State University has found that the space rock known as the Sutter's Mill meteorite had organic compounds in it that have not been found in any other known meteorite.

Phys.org - In their paper published in the journal Proceedings of the National Academy of Sciences, the researchers describe how they applied hydrothermal treatment to fragments of the meteorite which allowed the organic compounds to be released.
Sutter's Mill meteorite was seen streaking through the atmosphere above northern California in April 2012. That led to a search by many interested parties for the chunks that survived the intense heat and made their way to the Earth's surface—in all 77 rocks were found and turned over to scientists eager to study their composition—initial testing of some of the specimens revealed few dissoluble organic compounds. Undaunted, the researchers took another approach, applying hydrothermal treatment—a process that is meant to mimic the conditions scientists believe existed on certain parts of the Earth during the time life first emerged. This time, the team reports, the fragments released organic compounds that had never before been seen in a meteorite.

Fragments of the Sutter's Mill meteorite obtained from Henningsen Lotus Park, Lotus, California. **Credit: NASA**

Organic compounds in meteorites (most of which are believed to come from the asteroid belt between Jupiter and Mars) are important to researchers who believe it's possible that life got its start here on Earth thanks to meteorites that carried payloads that added to material found on Earth. Taken together, the ingredients made for the perfect cocktail, eventually giving rise to the mysterious process that resulted in the creation of living organic matter and eventually all the forms of life that came after.
Looking to meteorites as a possible source for life on Earth has come about due to scientists' inability to nail down a rational explanation for the development of life based on theories of how the Earth came to exist. Of course, such theories only move the debate to another arena—if life came here from somewhere else, how did it get started in that other place? Scientists have no answer, but hope studying rocks brought from space will offer clues that may help to someday solve the puzzle.
More information: Processing of meteoritic organic materials as a possible analog of early molecular evolution in planetary environments, PNAS, Published online before print September 9, 2013, DOI: 10.1073/pnas.1309113110

Abstract
The composition of the Sutter's Mill meteorite insoluble organic material was studied both in toto by solid-state NMR spectroscopy of the powders and by gas chromatography–mass spectrometry analyses of compounds released upon their hydrothermal treatment. Results were compared with those obtained for other meteorites of diverse classifications (Murray, GRA 95229, Murchison, Orgueil, and Tagish Lake) and found to be so far unique in regard to the molecular species released. These include, in addition to O-containing aromatic compounds, complex polyether- and ester-containing alkyl molecules of prebiotic appeal and never detected in meteorites before. The Sutter's Mill fragments we analyzed had likely been altered by heat, and the hydrothermal conditions of the experiments realistically mimic early Earth settings, such as near volcanic activity or impact craters. On this basis, the data suggest a far larger availability of meteoritic organic materials for planetary environments than previously assumed and that molecular evolution on the

early Earth could have benefited from accretion of carbonaceous meteorites both directly with soluble compounds and, for a more protracted time, through alteration, processing, and release from their insoluble organic materials.

http://www.eurekalert.org/pub_releases/2013-09/bas-lfi091013.php

Life found in the sediments of an Antarctic subglacial lake for the first time

Evidence of diverse life forms dating back nearly a hundred thousand years has been found in subglacial lake sediments by a group of British scientists.

The possibility that extreme life forms might exist in the cold and dark lakes hidden kilometres beneath the Antarctic ice sheet has fascinated scientists for decades.

However, direct sampling of these lakes in the interior of Antarctica continues to present major technological challenges. Recognising this, scientists from the British Antarctic Survey (BAS), and the Universities of Northumbria and Edinburgh have been searching around the retreating margins of the ice sheet for subglacial lakes that are becoming exposed for the first time since they were buried more than 100,000 years ago.

This is because parts of the ice sheet are melting and retreating at unprecedented rates as the temperature rises at the poles.

The group targeted Lake Hodgson on the Antarctic Peninsula which was covered by more than 400 m of ice at the end of the last Ice Age, but is now considered to be an emerging subglacial lake, with a thin covering of just 3-4 metres of ice.

Drilling through the ice they used clean coring techniques to delve into the sediments at the bottom of the lake which is 93 metres deep and approximately 1.5 km long by 1.5 km wide.

The lake was thought to be a harsh environment for any form of life but the layers of mud at the bottom of the lake represent a time capsule storing the DNA of the microbes which have lived there throughout the millennia.

The top few centimetres of the core contained current and recent organisms which inhabit the lake but once the core reached 3.2 m deep the microbes found most likely date back nearly 100,000 years.

Lead author David Pearce, who was at BAS and is now at the University of Northumbria, says,

"What was surprising was the high biomass and diversity we found. This is the first time microbes have been identified living in the sediments of a subglacial Antarctic lake and indicates that life can exist and potentially thrive in environments we would consider too extreme.

"The fact these organisms have survived in such a unique environment could mean they have developed in unique ways which could lead to exciting discoveries for us. This is the early stage and we now need to do more work to further investigate these life forms."

Some of the life discovered was in the form of Fossil DNA showing that many different types of bacteria live there, including a range of extremophiles which are species adapted to the most extreme environments. These use a variety of chemical methods to sustain life both with and without oxygen.

One DNA sequence was related to the most ancient organisms known on Earth and parts of the DNA in twenty three percent has not been previously described. Many of the species are likely to be new to science making clean exploration of the remote lakes isolated under the deeper parts of the ice sheet even more pressing.

Scientists believe organisms living in subglacial lakes could hold clues for how life might survive on other planets.

Late last year a British expedition to drill into Lake Ellsworth was called off after technical difficulties. A US expedition sampled a subglacial environment near the edge of the ice sheet but has yet to report its findings, and a Russian led project has sampled ice near the surface of a subglacial lake and has reported finding signs of life.

The paper, Preliminary Analysis of Life within a Former Subglacial Lake Sediment in Antarctica has been published online in the Journal 'Diversity' as part of a special issue on Microbial Ecology and Diversity.

Funding was from the Natural Environment Research Council UK

http://www.sciencedaily.com/releases/2013/09/130910095217.htm

New Evidence That Orangutans and Gorillas Can Match Images Based On Biological Categories

Other apes may form categories to represent different types of animals

The ability to form a general concept that connects what we know about the members of a category allows humans to respond appropriately when they encounter a novel member of that category. At an early age, children form categories to, for example, differentiate animals from inanimate objects and to differentiate dogs from cats. New research shows that other apes may form similar categories to represent different types of animals.

There are at least two ways to visually identify an animal as being similar to any other: the animals may be within a species and therefore closely resemble each other (so called 'perceptual' differences) or the animals may be considered to meet the criteria for a broader mental concept (for example, "reptiles do not have fur, they

have short legs or have no legs, and lay eggs -- these all seem like reptiles"). Concept formation in human children has been subjected to extensive experimental study, with much focus on the interplay between concept acquisition and language acquisition. It has been proposed that these broader concepts depend upon formal scientific training and/or the ability to form verbal labels for such concepts. If non-human animals represent such concepts, this finding would be evidence against such a view. It is surprising then that the existence of natural categories, such as classification of animals, has not been extensively studied in language-less non-human apes. Studies of concepts in animals have instead paid close attention to the perceptual features that are used by the animals to extract information about category membership but have not typically allowed animals to demonstrate that they can also form concepts at different levels of breadth simultaneously.

In this study, a young female gorilla and four orangutans of various ages were shown images of animals and asked to match them to an image from the same species or family (i.e. one with a perceptual similarity). In an alternate experiment, they were presented with images of animals belonging to different taxonomic classes (insects, reptiles, fish, birds, and mammals) and were asked to match these images to sample images of other members of that class.

In the case of images from within a taxonomic class (for example different reptiles) each image naturally shared fewer perceptual features, presumably making it more difficult for the apes to match the images correctly using only perceptual strategies. If the apes were using a purely perceptual strategy then they should find it harder to match images from the same classes compared to matching images from within the same species or family. However, the orangutans were actually able to match images from the same classes at a higher level of accuracy than they were able to match images from within the same species or family, indicating that they may have formed a concept for the class of animal that extended beyond perceptual similarity. The gorilla was also able to acquire these concepts but required more testing sessions than with the concepts involving same species. The 'class level' distinctions are analogous to the basic level categories learned first by human children. Importantly, these apes had not been trained to match based on perceptual identity -- a procedure that might work against the likelihood that animals focus on broader concepts rather than perceptual features.

Dr Vonk, the lead researcher on the study "Matching based on Biological Categories in Orangutans (Pongo abelii) and a Gorilla (Gorilla gorilla gorilla)" which was published today in the journal PeerJ, said that "the ability of other apes to match stimuli at the level of taxonomic class is a novel finding that tells us that abstract categories can be extracted from visual stimuli in the absence of biological information, verbal labels, or extensive experience with the objects. This finding suggests that orangutans, and perhaps gorillas, may share an underlying conceptual process with humans."

This finding of category matching in non-humans refutes the often-held claim that biological categories depend upon scientific knowledge or labels produced by language. The findings are expected to inspire other investigators to test non-humans on increasingly abstract category tasks to further determine what features non-humans are using to solve such tasks, and whether the process is indeed similar to that used by humans to categorize novel items.

Jennifer Vonk. Matching based on biological categories in Orangutans (Pongo abelii) and a Gorilla (Gorilla gorilla gorilla). PeerJ, 2013; 1: e158 DOI: 10.7717/peerj.158

http://blog.longnow.org/02013/09/09/the-oldest-petroglyphs-in-the-american-west

The Oldest Petroglyphs in the American West

Researchers reveal that a series of petroglyphs are evn older than previously suspected and might be attributed to the first people to set foot in the American West

September 9th, 02013 by Charlotte

The story of the oldest Americans is largely unknown to us; the first people to arrive on the North American continent didn't leave behind any material clues for later generations to find. But a recent discovery in Nevada may now offer us a little glimpse into their world. In a forthcoming issue of the Journal of Archaeological Science, a team of researchers reveals that a series of petroglyphs, carved into boulders near Pyramid Lake, are even older than previously suspected – and might be attributed to the first people to set foot in the American West.

Unlike those ancient Americans, weather patterns do leave their mark on the world around them – and this allowed paleoclimatologist Larry Benson to determine that the images are about 10,000, or about 14,000, years old. The petroglyphs are carved into what Benson knew to be a lakebed, and must therefore have been created during a dry period. Chemical testing of samples from the site

revealed that such a dry period occurred between 14,800 and 13,200 years ago, and again between 11,300 and 10,500 years ago. Whichever dating turns out to be the right one, these are easily the oldest petroglyphs that have been found on the North American continent, and will inform what we know about the first people to cross the Bering Strait.

The images are composed of abstract swirling and geometrical patterns. The researchers have suggested that the carvings may depict natural phenomena, such as leaves, clouds, or even the Milky Way. But without other evidence of culture from this period, it will be difficult to determine what exactly the etchings represent – or who created them.

"We have no idea what they mean," Benson said of the Winnemucca Lake petroglyphs. "But I think they are absolutely beautiful symbols. Some look like multiple connected sets of diamonds, and some look like trees, or veins in a leaf. There are few petroglyphs in the American Southwest that are as deeply carved as these, and few that have the same sense of size."

http://www.sciencedaily.com/releases/2013/09/130910121521.htm

Think Twice, Speak Once: Bilinguals Process Both Languages Simultaneously

Bilingual speakers can switch languages seamlessly, likely developing a higher level of mental flexibility than monolinguals, according to Penn State linguistic researchers.

"In the past, bilinguals were looked down upon," said Judith F. Kroll, Distinguished Professor of Psychology, Linguistics and Women's Studies. "Not only is bilingualism not bad for you, it may be really good. When you're switching languages all the time it strengthens your mental muscle and your executive function becomes enhanced."

Fluent bilinguals seem to have both languages active at all times, whether both languages are consciously being used or not, the researchers report in a recent issue of Frontiers in Psychology. Both languages are active whether either was used only seconds earlier or several days earlier.

Bilinguals rarely say a word in the unintended language, which suggests that they have the ability to control the parallel activity of both languages and ultimately select the intended language without needing to consciously think about it.

The researchers conducted two separate but related experiments. In the first, 27 Spanish-English bilinguals read 512 sentences, written in either Spanish or English -- alternating language every two sentences. Participants read the sentences silently until they came across a word displayed in red, at which point they were instructed to read the red word out loud, as quickly and accurately as possible. About half of the red words were cognates -- words that look and sound similar and have the same meaning in both languages.

"Cognate words were processed more quickly than control words," said Jason W. Gullifer, a graduate student in psychology, suggesting that both languages are active at the same time.

Participants in the second experiment performed the same tasks as those in the first experiment, but this time were presented one language at a time. The second experiment's results were similar to the first, suggesting that context does not influence word recognition. "The context of the experiment didn't seem to matter," said Gullifer. "If you look at bilinguals there seems to be some kind of mechanistic control."

Paola E. Dussias, professor of Spanish and head of the Spanish, Italian and Portuguese, department also collaborated on this research.

Paola E. Dussias, Judith F. Kroll, Jason W. Gullifer. When Language Switching has No Apparent Cost: Lexical Access in Sentence Context. Frontiers in Psychology, 2013; 4 DOI: 10.3389/fpsyg.2013.00278

http://www.eurekalert.org/pub_releases/2013-09/ru-msa091013.php

Multiple sclerosis appears to originate in different part of brain than long believed

Rutgers professor's advanced analysis could let therapy start earlier and lead MS research in new directions

The search for the cause of multiple sclerosis, a debilitating disease that affects up to a half million people in the United States, has confounded researchers and medical professionals for generations. But Steven Schutzer, a physician and scientist at Rutgers New Jersey Medical School, has now found an important clue why progress has been slow – it appears that most research on the origins of MS has focused on the wrong part of the brain. Look more to the gray matter, the new findings published in the journal PLOS ONE suggest, and less to the white. That change of approach could give physicians effective tools to treat MS far earlier than ever before.

Until recently, most MS research has focused on the brain's white matter, which contains the nerve fibers. And for good reason: Symptoms of the disease, which include muscle weakness and vision loss, occur when there is deterioration of a fatty substance called myelin, which coats nerves contained in the white matter and acts as insulation for them. When myelin in the brain is degraded, apparently by the body's own immune system, and the nerve fiber is exposed, transmission of nerve impulses can be slowed or interrupted. So when patients' symptoms flare up, the white matter is where the action in the brain appears to be.

But Schutzer attacked the problem from a different direction. He is one of the first scientists to analyze patients' cerebrospinal fluid (CSF) by taking full advantage of a combination of technologies called proteomics and high-resolution mass spectrometry. "Proteins present in the clear liquid that bathes the central nervous system can be a window to physical changes that accompany neurological disease," says Schutzer, "and the latest mass spectrometry techniques allow us to see them as never before." In this study, he used that novel approach to compare the cerebrospinal fluid of newly diagnosed MS patients with that of longer term patients, as well as fluid taken from people with no signs of neurological disease.

What Schutzer found startled one of his co-investigators, Patricia K. Coyle of Stony Brook University in New York, one of the leading MS clinicians and researchers in the country. The proteins in the CSF of the new MS patients suggested physiological disruptions not only in the white matter of the brain where the myelin damage eventually shows up. They also pointed to substantial disruptions in the gray matter, a different part of the brain that contains the axons and dendrites and synapses that transfer signals between nerves.

Several scientists had in fact hypothesized that there might be gray matter involvement in early MS, but the technology needed to test their theories did not yet exist. Schutzer's analysis, which Coyle calls "exquisitely sensitive," provides the solid physical evidence for the very first time. It includes a finding that nine specific proteins associated with gray matter were far more abundant in patients who had just suffered their first attack than in longer term MS patients or in the healthy controls. "This evidence indicates gray matter may be the critical initial target in MS rather than white matter," says Coyle. "We may have been looking in the wrong area."

According to Coyle, that realization presents exciting possibilities. One, she says, is that patients who suffer attacks that appear related to MS could have their cerebrospinal fluid tested quickly. If proteins that point to early MS are found, helpful therapy could begin at once, before the disease can progress further.

Coyle says Schutzer's findings may also lead one day to more effective treatments for MS with far fewer side effects. Without specific knowledge of what causes multiple sclerosis, patients now need to take medications that can broadly weaken their immune systems. These drugs slow the body's destruction of myelin in the brain, but also degrade the immune system's ability to keep the body healthy in other ways. By suggesting an exciting new direction for MS research, Schutzer and his team may have set the stage for more targeted treatments that attack MS while preserving other important immune functions.

Schutzer sees an even broader future for the work he is now doing. He also has used advanced analysis of cerebrospinal fluid to identify physical markers for neurological ailments that include Lyme disease, in which he has been a world leader in research for many years, as well as chronic fatigue syndrome. He says, "When techniques are refined, more medical conditions are examined, and costs per patient come down, one day there could be a broad panel of tests through which patients and their doctors can get early evidence of a variety of disorders, and use that knowledge to treat them both more quickly and far more effectively than is possible now." *This research was funded by the National Institutes of Health.*

http://www.eurekalert.org/pub_releases/2013-09/ucl-tsc091013.php

Tingling sensation caused by Asian spice could help patients with chronic pain

The science behind the tingling sensation caused by eating a popular Asian spice has been explained by researchers at UCL.

The study, which is published in the journal Proceedings of the Royal Society B, helps shed light on the complex interactions between the senses of taste and touch, and could lead to a greater understanding of the causes of the tingling sensations experienced by many chronic pain patients.

Widely used in Asian cooking, the Szechuan pepper was found to mimic the sense of touch in the brain. It chemically activates light-touch fibres on the lips and tongue and sends the equivalent of 50 light taps to the brain per second.

Dr Nobuhiro Hagura (UCL Institute of Cognitive Neuroscience), lead author of the study, said: "This is the first time that we've been able to show how chemicals activate touch fibres, inducing a measureable frequency. We know that natural products like chilli, mustard oil and menthol can activate the thermal and pain fibres in the skin, but we wanted to find out why Szechuan pepper specifically works on the light-touch fibres, producing a conscious sensation of touch and that distinctive tingling feeling."

After Szechuan pepper was applied to the lips of volunteers, participants were asked to match the frequency of the resulting tingling sensation by adjusting a vibrating stimulus, either higher or lower, on their fingertips.

The team was able to show that an active ingredient in the peppers stimulates specific RA1 fibres in the lips and tongue. These fibres are responsible for transmitting touch sensation, and send the equivalent of a light tap on the skin to the brain at the rate of 50 times per second.

Dr Hagura said: "What we found was that a unique active ingredient in the pepper, called sanshool, activates these fibres, sending a highly specific signal to the brain. Szechuan peppers and physical touch sensations share this same pathway to the brain.
"We hope that laboratory studies of the tingling sensations caused by sanshool could help to clarify the brain processes underlying these sensations, and how they are related to pain in some cases."
The team also hopes to investigate the reasons why people enjoy eating Szechuan pepper and how touch sensation can boost the taste of food.
'Food vibrations: Asian spice sets lips trembling,' by Hagura al is published in the Proceedings of the Royal Society B; Biological Science. Copies are available from UCL Media Relations on request.
Dr Hagura was supported by a Marie Curie International Incoming Fellowship. Professor Haggard was supported by the Lerverhulme Trust Research Fellowship and by EU FP7 project VERE.

http://bit.ly/19EO36x

Warming Climate Begins to Taint Europe's Blood

Tropical diseases have begun appearing in Europe anew, raising concerns about donated blood

By Erica Rex and ClimateWire | Tuesday, September 10, 2013 | 15

A whole new set of ungovernable pathogens are being loosed on the world's blood supplies. A warming climate has allowed blood-borne tropical diseases to flourish where once they were unheard of, and they're getting around.
The state of blood supplies became worrisome after tennis star Arthur Ashe's death from AIDS 20 years ago in 1993 -- the result of an HIV-tainted transfusion administered during a routine heart bypass operation in the late 1980s.
Hospitals and blood banks now routinely screen potential donors for HIV and hepatitis in order to keep these diseases from accidentally finding their way into patients.
But recent outbreaks of diseases such as West Nile fever, dengue fever and malaria -- all carried by mosquitoes -- have posed new problems for the health of European blood banks.
During the summer heat wave of 2010, when global average temperatures reached a 30-year high, an outbreak of West Nile fever erupted in southeastern Europe.
The first cases were in Greece, where 261 cases and 32 deaths were reported. Although West Nile virus had been seen in animals, these were the first reported cases in humans. Additional cases were reported in Romania, Hungary and parts of Russia. In total, there were 900 confirmed cases.
Europe also saw its first case of nonimported dengue fever in 2010, when a local case was reported in southern France. More than 1,000 cases of the disease are brought into Europe every year from areas where it's endemic, usually by migrants or visitors predominantly from urban areas in Asia and South America.
Disease vectors spread; some infections spread farther
But until 2010 there were no locally originating cases. The patient in question had not been traveling outside Europe and could have contracted the disease only by being bitten in France by a member of the vector species, the Asian tiger mosquito (Aedes albopictu).
Since then, the Asian tiger mosquito has been found over a substantial area in Europe. In 2012, colonies were found in 20 European countries, as far north as Germany, Belgium and the Netherlands, as far south as Sicily and as far east as Croatia.
Jan Semenza, researcher at the Unit of Scientific Advice at the European Centre for Disease Prevention and Control in Stockholm, said: "Climate change has introduced several public health issues. For one thing, now there are new pathogens in Europe which have never been seen here before."
Tropical and sub-Saharan vector-borne diseases are seeing an upsurge in Europe, largely because climate conditions have become favorable to carriers, which include mosquitoes, ticks, triatomine bugs, sand flies and black flies.
Many of the diseases carried by these insects, including West Nile fever, have latency periods sometimes lasting months, when an infected person has no symptoms and is unlikely to be a suspected carrier. For this reason, potential blood donors may unwittingly donate tainted blood.
Although transfusion-transmitted cases of diseases such as West Nile and dengue fever, both carried by mosquitoes, have not been documented in Europe, there have been several cases of transfusion-transmitted leishmaniasis. Leishmaniasis is normally transmitted to humans through the bite of infected female sand flies. Endemic to South America, parts of Africa and Asia, the disease doesn't have any symptoms for a large proportion of the carriers. Several cases have been documented resulting from intravenous drug users in Spain sharing infected needles.

Difficulties of broad-scale blood screening

Blood banks have sets of standard procedures in place when it comes to protecting the blood supply. They can refuse donations from certain populations, to include those returning or migrating from areas where certain diseases are prevalent. But that decreases the available donor pool and can create blood shortages in areas where it's most needed.

These were the conditions in Greece in 2010, when in several areas the outbreak of West Nile fever coincided with local outbreaks of malaria. Deferral created a roadblock to testing, as well as imposing additional strains on the already strapped public health infrastructure. A blood shortage ensued.

Screening each sample for several pathogens is possible, but it can get expensive. "The problem with testing," Semenza said, "is really several questions, each with its own cost. For instance, when do we test and how long do we test for? A year after someone was exposed? Two years?

"And how many organisms do we need to test for? One? Two? There is a limit to the cost-effectiveness," he added. For some blood-borne diseases, it can take months if not years for blood to show a positive reaction for the disease in question.

Because it is hardly feasible to test each blood donor and each donation for every possible pathogen, pre-emptive treatment and new technology may hold some promise. One pre-emptive technique, pathogen reduction, involves treating donated blood to eliminate the possibility of infection from a range of microorganisms, rather than targeting each and every known disease individually.

Currently used in France, Poland, Spain, Switzerland and the United Kingdom, various compounds, among these riboflavin (vitamin B2) and methylene blue in combination with light, are used to inactivate known pathogens in platelets or blood plasma.

The development of artificial blood and blood components may further reduce risk of infection through tainted blood. Two types of synthetic coagulation factors -- the main therapeutic components of fresh frozen plasma -- have been in use for several years.

Artificial red blood cells with synthetic membranes are under development. In Russia and South Africa, a simple polyhemoglobin -- an oxygen-carrying blood substitute -- is already in limited clinical use.

http://www.sciencedaily.com/releases/2013/09/130910142334.htm

Scientists Create New Memories by Directly Changing the Brain

By studying how memories are made, UC Irvine neurobiologists created new, specific memories by direct manipulation of the brain, which could prove key to understanding and potentially resolving learning and memory disorders.

Research led by senior author Norman M. Weinberger, a research professor of neurobiology & behavior at UC Irvine, and colleagues has shown that specific memories can be made by directly altering brain cells in the cerebral cortex, which produces the predicted specific memory. The researchers say this is the first evidence that memories can be created by direct cortical manipulation.

Study results appeared in the August 29 issue of Neuroscience.

During the research, Weinberger and colleagues played a specific tone to test rodents then stimulated the nucleus basalis deep within their brains, releasing acetylcholine (ACh), a chemical involved in memory formation. This procedure increased the number of brain cells responding to the specific tone. The following day, the scientists played many sounds to the animals and found that their respiration spiked when they recognized the particular tone, showing that specific memory content was created by brain changes directly induced during the experiment. Created memories have the same features as natural memories including long-term retention.

"Disorders of learning and memory are a major issue facing many people and since we've found not only a way that the brain makes memories, but how to create new memories with specific content, our hope is that our research will pave the way to prevent or resolve this global issue," said Weinberger, who is also a fellow with the Center for the Neurobiology of Learning & Memory and the Center for Hearing Research at UC Irvine.

The creation of new memories by directly changing the cortex is the culmination of several years of research in Weinberger's lab implicating the nucleus basalis and ACh in brain plasticity and specific memory formation. Previously, the authors had also shown that the strength of memory is controlled by the number of cells in the auditory cortex that process a sound.

D. Kim, D. Pare, S. S. Nair. Assignment of Model Amygdala Neurons to the Fear Memory Trace Depends on Competitive Synaptic Interactions. Journal of Neuroscience, 2013; 33 (36): 14354 DOI: 10.1523/JNEUROSCI.2430-13.2013

http://scitechdaily.com/new-research-explores-possibility-detecting-biomarkers-distant-planets/

New Research Explores the Possibility of Detecting Biomarkers on Distant Planets

New Research Aims to Detect Biomarkers on Distant Planets

New research presented to the European Planetary Science Congress at UCL aims to explore how atmospheric biomarkers from faraway planets might be detected in the future.

On Earth, life leaves tell-tale signals in the atmosphere. Photosynthesis is ultimately responsible for the high oxygen levels and the thick ozone layer. Microbes emit methane and nitrous oxide into the atmosphere, and seaweeds emit chloromethane gas. These chemicals, when present in sufficient quantities, are indicators of life and are known as atmospheric biomarkers. Detecting them in the atmosphere of an exoplanet should, in theory, be a means of discovering whether life exists on any alien worlds.

While biomarkers have never been spotted in observations of an exoplanet, because their signal is so faint, the new generation of telescopes being planned today, such as the European Extremely Large Telescope, may be sensitive enough to detect them. New research presented to the European Planetary Science Congress at UCL by Lee Grenfell (DLR) aims to explore how such biomarkers might be detected in future.

"The main aim of our work is to assess the possible range of biomarker signals that might be detected by future telescopes," Grenfell explains. "To do this, we developed computer models of exoplanets which simulate the abundances of different biomarkers and the way they affect the light shining through a planet's atmosphere."

Chemicals in a planet's atmosphere affect light that passes through it, leaving characteristic chemical fingerprints in the star's spectrum. Using this technique, astronomers have already deduced a wealth of information about the conditions present in (large, hot) exoplanets. Biomarkers would be detected in much the same way, but here the signal is expected to be so weak that scientists will need a solid understanding based on theoretical models before they can hope to decipher the actual data.

"In our simulations, we modelled an exoplanet similar to the Earth, which we then placed in different orbits around stars, calculating how the biomarker signals respond to differing conditions," Grenfell explains. "We focused on red-dwarf stars, which are smaller and fainter than our Sun, since we expect any biomarker signals from planets orbiting such stars to be easier to detect."

For detections of the biomarker ozone, the team confirms that there appears to be a 'Goldilocks' effect when it comes to the amount of ultraviolet radiation from the star to which the planet is exposed. With weak UV radiation, less ozone is produced in the atmosphere and its detection is challenging. Too much UV leads to increased heating in the middle atmosphere that weakens the vertical gradient and destroys the signal. At intermediate UV, the conditions are 'just right' for detecting ozone.

"We find that variations in the UV emissions of red-dwarf stars have a potentially large impact on atmospheric biosignatures in simulations of Earth-like exoplanets. Our work emphasizes the need for future missions to characterize the UV emissions of this type of star," said Grenfell.

There are other limitations on using this method to detect signs of life. For example, it is assuming that any life-bearing planets would be identical to Earth, which is not guaranteed. Moreover, scientists will have to be certain that apparent biomarker signals they find truly arose from life, and not from other, non-living processes. Finally, dim red dwarf stars may not be the most suitable for the onset and maintenance of life. Nevertheless, this technique is an extremely promising one for detecting potential signs of life on alien worlds.

Grenfell concludes: "For the first time we are reaching a point where serious scientific debate can be applied to address the age-old question: are we alone?"

Publication: This research has been submitted to the journal Planetary & Space Science (2013) "Planetary Evolution and Life" Special Issue.

http://www.sciencedaily.com/releases/2013/09/130911093049.htm

Mosquito Bites Deliver Potential New Malaria Vaccine

A study published in Vaccine could provide hope for new live-attenuated malaria vaccine

This study suggests that genetically engineered malaria parasites that are stunted through precise gene deletions (genetically attenuated parasites, or "GAP") could be used as a vaccine that protects against malaria infection. This means that the harmless (attenuated) version of the parasite would interact with the body in the same way as the infective version, but without possibility of causing disease. GAP-vaccination would induce robust immune responses that protect against future infection with malaria.

According to the World Health Organization, there were 219 million documented cases of malaria in 2010, causing the deaths of up to 1.2 million people worldwide. Antimalarial treatments are available to reduce the risk of infection, but as yet there is no effective vaccine against the disease.

Last month, a team of scientists announced the results of a trial with a new kind of malaria vaccine, a whole-parasite preparation weakened by radiation. The trial showed promising results, but the method of vaccination

was not optimal, requiring intravenous administration and multiple high doses. This current paper outlines a method of attenuation through genetic engineering rather than radiation, which offers hope for a more consistent vaccine that gives better protection.

"Malaria is one of the world's biggest killers, and threatens 40 percent of the world's population, yet still no effective vaccine exists," said Stefan Kappe, Ph.D., lead author of the paper and professor at Seattle BioMed. "In this paper we show that genetically engineered parasites are a promising, viable option for developing a malaria vaccine, and we are currently engineering the next generation of attenuated parasite strains with the aim to enter clinical studies soon."

For the first time, researchers created a weakened version of the human malaria parasite by altering its DNA. They tested the safety of the new modified parasite by injecting six human volunteers through mosquito bites. Five of the six volunteers showed no infection with the parasite, suggesting that the new genetic technique has potential as the basis for a malaria vaccine.

"Our approach offers a new path to make a protective malaria vaccine that might overcome the limitations of previous development attempts. Genetically engineered parasites potentially provide us with a potent, scalable approach to malaria vaccination," said Kappe. "Our results are very encouraging, providing a strong rationale for the further development of live-attenuated strains using genetic engineering."

Michele Spring, Jittawadee Murphy, Robin Nielsen, Megan Dowler, Jason W. Bennett, Stasya Zarling, Jack Williams, Patricia de la Vega, Lisa Ware, Jack Komisar, Mark Polhemus, Thomas L. Richie, Judy Epstein, Cindy Tamminga, Ilin Chuang, Nancy Richie, Michael O'Neil, D. Gray Heppner, Julie Healer, Matthew O'Neill, Hannah Smithers, Olivia C. Finney, Sebastian A. Mikolajczak, Ruobing Wang, Alan Cowman, Christian Ockenhouse, Urszula Krzych, Stefan H.I. Kappe. First-in-human evaluation of genetically attenuated Plasmodium falciparum sporozoites administered by bite of Anopheles mosquitoes to adult volunteers. Vaccine, 2013; DOI: 10.1016/j.vaccine.2013.08.007

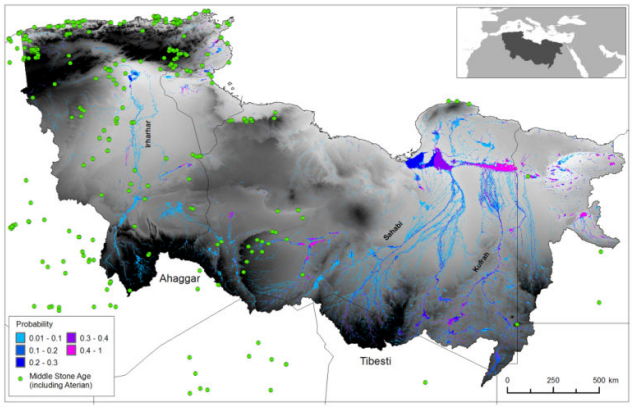
http://www.eurekalert.org/pub_releases/2013-09/plos-pas090613.php

Paleorivers across Sahara may have supported ancient human migration routes

Paleoclimate simulations reveal potential 'green corridors' across North Africa

Three ancient river systems, now buried, may have created viable routes for human migration across the Sahara to the Mediterranean region about 100,000 years ago, according to research published September 11 in the open access journal PLOS ONE by Tom Coulthard from the University of Hull, UK, and colleagues from other institutions.

Simulating paleoclimates in the region, the researchers found quantitative evidence of three major river systems that likely existed in North Africa 130,000-100,000 years ago, but are now largely buried by dune systems in the desert. When flowing, these rivers likely provided fertile habitats for animals and vegetation, creating 'green corridors' across the region. At least one river system is estimated to have been 100 km wide and largely perennial. The Irharhar river, westernmost of the three identified, may represent a likely route of human migration across the region. In addition to rivers, the researchers' simulations predict massive lagoons and wetlands in northeast Libya, some of which span over 70,000-square kilometers. "It's exciting to think that 100 000 years ago there were three huge rivers forcing their way across a 1000km of the Sahara desert to the Mediterranean -- and that our ancestors could have walked alongside them" said Coulthard.



Simulated probability of surface water during the last interglacial. This figure details Archaeological sites, and an annual probability that a location has surface water. The archaeological data are derived from a number of sources (including [42], [66], [67], [68]. The findspots are characterised by Aterian and Middle Stone Age artefacts such as bifacial foliates and stemmed Aterian points and/or typical 'Mousterian' points, side scrapers and Levallois technology. Most are represented by surface scatters but where stratified examples exist these can be shown by dating (OSL and U-series techniques) and geomorphological setting to belong within MIS 5e [41], [42].

Previous studies have shown that people travelled across the Saharan mountains toward more fertile Mediterranean regions, but when, where and how they did so is a subject of debate. Existing evidence supports the possibilities of a single trans-Saharan migration, many migrations along one route, or multiple migrations along several different routes. The existence of 'green corridors' that provided water and food resources were likely critical to these events, but their location and the amount of water they carried is not known. The

simulations provided in this study aim to quantify the probability that these routes may have been viable for human migration across the region.

Citation: Coulthard TJ, Ramirez JA, Barton N, Rogerson M, Brücher T (2013) Were Rivers Flowing across the Sahara During the Last Interglacial? Implications for Human Migration through Africa. PLoS ONE 8(9): e74834. doi:10.1371/journal.pone.0074834

http://www.eurekalert.org/pub_releases/2013-09/uom-tfn091013.php

The final nail in the Jurassic Park coffin: Next generation sequencing reveals absence of DNA in sub-fossilized insects

Research just published in the journal PLOS ONE by a team of researchers from the Faculty of Life Sciences at The University of Manchester can now confirm that the existence of DNA in amber fossils is highly unlikely

It is hardly possible to talk about fossil insects in amber without the 1993 movie Jurassic Park entering the debate. The idea of recreating dinosaurs by extracting DNA from insects in amber has held the fascination of the public for two decades. Claims for successful extraction of DNA from ambers up to 130 million-years-old by various scientists in the early 1990s were only seriously questioned when a study at the Natural History Museum, London, was unable to replicate the process. The original claims are now considered by many to be a text-book example of modern contaminant DNA in the samples. Nonetheless, some scientists hold fast to their original claims.

This image shows a sub-fossilized insect in copal. **Dr. David Penney, University of Manchester**

Research just published in the journal The Public Library of Science ONE (PLOS ONE) by a team of researchers from the Faculty of Life Sciences at The University of Manchester can now confirm that the existence of DNA in amber fossils is highly unlikely. The team led by amber expert Dr David Penney and co-ordinated by ancient DNA expert Professor Terry Brown used highly-sensitive 'next generation' sequencing techniques – the most advance type of DNA sequencing - on insects in copal, the sub-fossilized resin precursor of amber.

The research was conducted wearing full forensic suits in the dedicated ancient DNA facility at The University of Manchester, which comprises a suite of independent, physically isolated laboratories, each with an ultra-filtered air supply maintaining positive displacement pressure and a managed access system.

According to Professor Brown: "In the original 1990s studies DNA amplification was achieved by a process called the polymerase chain reaction (PCR), which will preferentially amplify any modern, undamaged DNA molecules that contaminate an extract of partially degraded ancient ones to give false positive results that might be mistaken for genuine ancient DNA. Our approach, using 'next generation' sequencing methods is ideal for ancient DNA because it provides sequences for all the DNA molecules in an extract, regardless of their length, and is less likely to give preference to contaminating modern molecules."

The team concluded that their inability to detect ancient DNA in relatively young (60 years to 10,600 years old) sub-fossilized insects in copal, despite using sensitive next generation methods, suggests that the potential for DNA survival in resin inclusions is no better, and perhaps worse, than that in air-dried museum insects (from which DNA has been retrieved using similar techniques). This raises significant doubts about claims of DNA extraction from fossil insects in amber, many millions of years older than copal.

Dr Penney said: "Intuitively, one might imagine that the complete and rapid engulfment in resin, resulting in almost instantaneous demise, might promote the preservation of DNA in a resin entombed insect, but this appears not to be the case. So, unfortunately, the Jurassic Park scenario must remain in the realms of fiction."

http://www.eurekalert.org/pub_releases/2013-09/hfhs-cpd091113.php

Chest pain duration can signal heart attack

Heart Patients with chest pain of less than 5 minutes, are unlikely to have a heart attack.

DETROIT – Patients with longer-lasting chest pain are more likely having a heart attack than those with pain of a shorter duration, according to a study by researchers at Henry Ford Hospital. The study is published in the September issue of Critical Pathways in Cardiology.

Every year, eight to 10 million people in the U.S. go to emergency departments for chest pain. But only 15- 30 percent of them are having a heart attack. The characteristics of chest pain are important to diagnosing the cause. Researchers studied the relationship between the length of time that a patient experienced chest pain and a diagnosis of heart attack in patients evaluated in the emergency department.

"Patients can experience varying strength, location, and duration of chest pain," says James McCord, M.D., a cardiologist at Henry Ford Hospital on the research team. "The variety of symptoms any one patient may

experience during a heart attack is a challenge to the physician who is trying to distinguish between patients who are having a heart attack and those who are not." "Although an electrocardiogram (ECG) and cardiac markers in the blood are important in the evaluation of patients with a possible heart attack, they are not 100 percent accurate."
Records of patients who were evaluated for possible heart attack in the emergency department at Henry Ford Hospital between January and May of 1999 were studied. Only patients for whom chest pain duration and 30-day follow-up data was available were selected.
Of 426 patients included in the study, 38 (less than 9 percent) had a final diagnosis of heart attack, with average chest pain duration of 120 minutes, compared with 40 minutes in patients without heart attack. In patients with chest pain lasting less than five minutes, there were no heart attacks and no deaths at 30 days.
"These findings suggest that patients with chest pain lasting less than five minutes may be evaluated as an out-patient in their doctor's office; while patients with chest pain greater than 5 minutes, without a clear cause, should seek prompt medical evaluation in an emergency department," says Dr. McCord.
Patients were interviewed during the study to determine medical history and demographics. Those with a diagnosis of heart attack were significantly older. The researchers concluded that patients with heart attack have longer duration of chest pain than those not experiencing a heart attack; patients with chest pain of short duration, less than 5 minutes, are unlikely to have a heart attack and have a good prognosis at 30 days.
He added that, since this study was done at one hospital with a relatively small number of patients, further study is needed.

http://www.sciencedaily.com/releases/2013/09/130911125055.htm

Low Dose Antibiotic Treatment of C-Difficile Is as Effective as High Dose

Clostridium difficile infection treatment in a hospital setting using low dose oral vancomycin showed similar effectiveness compared to high dose

Clostridium difficile infection (CDI) treatment in a hospital setting using low dose oral vancomycin showed similar effectiveness compared to high dose, according to a new study by researchers at Montefiore Medical Center and Albert Einstein College of Medicine of Yeshiva University. These data were presented yesterday at the 53rd Annual Interscience Conference on Antimicrobial Agents and Chemotherapy meeting in Denver.
Patients with CDI treated with vancomycin at the low dose (LD) (125 mg every 6 hours) and high dose (HD) (greater than 125mg every 6 hours) showed clinical improvements 72 hours after administration (85% and 86%, respectively).
CDI is an infection of the large bowel that can result in mild to severe symptoms including stomach pain, severe cramping, profuse diarrhea, and, in the most severe form, can lead to death. CDI is linked to 14,000 deaths each year in the United States, according to the Centers for Disease Control and Prevention.
"This study's comparable results in low dose and high dose antibiotic treatment of CDI reinforce the importance of considering new approaches to using these medications," said Philip Chung, PharmD, M.S., clinical pharmacy manager in Infectious Diseases, Montefiore Medical Center and assistant professor of medicine, Department of Medicine (Infectious Diseases), Einstein. "Antibiotic stewardship is an important focus in hospitals today. We are using our study findings to develop treatment guidelines that encourage low dose treatment."
Comparable results in the LD and HD groups were shown in secondary endpoints, including rates of clinical improvement at end of therapy or time of hospital discharge (93% and 95%, respectively), in-hospital mortality (15% and 23%), re-treatment (4% and 6%), and 30-day readmission (34% and 24%).
"Montefiore is committed to the appropriate use of antibiotics through a multi-disciplinary Antimicrobial Stewardship Team that supports better patient care and safety, improved clinical outcomes and reduced resistance and healthcare-acquired infections such as CDI," said infectious diseases specialist Belinda Ostrowsky, M.D., M.P.H., director, Antibiotic Stewardship Program, Montefiore and associate professor of clinical medicine, Department of Medicine (Infectious Diseases), Einstein. "Based on our study results, we know making small changes can make a big difference without impacting patient care in a hospital setting. These results are encouraging and we plan to continue exploring other ways to impact antibiotic use."
This retrospective study included 300 patients (197 LD, 103 HD) hospitalized at Montefiore between 2006 and 2010 who had a diagnosis of diarrhea associated CDI and received at least 72 hours of oral vancomycin. Medical records of eligible patients were reviewed for demographics, clinical and laboratory parameters for resolution of infection, other antibiotics prescribed during treatment of CDI, death during hospitalization and hospital readmission within 30-days after discharge.

http://www.sciencedaily.com/releases/2013/09/130911141746.htm

AIDS Vaccine Candidate Appears to Completely Clear Virus from the Body in Monkeys

An HIV/AIDS vaccine candidate appears to have the ability to completely clear an AIDS-causing virus from the body

An HIV/AIDS vaccine candidate developed by researchers at Oregon Health & Science University appears to have the ability to completely clear an AIDS-causing virus from the body. The promising vaccine candidate is being developed at OHSU's Vaccine and Gene Therapy Institute. It is being tested through the use of a non-human primate form of HIV, called simian immunodeficiency virus, or SIV, which causes AIDS in monkeys. Following further development, it is hoped an HIV-form of the vaccine candidate can soon be tested in humans. These research results were published online today by the journal Nature. The results will also appear in a future print version of the publication.

"To date, HIV infection has only been cured in a very small number of highly-publicized but unusual clinical cases in which HIV-infected individuals were treated with anti-viral medicines very early after the onset of infection or received a stem cell transplant to combat cancer," said Louis Picker, M.D., associate director of the OHSU Vaccine and Gene Therapy Institute. "This latest research suggests that certain immune responses elicited by a new vaccine may also have the ability to completely remove HIV from the body."

The Picker lab's approach involves the use of cytomegalovirus, or CMV, a common virus already carried by a large percentage of the population. In short, the researchers discovered that pairing CMV with SIV had a unique effect. They found that a modified version of CMV engineered to express SIV proteins generates and indefinitely maintains so-called "effector memory" T-cells that are capable of searching out and destroying SIV-infected cells.

T-cells are a key component of the body's immune system, which fights off disease, but T-cells elicited by conventional vaccines of SIV itself are not able to eliminate the virus. The SIV-specific T-cells elicited by the modified CMV were different. About 50 percent of monkeys given highly pathogenic SIV after being vaccinated with this vaccine became infected with SIV but over time eliminated all trace of SIV from the body. In effect, the hunters of the body were provided with a much better targeting system and better weapons to help them find and destroy an elusive enemy.

"Through this method we were able to teach the monkey's body to better 'prepare its defenses' to combat the disease," explained Picker. "Our vaccine mobilized a T-cell response that was able to overtake the SIV invaders in 50 percent of the cases treated. Moreover, in those cases with a positive response, our testing suggests SIV was banished from the host. We are hopeful that pairing our modified CMV vector with HIV will lead to a similar result in humans."

The Picker lab is now investigating the possible reasons why only a subset of the animals treated had a positive response in hopes that the effectiveness of the vaccine candidate can be further boosted.

This research was funded by several grants from the National Institutes of Health, funding from the International AIDS Vaccine Initiative and a CAVD grant from the Bill & Melinda Gates Foundation.

Scott G. Hansen, Michael Piatak Jr, Abigail B. Ventura, Colette M. Hughes, Roxanne M. Gilbride, Julia C. Ford, Kelli Oswald, Rebecca Shoemaker, Yuan Li, Matthew S. Lewis, Awbrey N. Gilliam, Guangwu Xu, Nathan Whizin, Benjamin J. Burwitz, Shannon L. Planer, John M. Turner, Alfred W. Legasse, Michael K. Axthelm, Jay A. Nelson, Klaus Früh, Jonah B. Sacha, Jacob D. Estes, Brandon F. Keele, Paul T. Edlefsen, Jeffrey D. Lifson et al. Immune clearance of highly pathogenic SIV infection. Nature, 2013 DOI: 10.1038/nature12519

http://nyti.ms/1ekuN4l

Camels Linked to Spread of Fatal Virus

Evidence is mounting that camels are the most likely intermediary in the transmission from bats to humans of the virus that causes Middle East Respiratory Syndrome.

By DONALD G. McNEIL Jr.

While the virus itself has not been found in a camel yet, antibodies that react to it have been discovered in the blood of camels in Sudan, Egypt, Oman and the Canary Islands. The finding suggests that the animals had recovered from infection with the MERS virus or a close relative.

While many of the 114 confirmed MERS cases have had no contact with camels, it appears that the first confirmed or suspected cases in three separate clusters may have, and in two cases, the camels were observed to be ill.

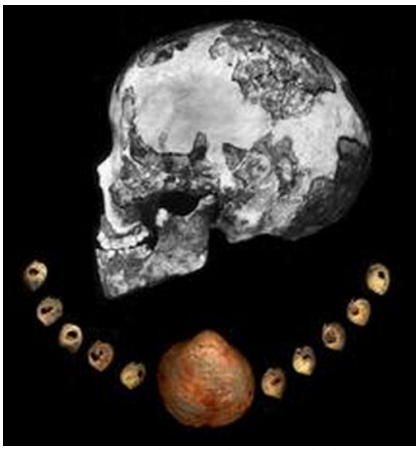
According to the Saudi newspaper Asharq, a 38-year-old man from Batin, Saudi Arabia, who died of what was diagnosed as bacterial pneumonia was a camel dealer with at least one obviously sick camel. Later, other members of his family, including a mother, daughter and cousin, fell ill with what was diagnosed as MERS, and two died. They were part of a cluster of cases reported Sept. 7 by the World Health Organization.

In April, the magazine Science reported that a wealthy 73-year-old Abu Dhabi man fell ill shortly after contact with a sick racing camel in his stable. He flew by private jet to Germany for treatment; after his death, doctors there said they had been told that his brother had also fallen ill after contact with the camel.
The first confirmed MERS victim, the owner of a paint warehouse in Bisha, Saudi Arabia, had four pet camels, according to Dr. W. Ian Lipkin, a virologist at Columbia University who took blood samples from them. Those tests are still being done, Dr. Lipkin said.
The unconnected welter of reports shows that surveillance for the MERS virus in the Middle East is inadequate, said Henry L. Niman, a Pittsburgh biochemist who tracks viral mutations. Not enough camels are being evaluated in the countries where human cases have been found, he said, and humans who fall ill with what might be MERS in poor countries like Sudan are not being tested.

http://phys.org/news/2013-09-dating-beads-timeline-early-humans.html

Dating of beads sets new timeline for early humans

Beads from the site of Ksar Akil in Lebanon were found closely associated with the skeleton of an early modern girl dating to between 39,000–41,000 years ago



Phys.org - An international team of researchers led by Oxford University has new dating evidence indicating when the earliest fully modern humans arrived in the Near East, the region known as the Middle East today.
They have obtained the radiocarbon dates of marine shell beads found at Ksar Akil, a key archaeological site in Lebanon, which allowed them to calculate that the oldest human fossil from the same sequence of archaeological layers is 42,400–41,700 years old. This is significant because the age of the earliest fossils, directly and indirectly dated, of modern humans found in Europe is roughly similar.
This latest discovery throws up intriguing new possibilities about the routes taken by the earliest modern humans out of Africa, says the study published online by the journal PLOS ONE.

Beads from the site of Ksar Akil (Lebanon) found closely associated with the skeleton of an early modern girl dating to between 39,000–41,000 years ago. The beads shown here are made of the shell of a small marine snail (Nassarius gibbosulus/circumcinctus). The large Glycymeris valve in the centre was not pierced, but its surface preserved bright red pigmentation. **Credit: Katerina Douka and Natural History Museum London**

The research team radiocarbon dated 20 marine shells from the top 15 metres of archaeological layers at Ksar Akil, north of Beirut. The shells were perforated, which indicates they were used as beads for body or clothes decoration by modern humans. Neanderthals, who were living in the same region before them, were not making such beads. The study confirms that the shell beads are only linked to the parts of the sequence assigned to modern humans and shows that through direct radiocarbon dating they are between 41,000–35,000 years old.
The Middle East has always been regarded as a key region in prehistory for scholars speculating on the routes taken by early humans out of Africa because it lies at the crossroads of three continents – Africa, Asia and Europe. It was widely believed that at some point after 45,000 years ago early modern humans arrived in Europe, taking routes out of Africa through the Near East and, from there, along the Mediterranean rim or along the River Danube. However, this dating evidence suggests populations of early modern humans arrived in Europe and the Near East at roughly the same time, sparking a new debate about where the first populations of early humans travelled from in their expansion towards Europe and which alternative routes they may have taken.
In Ksar Akil, the Lebanese rockshelter, several human remains were found in the original excavations made 75 years ago. Unfortunately, since then the most complete skeleton of a young girl, thought to be about 7–9 years of age and buried at the back of the rock shelter, has been lost. Lost also are the fragments of a second individual, found next to the buried girl. However, the team was able to calculate the age of the lost fossil at 40,800–39,200 years ago, taking into account its location in the sequence of archaeological layers in relation to the marine shell beads.
Another fossil of a recently rediscovered fragment of the upper jaw of a woman, now located in a museum in Beirut, had insufficient collagen to be dated by radiocarbon methods. A method using statistical modelling was used to date by association the jaw fragment at 42,400–41,700 years old.
Ksar Akil is one of the most important Palaeolithic sites in Eurasia. It consists of a 23-metre-deep sequence of archaeological layers that lay undisturbed for thousands of years until a team of American Jesuit priests excavated the rockshelter in 1937–38, and again after the end of the Second World War, in 1947–48. The cave

layers were found to contain the human fossils and hundreds of shell beads, as well as thousands of stone tools and broken bones of hunted and consumed animals.
Study lead author Dr Katerina Douka, from the School of Archaeology at the University of Oxford, said: 'This is a region where scholars have been expecting to find early evidence of anatomically and behaviourally modern humans, like us, leaving Africa and directly replacing Eurasian Neanderthal populations that lived there for more than 150,000 years. The human fossils at Ksar Akil appear to be of a similar age to fossils in other European contexts. It is possible that instead of the Near East being the single point of origin for modern humans heading for Europe, they may also have used other routes too. A maritime route across the Mediterranean has been proposed, although evidence is scarce. A wealth of archaeological data now pinpoints the plains of Central Asia as a particularly important but relatively unknown region which requires further investigation.'
The earliest European modern fossil, from Romania, dates to between 42,000–38,000 years before the present time, and specialists have estimated the age of Kent's Cavern maxilla from southern England, between 44,000–41,000 years, and that of two milk teeth in southern Italy, at 45,000–43,000 years old. The new dating evidence from Ksar Akil is largely comparable to these ages, if not slightly younger.
More information: dx.plos.org/10.1371/journal.pone.0072931

http://www.eurekalert.org/pub_releases/2013-09/uoa-bme091113.php

Biologists measure evolution's Big Bang

A new study led by Adelaide researchers has estimated, for the first time, the rates of evolution during the "Cambrian explosion" when most modern animal groups appeared between 540 and 520 million years ago.

The findings, published online today in the journal Current Biology, resolve "Darwin's dilemma": the sudden appearance of a plethora of modern animal groups in the fossil record during the early Cambrian period.
"The abrupt appearance of dozens of animal groups during this time is arguably the most important evolutionary event after the origin of life," says lead author Associate Professor Michael Lee of the University of Adelaide's School of Earth and Environmental Sciences and the South Australian Museum.
"These seemingly impossibly fast rates of evolution implied by this Cambrian explosion have long been exploited by opponents of evolution. Darwin himself famously considered that this was at odds with the normal evolutionary processes.
"However, because of the notorious imperfection of the ancient fossil record, no-one has been able to accurately measure rates of evolution during this critical interval, often called evolution's Big Bang.
"In this study we've estimated that rates of both morphological and genetic evolution during the Cambrian explosion were five times faster than today – quite rapid, but perfectly consistent with Darwin's theory of evolution."
The team, including researchers from the Natural History Museum in London, quantified the anatomical and genetic differences between living animals, and established a timeframe over which those differences accumulated with the help of the fossil record and intricate mathematical models. Their modelling showed that moderately accelerated evolution was sufficient to explain the seemingly sudden appearance of many groups of advanced animals in the fossil record during the Cambrian explosion.
The research focused on arthropods (insects, crustaceans, arachnids and their relatives), which are the most diverse animal group in both the Cambrian period and present day. "It was during this Cambrian period that many of the most familiar traits associated with this group of animals evolved, like a hard exoskeleton, jointed legs, and compound (multi-faceted) eyes that are shared by all arthropods. We even find the first appearance in the fossil record of the antenna that insects, millipedes and lobsters all have, and the earliest biting jaws." says co-author Dr Greg Edgecombe of the Natural History Museum.

http://www.eurekalert.org/pub_releases/2013-09/bumc-nrs091113.php

New research shows link between rates of gun ownership and homicides

A new study from the American Journal of Public Heath shows that U.S. states with higher estimated rates of gun ownership experience a higher number of firearms-related homicides.

Boston - The study, led by a Boston University School of Public Health researcher, examines the National Rifle Association's (NRA) claim that increased gun ownership does not lead to increased gun violence. It is the largest study conducted to date into the correlation between gun ownership and firearms violence, and the first to comprehensively examine the issue since the tragic shooting last December of 20 children and 7 adults at Sandy Hook Elementary School in Newtown, Connecticut.
The study, covering 30 years (1981-2010) in all 50 states, found a "robust correlation" between estimated levels of gun ownership and actual gun homicides at the state level, even when controlling for factors typically

associated with homicides. For each 1 percentage point increase in the prevalence of gun ownership, the state firearm homicide rate increases by 0.9 percent, the authors found. "Understanding the relationship between the prevalence of gun ownership and therefore the availability of guns, and firearm-related mortality is critical to guiding decisions regarding recently proposed measures to address firearm violence," the authors said.
Researchers led by Dr. Michael Siegel, professor of community health sciences at the BU School of Public Health, examined data for the years 1981-2010 on state firearm homicide rates from the Center for Disease Control and Prevention's Web-Based Injury Statistics Query and Reporting System (WISQUARS) database.
State levels of gun ownership were estimated using a well-established proxy variable: the percentage of a state's suicides that are committed with a firearm (FS/S). Because there is no state-level survey that measures household gun ownership, researchers have widely relied upon the FS/S proxy in injury prevention research, and this proxy has been extensively validated in past studies. The proxy correlates highly with survey measures of household firearm ownership, the authors said.
Regression analysis was used to examine the relationship between state levels of gun ownership and firearm homicide rates, while controlling for a range of potential state-level confounding variables, including: age, gender, race/ethnicity, urbanization, poverty, unemployment, income, education, divorce rate, alcohol use, violent crime rate, nonviolent crime rate, number of hunting licenses, age-adjusted non-firearm homicide rate, incarceration rate, and suicide rate.
The regression model predicted that each 1 percentage point increase in gun ownership increases a state's firearm homicide rate by 0.9 percent, translating into a 12.9 percent increase in the gun homicide rate for each one standard deviation increase in gun ownership. All other factors being equal, for example, the model predicts that if the gun ownership estimate for Mississippi were 58 percent (the average for all states), instead of 77 percent (the highest of all states), its firearm homicide rate would be 17 percent lower.
The results of the research are consistent with previous studies that have demonstrated a correlation between higher levels of gun ownership and higher levels of firearm homicide.
Siegel noted that the study did not determine causation, allowing that it is theoretically possible that people are more likely to purchase guns if they live in states with higher levels of firearm homicide. But he said the issue warrants further study.
"In the wake of the tragic shooting in Newtown, Connecticut, last year, many states are considering legislation to control firearm-related deaths. This research is the strongest to date to document that states with higher levels of gun ownership have disproportionately large numbers of deaths from firearm-related homicides. It suggests that measures which succeed in decreasing the overall prevalence of guns will lower firearm homicide rates," he said.
The new study is the first cross-sectional analysis to examine data more recent than 1999 and is the most comprehensive to date, both in the number of years studied and the breadth of variables that were controlled for in the analysis. The study found that over the three decades, the mean estimated percentage of gun ownership ranged from a low of 25.8 percent in Hawaii to a high of 76.8 percent in Mississippi, with an average over all states of 57.7 percent.
The mean age-adjusted firearm homicide rate ranged from a low of 0.9 per 100,000 population in New Hampshire to a high of 10.8 per 100,000 in Louisiana over the three decades, with an average for all states of 4 per 100,000. For all states, the average firearm homicide rate decreased from 5.2 per 100,000 in 1981 to 3.5 per 100,000 in 2010.
Co-authors on the study include Craig Ross of Virtual Media Resources and Charles King III of Pleiades Consulting Group. The study, which includes state-level data, will be available after 4 p.m. Thursday online under 'First Look' at http://www.ajph.org.

http://www.eurekalert.org/pub_releases/2013-09/ksu-rtt091213.php

Research treats the fungus among us with nontoxic medicinal compound

Researcher has found a breakthrough herbal medicine treatment for a common human fungal pathogen that lives in almost 80 percent of people.

Manhattan, Kan. -- A Kansas State University microbiologist has found a breakthrough herbal medicine treatment for a common human fungal pathogen that lives in almost 80 percent of people.
Govindsamy Vediyappan, assistant professor of biology, noticed that diabetic people in developing countries use a medicinal herb called Gymnema slyvestre to help control sugar levels. He decided to study the microbiological use of Gymnema slyvestre -- a tropical vine plant found in India, China and Australia -- to see if it could treat a common human fungal pathogen called Candida albicans.

The investigation was successful on two levels: Vediyappan's research team found the medicinal compound is both nontoxic and blocks the virulence properties of the fungus so that it is more treatable. The results are important for human health, biomedical applications and potential drug development.
"We have shown that this compound is safe to use because it doesn't hurt our body cells, yet it blocks the virulence of this fungus under in vitro conditions," Vediyappan said. "Taking the medicine could potentially help patients control the invasive growth of the fungus and also help bring their sugar levels down."
Candida albicans is one of the major fungal pathogens in humans because it lives in oral and intestinal areas as a normal flora, Vediyappan said. But the fungus can overgrow and can cause oral, intestinal and genital infections. The fungus kills almost 30 percent of people who have it and it is a concern among cancer patients -- especially patients with neck or oral cancer -- HIV patients, organ transplant patients and other people with compromised immune systems.
The fungus can grow in two forms: a treatable yeast and a difficult-to-treat hyphal form. Once the fungus transforms from a yeast to a hyphal growth it becomes difficult to treat because the hyphal growth has long filament-like structures that can spread into various organs. Vediyappan's study aimed to block the hyphal growth form. "Once it gets into the tissue, it spreads like roots and is difficult to contain by our immune system," Vediyappan said.
If the fungus remains in yeast form, it is easy to manage and does not invade tissues. Vediyappan's research team purified gymnemic acid compounds that prevented the transition stage from occurring and stopped the fungus spread. The gymnemic acids come from the leaves of Gymnema sylvestre, a traditional medicinal plant.
The research appears in the peer-reviewed journal PLOS ONE in an article titled "Gymnemic acids inhibit hyphal growth and virulence in Candida albicans."
Gymnema extract is commonly used to treat diabetes and other ailments because it is a cost-effective treatment, Vediyappan said. Often, people drink the extract to control their sugar levels or to lose weight.
Although Vediyappan's research team is not the first to discover gymnemic acid compounds, the team is the first to discover that the compounds block the fungal transition. The researchers found that the compounds work quickly, too, which was an important characteristic. The treatable fungal yeast can transition to a hyphal growth within 30 minutes of an infection. When the hyphal transition has occurred, it will grow into branched filaments.
The gymnemic acid compounds are nontoxic, which is especially important for cancer patients and other immunocompromised patients. The gymnemic acids can stop the unwanted invasive infection while preserving important healthy cells.
The Candida albicans fungus also makes a biofilm, which is a fungal cell collection that can be difficult to treat. The researchers found that the gymnemic acid compounds converted the biofilm back to treatable yeast cells.
"This compound prevents the biofilm formation because hyphae are the major builders of biofilms and biofilms are resistant to antifungals," Vediyappan said. "Yeast cells by themselves cannot make biofilms and are sensitive to antifungal treatments."
Another interesting aspect: The gymnemic acid compounds also stopped the growth of Aspergillus, another fungal pathogen that can affect heart transplant patients and leukemia patients.
Vediyappan plans future studies to research mode of action, potential drug development, diabetes applications and other ways to improve treatment for Candida albicans and other fungal pathogens.
Funding for the research came from Kansas State University's Johnson Cancer Research Center and K-INBRE at the University of Kansas Medical Center. Collaborating researchers include Vincent Dumontet and Franck Pelissier with the Natural Product Chemistry Institute, part of the National Center for Scientific Research, in Gif-sur-Yvette, France; and Christophe d'Enfert with the Fungal Biology and Pathogenicity Unit in the Department of Genomes and Genetics at the Institut Pasteur in Paris, France.

http://www.eurekalert.org/pub_releases/2013-09/mcog-ssm091213.php

Simple steps may identify patients that hold onto excess sodium

Getting a second urine sample and blood pressure measure as patients head out of the doctor's office appears an efficient way to identify those whose health may be in jeopardy because their bodies hold onto too much sodium, researchers report.

Augusta, Ga. - "We want to prove that you can easily and efficiently identify these patients," said Evan A. Mulloy, a second-year medical student at the Medical College of Georgia at Georgia Regents University. "We want this to become a part of our routine standard of care."
Using the simple method, researchers looked at 19, 10-19 year-olds seeing a pediatric nephrologist. They found eight were sodium retainers and seven of these were already hypertensive. "Eight kids were holding onto sodium and the amounts ranged anywhere from a few milligrams to hundreds of milligrams over the course of a

doctor's visit," Mulloy said. The findings are featured as a poster presentation at the American Heart Association's High Blood Pressure Research 2013 Scientific Sessions Sept. 11-14 in New Orleans.
About 1 in 3 blacks and 1 in 5 whites retain too much sodium following stress, driving fluid retention and blood pressure levels up, said Dr. Gregory A. Harshfield, a hypertension researcher who directs the Georgia Prevention Center at GRU's Institute of Public and Preventive Health.
Years ago, Harshfield identified this impaired ability in some blacks and wanted to take the next logical step: finding an easy, inexpensive way to identify these individuals. His studies, funded by the National Institutes of Health, have already shown sodium retainers respond well to angiotensin receptor blockers. These drugs, which reduce blood vessel constriction, are widely used to treat hypertension but, ironically, they often are considered ineffective in blacks, Harshfield said. Studies at MCG and elsewhere have shown angiotensin promotes sodium retention directly and it increases aldosterone, another hormone that enhances sodium retention.
For the new study, Mulloy recruited patients as they came into the pediatric nephology clinic at Children's Hospital of Georgia where patients have their blood pressure taken and provide a urine sample as part of their routine visit. Those who agreed to participate had both steps repeated at the conclusion of their visit for comparison sake.
The idea was that the stress of going to the doctor would be sufficient to cull out the sodium retainers. Increased sodium retention is one way the body responds to stress but normally, as soon as the stress passes, the extra sodium gets excreted in the urine.
To be effective, they knew the method for identifying retainers had to fit easily into a regular doctor's visit. Knowing patients are sodium retainers will go a long way in helping physicians identify optimal therapies, including prevention strategies, Mulloy said. They are now using the method in adults seeing a general internist.
"Salt sensitivity is a great concept but it's never been implemented into the clinical arena. We think this is a measure of salt sensitivity," Harshfield said. Nearly 31 percent of American adults are hypertensive and more than half do not have their high pressure under control, according to the Centers for Disease Control and Prevention.
In a related poster presentation at the AHA meeting, the MCG team also presents early evidence that potassium supplementation could help maintain a healthier sodium level following stress.
While analyzing another cohort of young healthy blacks, Harshfield and Office Associate Deborah L. Stewart noted that sodium retainers in the group still dumped potassium. Normally, potassium and sodium are dumped at the same time, Stewart said. They are writing a grant now to explore whether potassium supplementation is an inexpensive and safe method to improve sodium excretion.
Stewart, who has worked with Harshfield for a year, helping write grants, abstracts and analyze data, is completing her undergraduate degree in biology with plans to move into a role as research assistant. Mulloy has worked with Harshfield for three consecutive summers, beginning when he was an undergraduate at William & Mary.

http://www.eurekalert.org/pub_releases/2013-09/uoo-glt091013.php

Genes linked to being right- or left-handed identified

A genetic study has identified a biological process that influences whether we are right handed or left handed.

Scientists at the Universities of Oxford, St Andrews, Bristol and the Max Plank Institute in Nijmegen, the Netherlands, found correlations between handedness and a network of genes involved in establishing left-right asymmetry in developing embryos.
'The genes are involved in the biological process through which an early embryo moves on from being a round ball of cells and becomes a growing organism with an established left and right side,' explains first author William Brandler, a PhD student in the MRC Functional Genomics Unit at Oxford University.
The researchers suggest that the genes may also help establish left-right differences in the brain, which in turn influences handedness. They report their findings in the open-access journal PLOS Genetics.
Humans are the only species to show such a strong bias in handedness, with around 90% of people being right-handed. The cause of this bias remains largely a mystery.
The researchers, led by Dr Silvia Paracchini at the University of St Andrews, were interested in understanding which genes might have an influence on handedness, in order to gain an insight into the causes and evolution of handedness. The team carried out a genome-wide association study to identify any common gene variants that might correlate with which hand people prefer using.
The most strongly associated, statistically significant, variant with handedness is located in the gene PCSK6, which is involved in the early establishment of left and right in the growing embryo.

The researchers then made full use of knowledge from previous studies of what PCSK6 and similar genes do in mice to reveal more about the biological processes involved.
Disrupting PCSK6 in mice causes 'left-right asymmetry' defects, such as abnormal positioning of organs in the body. They might have a heart and stomach on the right and their liver on the left, for example.
They found that variants in other genes known to cause left-right defects when disrupted in mice were more likely to be associated with relative hand skill than you would expect by chance.
While the team has identified a role for genes involved in establishing left from right in embryo development, William Brandler cautions that these results do not completely explain the variation in handedness seen among humans. He says: 'As with all aspects of human behaviour, nature and nurture go hand-in-hand. The development of handedness derives from a mixture of genes, environment, and cultural pressure to conform to right-handedness.'
This paper details a genome-wide association study meta-analysis for a measure of relative hand skill in 728 individuals with dyslexia from three different cohorts. The results were replicated in a general population cohort of over 2,600 people who are unaffected with dyslexia (the longitudinal cohort ALSPAC).
The inclusion of three study groups of individuals with dyslexia is more accident than design. It just so happens that these studies in individuals with dyslexia included a test of relative hand skill. Being right or left-handed does not correlate with dyslexia. None of the genes in this study have any effect on the risk of developing dyslexia.
This work was supported by the University of St Andrews, the UK Medical Research Council, the Wellcome Trust, the Max Plank Society, and the EU 6th Framework Programme.
Data from the Avon Longitudinal Study of Parents and Children (ALSPAC) were included in the study.
The paper 'Common variants in left-right asymmetry genes and pathways are associated with relative hand skill' is to be published in the journal PLOS Genetics, freely available at:
http://www.plosgenetics.org/article/info:doi/10.1371/journal.pgen.1003751. Thank you.

http://www.sciencedaily.com/releases/2013/09/130912112736.htm

Read With Your Children, Not to Them

Research has found that reading with young children and engaging them can make a positive impact on the child's future and their family.

Bradford Wiles is an Assistant Professor and Extension Specialist in early childhood development at Kansas State University. For most of his career, Wiles' research has focused around building resilience in vulnerable families. His current research is focused on emergent literacy and the effect of parents reading with their children ages 3 to 5 years old.
"Children start learning to read long before they can ever say words or form sentences," said Wiles. "My focus is on helping parents read with their children and extending what happens when you read with them and they become engaged in the story."
The developmental process, known as emergent literacy, begins at birth and continues through the preschool and kindergarten years. This time in children's lives is critical for learning important preliteracy skills.
Although his research mainly focuses on 3-5 year olds, Wiles encourages anyone with young children to read with them as a family at anytime during the day, not just before going to bed. He also believes that it is okay to read one book over and over again, because the child can learn new things every time.
"There are always opportunities for you both to learn," said Wiles, "and it creates a family connection. Learning is unbelievably powerful in early childhood development."
It goes deeper than just reading to them, as parents are encouraged to read with their children. Engaging children is how they become active in the story and build literacy skills.
"There is nothing more powerful than your voice, your tone, and the way you say the words," said Wiles. "When I was a child, my dad read to me and while that was helpful and I enjoyed it, what we are finding is that when parents read with their children instead of to them, the children are becoming more engaged and excited to read."
Engaging the child means figuring out what the child is thinking and getting them to think beyond the words written on the page. While reading with them, anticipate what children are thinking. Then ask questions, offer instruction, provide examples and give them some feedback about what they are thinking.
"One of the things that I really hope for, and have found, is that these things spill over into other areas," said Wiles. "So you start out reading, asking open-ended questions, offering instruction and explaining when all of the sudden you aren't reading at all and they start to recognize those things they have seen in the books. And that's really powerful."
Wiles explains it in a scenario where a mother reads a book with her 4 year old about a garden. Then they go to the supermarket and the 4 year old is pointing and saying, "look there's a zucchini." The child cannot read the sign that says zucchini but knows what that is because they read the book about gardens.

During this time called the nominal stage, the developmental stage where children are naming things, a child's vocabulary can jump from a few hundred words to a few thousand words. The more exposure they've had through books and print materials, the more they can name things and understand. It's the emergent literacy skills that can set the stage for other elements.
The school of Family Studies and Human Services at Kansas State University is producing lesson plans to help families learn how to read with young children. These lesson plans are research-based but they have been condensed into usable and applicable lessons for families.

http://www.sciencedaily.com/releases/2013/09/130912143217.htm

Radical New View of Health: Stem Cells Are Wired for Cooperation, Down to the DNA

Researchers show a network of genes in cells which enforce a cooperative state within cells

We often think of human cells as tiny computers that perform assigned tasks, where disease is a result of a malfunction. But in the current issue of Science, researchers at The Mount Sinai Medical Center offer a radical view of health -- seeing it more as a cooperative state among cells, while they see disease as result of cells at war that fight with each other for domination.
Their unique approach is backed by experimental evidence. The researchers show a network of genes in cells, which includes the powerful tumor suppressor p53, which enforce a cooperative state within cells -- rather like the queen bee in a beehive. Disease or disorder occurs when these enforcer genes are mutated, allowing competition between cells to ensue.
"Both competition and cooperation drive evolution, and we are wired for cooperation all the way down to our genes," says the study's senior investigator, Thomas P. Zwaka, MD, PhD, Professor at the Black Family Stem Cell Institute at the Icahn School of Medicine at Mount Sinai.
The findings, if backed by future research, offer a new way to address disease, Dr. Zwaka says. Understanding the genetic basis of cooperative and competitive cellular behaviors could explain how cancer and immune system dysfunction develops, he says. "If a cell has lost a gene that fosters communication among cells, it may dominate other cells by ignoring signals to stop proliferating. It also makes sense that the immune system might detect and attack cells that are not cooperating. Failure to cooperate may also underlie development of birth defects."
He adds that it may be possible to flip the cooperation switch back on therapeutically, or to manipulate stem-like cells to misbehave in a way that produces replacement cells for regenerative medicine.
"Cell misbehave, they are unpredictable. They do not operate like little machines," he says. "What our study suggests is that cooperation is so central to our evolution that we have genetic mechanisms to protect us against cheating and dominating behavior."
A network of genes with an ancient function The research team, which also includes study first author Marion Dejosez, PhD, Assistant Professor at the Icahn School at Mount Sinai, took a long view toward the behavior of cells. They wondered how it was that cells, which lived on earth as single units for hundreds of millions of years, could effectively bundle themselves together to perform specific tasks. "Cells started somehow to form alliances, and to cooperate, and obviously this multicellularity had certain advantages."
But they also questioned what happened to the "cheating" behavior that can be seen in single cells, such as amoeba, that live in colonies -- competitive behavior that allows the cell to gain a reproductive advantage without contributing its fair share to the community.
They conducted a genetic screen in stem cells to look for mutants that allow cells to "misbehave -- to become a little antisocial and do things they wouldn't normally do," Dr. Zwaka says. The screen picked up about 100 genes, which seem to cluster together into a network.
The team focused on three of those genes -- p53, long known as the guardian of the genome, Topoisomerase 1 (Top1), which control genomic stability, and olfactory receptors involved in the sensation of smell.
"We could understand that p53 might foster cooperation, because loss of p53 function is a step in the development of many cancers. But finding that top1 and olfactory receptors may have the same function was a surprise," he says. "We think these genes have the ancient function of safeguarding multicellular organisms by helping cells to coordinate their activities."
The scientists then tested the effects of knocking down these genes in developing mouse embryos. To their surprise, p53 and Top1 knockdown embryos developed normally -- perhaps because other intact social enforcement genes took over.
"This showed us that mutant cells only misbehave when they are around normal cells. They become competitive, perhaps promoting an evolutionary advance," Dr. Zwaka says. "When all the cells are the same, either all mutated or all normal, they cooperate with each other.

"This study suggests that cell cooperation, altruistic behavior, cheating, and other so-called social behaviors are wired into cells via the genome at the early primitive stage," he says. "Perhaps there is no coincidence that amoeba, insects, animals, the human culture and society, generally follow innate rules of cooperation. Darwin's explanation of evolution as a struggle for existence needs to be tempered with an acknowledgment of the importance of cooperation in the evolution of complexity."
Working with Dr. Zwaka and Dr. Dejosez on the study were co-authors V. L. Brandt from the Black Family Stem Cell Institute, and Hiroki Ura, PhD, from Baylor College of Medicine in Houston.
The work was funded by the Huffington Foundation and by the National Institutes of Health (grants R01 GM077442 and P01 GM81627).
Marion Dejosez, Hiroki Ura, Vicky L. Brandt, and Thomas P. Zwaka. Safeguards for Cell Cooperation in Mouse Embryogenesis Shown by Genome-Wide Cheater Screen. Science, 12 September 2013 DOI: 10.1126/science.1241628

http://phys.org/news/2013-09-assumptions-life.html

New findings challenge assumptions about origins of life

All the enzymes that translate our genetic code have virtually identical cores that can be extracted to produce "molecular fossils" called Urzymes

Before there was life on Earth, there were molecules. A primordial soup. At some point a few specialized molecules began replicating. This self-replication, scientists agree, kick-started a biochemical process that would lead to the first organisms. But exactly how that happened—how those molecules began replicating—has been one of science's enduring mysteries.
Now, research from UNC School of Medicine biochemist Charles Carter, PhD, appearing in the September 13 issue of the Journal of Biological Chemistry, offers an intriguing new view on how life began. Carter's work is based on lab experiments during which his team recreated ancient protein enzymes that likely played a vital role in helping create life on Earth. Carter's finding flies in the face of the widely-held theory that Ribonucleic Acid (RNA) self-replicated without the aid of simple proteins and eventually led to life as we know it.
In the early 1980s, researchers found that ribozymes—RNA enzymes—act as catalysts. It was evidence that RNA can be both the blueprints and the chemical catalysts that put those blueprints into action. This finding led to the "RNA World" hypothesis, which posits that RNA alone triggered the rise of life from a sea of molecules. But for the hypothesis to be correct, ancient RNA catalysts would have had to copy multiple sets of RNA blueprints nearly as accurately as do modern-day enzymes. That's a hard sell; scientists calculate that it would take much longer than the age of the universe for randomly generated RNA molecules to evolve sufficiently to achieve the modern level of sophistication. Given Earth's age of 4.5 billion years, living systems run entirely by RNA could not have reproduced and evolved either fast or accurately enough to give rise to the vast biological complexity on Earth today.
"The RNA world hypothesis is extremely unlikely," said Carter. "It would take forever."
Moreover, there's no proof that such ribozymes even existed billions of years ago. To buttress the RNA World hypothesis, scientists use 21st century technology to create ribozymes that serve as catalysts. "But most of those synthetic ribozymes," Carter said, "bear little resemblance to anything anyone has ever isolated from a living system."
Carter, who has been an expert in ancient biochemistry for four decades, took a different approach. His experiments are deeply embedded in consensus biology.
Our genetic code is translated by two super-families of modern-day enzymes. Carter's research team created and superimposed digital three-dimensional versions of the two super-families to see how their structures aligned. Carter found that all the enzymes have virtually identical cores that can be extracted to produce "molecular fossils" he calls Urzymes—Ur meaning earliest or original. The other parts, he said, are variations that were introduced later, as evolution unfolded.
These two Urzymes are as close as scientists have gotten to the actual ancient enzymes that would have populated the Earth billions of years ago.
"Once we identified the core part of the enzyme, we cloned it and expressed it," Carter said. "Then we wanted to see if we could stabilize it and determine if it had any biochemical activity." They could and it did.
Both Urzymes are very good at accelerating the two reactions necessary to translate the genetic code.
"Our results suggest that there were very active protein enzymes very early in the generation of life, before there were organisms," Carter said. "And those enzymes were very much like the Urzymes we've made."
The finding also suggests that Urzymes evolved from even simpler ancestors—tiny proteins called peptides. And over time those peptides co-evolved with RNA to give rise to more complex life forms.
In this "Peptide-RNA World" scenario, RNA would have contained the instructions for life while peptides would have accelerated key chemical reactions to carry out those instructions.

"To think that these two Urzymes might have launched protein synthesis before there was life on Earth is totally electrifying," Carter said. "I can't imagine a much more exciting result to be working on, if one is interested in the origin of life."
The study leaves open the question of exactly how those primitive systems managed to replicate themselves—something neither the RNA World hypothesis nor the Peptide-RNA World theory can yet explain. Carter, though, is extending his research to include polymerases—enzymes that actually assemble the RNA molecule. Finding an Urzyme that serves that purpose would help answer that question. The study's co-authors include Li Li of UNC and Christopher Francklyn of the University of Vermont, Burlington.

http://www.eurekalert.org/pub_releases/2013-09/aiop-tc091313.php

The '50-50' chip: Memory device of the future?

A new material built from aluminum and antimony shows promise for next-generation data-storage devices

WASHINGTON, D.C. - A new, environmentally-friendly electronic alloy consisting of 50 aluminum atoms bound to 50 atoms of antimony may be promising for building next-generation "phase-change" memory devices, which may be the data-storage technology of the future, according to a new paper published in the journal Applied Physics Letters, which is produced by AIP Publishing.
Phase-change memory is being actively pursued as an alternative to the ubiquitous flash memory for data storage applications, because flash memory is limited in its storage density and phase-change memory can operate much faster.
Phase-change memory relies on materials that change from a disordered, amorphous structure to a crystalline structure when an electrical pulse is applied. The material has high electrical resistance in its amorphous state and low resistance in its crystalline state -- corresponding to the 1 and 0 states of binary data.
Flash memory has problems when devices get smaller than 20 nanometers. But a phase-change memory device can be less than 10 nanometers -- allowing more memory to be squeezed into tinier spaces. "That's the most important feature of this kind of memory," said Xilin Zhou of the Shanghai Institute of Microsystem and Information Technology at the Chinese Academy of Sciences. Data can also be written into phase-change memories very quickly and the devices would be relatively inexpensive, he added.
So far, the most popular material for phase-change memory devices contains germanium, antimony, and tellurium. But compounds with three elements are more difficult to work with, Zhou said.
"It's difficult to control the phase-change memory manufacturing process of ternary alloys such as the traditionally used germanium-antimony-tellurium material. Etching and polishing of the material with chalcogens can change the material's composition, due to the motion of the tellurium atoms," explained Zhou.
Zhou and his colleagues turned to a material with just two elements: aluminum and antimony. They studied the material's phase-changing properties, finding that it's more thermally stable than the Ge-Sb-Te compound. The researchers discovered that Al50Sb50, in particular, has three distinct levels of resistance -- and thus the ability to store three bits of data in a single memory cell, instead of just two. This suggests that this material can be used for multilevel data storage.
"A two-step resistance drop during the crystallization of the material can be used for multilevel data storage (MLS) and, interestingly, three distinct resistance levels are achieved in the phase-change memory cells," Zhou says. "So the aluminum-antimony material looks promising for use in high-density nonvolatile memory applications because of its good thermal stability and MLS capacity."
The researchers are now investigating the endurance or reversible electrical switching of the phase-change memory cell with MLS capacity.
The paper, "Phase-transition characteristics of Al-Sb phase change materials for phase change memory application," by Xilin Zhou, Liangcai Wu, Zhitang Song, Feng Rao, Kun Ren, Cheng Peng, Sannian Song, Bo Liu, Ling Xu, and Songlin Feng appears in the journal Applied Physics Letters. See: http://dx.doi.org/10.1063/1.4818662

http://www.eurekalert.org/pub_releases/2013-09/uop-fsi091313.php

Fish skin immune responses resemble those of the gut, Penn study finds

Fish skin is unique in that it lacks keratin, the fibrous protein found in mammalian skin that provides a barrier against the environment.

Instead, the epithelial cells of fish skin are in direct contact with the immediate environment: water. Similarly, the epithelial cells that line the gastrointestinal tract are also in direct contact with their immediate milieu.
"I like to think of fish as an open gut swimming," said J. Oriol Sunyer, a professor in the the Department of Pathobiology of the University of Pennsylvania's School of Veterinary Medicine.
Building on this observation, a study led by Sunyer's group at Penn Vet found that, not only does fish skin resemble the gut morphologically, but key components of skin immune responses are also akin to those of the gut.

"In fish, the skin and the gut have much in common: they are both constantly exposed to environmental insults, they both have a large and varied microbiota and they both contain mucosal surfaces," Sunyer said. "So we hypothesized that the skin should have a similar immune response to the gut, and this is indeed what we found."
The results not only are of interest on the level of basic science and evolution but have important implications for the way that fish vaccines will be designed and tested, as a large number of fish pathogens enter through the skin.
The study was recently featured in the "highlights" section of the September issue of Nature Reviews Immunology, which described it as providing "a fascinating insight into the evolutionary origins of mucosal immune [defenses.]"
The current work is based on a 2010 finding from Sunyer's lab, published in Nature Immunology. In that study, scientists reported for the first time that rainbow trout produce an antibody known as IgT in their gut. This immunoglobulin is responsible for gut mucosal immunity. The equivalent antibody in mammals is IgA.
Because of the similarities between a fish's gut and skin, Sunyer's team went on the hunt for IgT in the skin tissue of rainbow trout. When they examined B cells, which produce immunoglobulins in response to foreign invaders, such as parasites and bacteria, they found that the majority of B cells in the skin were expressing IgT, suggesting that this immunoglobulin was playing an important role there.
Next the researchers took a closer look at the bacterial community, or microbiota, living on the trout's skin. In mammals and birds, IgA has been found to help prevent the "friendly" bacteria of the gut microbiota from invading the body and causing illness, leading Sunyer's team to hypothesize that IgT might be playing a parallel role in the skin of fish. In addition, earlier work by Sunyer's team found IgT coating bacteria in the intestinal microbiota.
In the current study, when the researchers examined the skin microbiota, they found that a significantly higher percentage of bacteria were coated by IgT than by IgM, another fish immunoglobulin. More critically, greater than 50 percent of the IgT present in the skin mucus was involved in coating bacteria. These findings suggest that IgT is involved in regulating host-microbiota homeostasis; in other words, IgT appears to play a role in maintaining a stable relationship between the fish and the bacterial community living in its skin.
To see how IgT functioned in response to infectious agents, the researchers exposed trout to a parasite that causes white spot disease, a common affliction that targets the skin of farmed, wild and aquarium fish. Compared with uninfected fish, infected fish that survived parasite exposure had many more IgT-producing B cells than IgM-producing B cells in their skin. Moreover, the skin mucus of surviving fish contained only IgT but not IgM, which specifically recognized the parasite. Conversely, IgM represented the main parasite-specific immunoglobulin in the serum of these animals. Taken together, these results demonstrate that IgT is the pivotal skin immunoglobulin generated in response to pathogenic infection.
According to Sunyer, the parallel immune responses in the fish gut and skin are likely the result of these body areas having been subjected to very similar evolutionary selective forces. They also appear to represent an example of convergent evolution with the IgA-mediated mucosal immunity in mammals. In conjunction with earlier work from Sunyer and others, the findings underline that many aspects of mucosal immune responses of fish and mammals operate under the guidance of primordially conserved principles, thus demonstrating the value of bony fish as model organisms.
"Discoveries we make in fish about the fundamental mechanisms of mucosal immunity may help us come up with paradigms of immunity in mammals that are yet to be discovered," Sunyer said. "There is a very important translational component."
The work could also help pave the way for improved fish vaccines — important tools in the burgeoning aquaculture industry.
"The skin is a very important portal for fish pathogens," Sunyer said. "Now that we are starting to understand how mucosal immunity works in the skin and that IgT is the key immunoglobulin there, we can target it and evaluate it when designing new vaccines."
Moving forward, Sunyer's team plans to examine how fish skin's microbiota regulates skin immunity as well as the role of IgT in influencing host-microbiota homeostasis. They also seek to develop new vaccine strategies that will induce IgT immune and protective responses in the skin and other mucosal body parts.
Sunyer's coauthors included Zhen Xu, David Parra and Daniela Gómez of Penn Vet; former Penn Vet postdoctoral researchers Irene Salinas and Yong-An Zhang, who are now faculty members at the University of New Mexico and the Chinese Academy of Sciences, respectively; Louise von Gersdorff Jørgensen, Rasmus Demuth Heinecke and Kurt Bachmann of the University of Copenhagen; and Scott LaPatra of Clear Springs Food.
The research was supported by grants from the National Institute of General Medical Sciences and the National Science Foundation.

http://www.sciencedaily.com/releases/2013/09/130913101819.htm

'Terminator' Polymer: Self-Healing Polymer That Spontaneously and Independently Repairs Itself

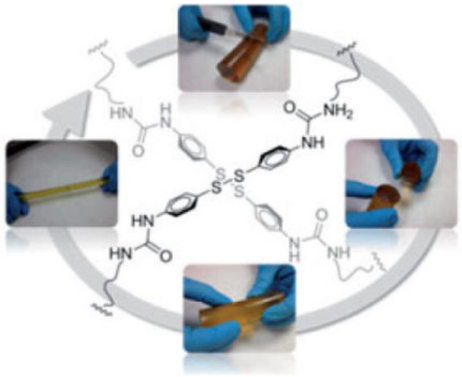
Scientists report the first self-healing thermoset elastomer that requires no intervention to induce its repair.

Self-healing polymers mend themselves by reforming broken cross-linking bonds. However, the cross-linking healing mechanism usually requires an external stimulus.

Triggers to promote bond repair include energy inputs, such as heat or light, or specific environmental conditions, such as pH. Self-healing polymers that can spontaneously achieve quantitative healing in the absence of a catalyst have never been reported before, until now.

Ibon Odriozola previously came close when his group at the CIDETEC Centre for Electrochemical Technologies in Spain developed self-healing silicone elastomers using silver nanoparticles as cross-linkers. Unfortunately, an applied external pressure was required and the expensive sliver component disfavoured commercialisation. But now they have achieved their goal to prepare self-healing elastomers from common polymeric starting materials using a simple and inexpensive approach.

An industrially familiar, permanently cross-linked poly(urea-urethane) elastomeric network was demonstrated to completely mend itself after being cut in two by a razor blade. It is the metathesis reaction of aromatic disulphides, which naturally exchange at room temperature, that causes regeneration.



The elastomer mends itself after being cut in two by a razor blade and can be manually stretched without rupture.
Royal Society of Chemistry

Ibon stresses the use of commercially available materials is important for industrial applications. He says the polymer behaves as if it was alive, always healing itself and has dubbed it a "terminator" polymer -- a tribute to the shape-shifting, molten T-1000 terminator robot from the Terminator 2 film. It acts as a velcro-like sealant or adhesive, displaying an impressive 97% healing efficiency in just two hours and does not break when stretched manually.

David Mecerreyes, a polymer chemistry specialist at the University of the Basque Country in Spain, sees opportunities to use this elastomer to improve the security and duration of many plastic parts, for example in cars, houses, electrical components and biomaterials.

'The introduction of a room temperature exchangeable covalent bond in classic thermoset elastomers provides unique autonomous self-healing abilities without comprising the pristine material properties,' says Richard Hoogenboom, head of the Supramolecular Chemistry group at Ghent University in Belgium. 'Close resemblance of this novel self-healing thermoset elastomer with current commercial materials makes it highly interesting for extending the lifetime of such materials.' Future work by the group will concentrate on stronger polymeric materials as the current poly(urea-urethane) composite is relatively soft.

Alaitz Rekondo, Roberto Martin, Alaitz Ruiz de Luzuriaga, Germán Cabañero, Hans J. Grande and Ibon Odriozola. Catalyst-free room-temperature self-healing elastomers based on aromatic disulfide metathesis. Mater. Horiz., 2014 (in press) DOI: 10.1039/C3MH00061C

Roberto Martín, Alaitz Rekondo, Jon Echeberria, Germán Cabañero, Hans J. Grande, Ibon Odriozola. Room temperature self-healing power of silicone elastomers having silver nanoparticles as crosslinkers. Chemical Communications, 2012; 48 (66): 8255 DOI: 10.1039/c2cc32030d

http://www.eurekalert.org/pub_releases/2013-09/icl-sdc091113.php

Scientists discover cosmic factory for making building blocks of life

Scientists have discovered a 'cosmic factory' for producing the building blocks of life, amino acids, in research published today in the journal Nature Geoscience.

The team from Imperial College London, the University of Kent and Lawrence Livermore National Laboratory have discovered that when icy comets collide into a planet, amino acids can be produced. These essential building blocks are also produced if a rocky meteorite crashes into a planet with an icy surface.

The researchers suggest that this process provides another piece to the puzzle of how life was kick-started on Earth, after a period of time between 4.5 and 3.8 billion years ago when the planet had been bombarded by comets and meteorites.

Dr Zita Martins, co-author of the paper from the Department of Earth Science and Engineering at Imperial College London, says: "Our work shows that the basic building blocks of life can be assembled anywhere in the Solar System and perhaps beyond. However, the catch is that these building blocks need the right conditions in

order for life to flourish. Excitingly, our study widens the scope for where these important ingredients may be formed in the Solar System and adds another piece to the puzzle of how life on our planet took root."
Dr Mark Price, co-author from the University of Kent, adds: "This process demonstrates a very simple mechanism whereby we can go from a mix of simple molecules, such as water and carbon-dioxide ice, to a more complicated molecule, such as an amino acid. This is the first step towards life. The next step is to work out how to go from an amino acid to even more complex molecules such as proteins."
The abundance of ice on the surfaces of Enceladus and Europa, which are moons orbiting Saturn and Jupiter respectively, could provide a perfect environment for the production of amino acids, when meteorites crash into their surface, say the researchers. Their work further underlines the importance of future space missions to these moons to search for signs of life.
The researchers discovered that when a comet impacts on a world it creates a shock wave that generates molecules that make up amino acids. The impact of the shock wave also generates heat, which then transforms these molecules into amino acids.
The team made their discovery by recreating the impact of a comet by firing projectiles through a large high speed gun. This gun, located at the University of Kent, uses compressed gas to propel projectiles at speeds of 7.15 kilometres per second into targets of ice mixtures, which have a similar composition to comets. The resulting impact created amino acids such as glycine and D-and L-alanine.
1. DOWNLOAD A COPY OF THE PAPER
'Shock synthesis of amino acids from impacting cometary and icy planet surface analogues' published 15 September 2013, 2013 Nature Geoscience

http://news.discovery.com/earth/rocks-fossils/origins-of-life-found-in-smashing-ice-130915.htm

Origins of Life Found in Smashing Ice

Comets and other icy celestial bodies have some basic building blocks for life, but it takes violent impacts to take them to the next level, according to researchers who claim to have successfully created amino acids in the lab by recreating icy interplanetary collisions.

Sep 15, 2013 01:00 PM ET // by Larry O'Hanlon

First the researchers created mixtures of water ice and light organic chemicals roughly based on what has been observed on comets and what is suspected to exist on the Saturn's moons. Then they shocked the ice by firing at it with a steel projectile at very high, interplanetary planetary collision speeds approaching 16,000 miles per hour (7 kilometers per second).
They found that the hypervelocity impact shock of a typical comet ice mixture produced several amino acids, including equal amounts of D- and L-alanine (that means right and left-handed versions of that amino acid molecules). Meanwhile, analyses of the non-shocked "control" samples of the same ice contained none of these important steps towards genuine proteins needed for life. The results suggest that icy impacts within our solar system may play an important role for making ingredients for life.
The team ran the experiment twice, a year apart, to show that their amino acids were not flukes. They also went to great pains to keep their ice mixtures and equipment free of earthly contamination.
"We needed everything to be extremely clean and we needed to show that the results were reproducible," said Zita Martins of Imperial College London and lead author on the paper published in the Sept. 15 issue of Nature Geoscience.
The study is an important step forward because it goes beyond simulations of impacts, of which there are many, she said.
"There are lots of theoretical studies," said Martins. "But every time they publish they get criticized for not being experimental." But with the success of this work, it's likely others will follow.
"It's an exciting paper and it's definitely going to spur ancillary work," said icy impacts researcher Michael Mumma of NASA's Goddard Space Flight Center. He is especially interested in what will happen if the experiments are done with a wider range of icy mixtures -- including those that match some of the latest discoveries about the composition of comet ices. "It suggests a whole range of mixtures."
As for what it has to do with life on Earth, that requires going back in time a few billion years and reversing the collisions a bit: instead of rocks slamming into ice, it would be icy comets slamming into Earth's rocky crust.
Another implication of the work is that it increases the chances of life originating and being widespread throughout our Solar System, the researchers wrote.