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Study finds bidirectional relationship between schizophrenia and epilepsy

Researchers from Taiwan have confirmed a bidirectional relation between schizophrenia and epilepsy.

The study published today in Epilepsia, a journal of the International League Against Epilepsy (ILAE), reports that patients with epilepsy were nearly 8 times more likely to develop schizophrenia and those with schizophrenia were close to 6 times more likely to develop epilepsy.

Prior clinical studies have shown a prevalence of psychosis among epilepsy patients and studies of psychiatric illness have found a strong relationship between schizophrenia and epilepsy, suggesting a shared susceptibility between the diseases that may be a result of genetic, environmental or neurobiological causes. While a number of studies have established a bidirectional relationship between depression, mood disorder and epilepsy, the current study is the first to investigate this type of relation between schizophrenia and epilepsy.

Using data from the Taiwan National Health Insurance database, the team identified 5195 patients with schizophrenia and 11527 patients with epilepsy who were diagnosed between 1999 and 2008. The patient groups were compared to age and sex-matched controls. Analysis included the incidence and risk of developing epilepsy in the schizophrenia patient group and schizophrenia in the epilepsy cohort.

The findings show that the incidence of epilepsy was higher in the schizophrenia patient group at 6.99 per 1,000 person-years compared to 1.19 in the non-schizophrenia control. Incidence of schizophrenia was 3.53 per 1,000 person-years for patient with epilepsy compared to 0.46 in the non-epilepsy group. Researchers also reported that schizophrenia incidence was slightly higher in men with epilepsy than in women with the disease.

"Our research results show a strong bidirectional relation between schizophrenia and epilepsy," said lead author I-Ching Chou, M.D., with China Medical University Hospital and Associate Professor with China Medical University in Taichung, Taiwan. "This relationship may be due to common pathogenesis in these diseases such as genetic susceptibility and environmental factors, but further investigation of the pathological mechanisms are needed."

This study is published in Epilepsia. Media wishing to receive a PDF of this article may contact healthnews@wiley.com.
Full citation: "Bidirectional Relation Between Schizophrenia and Epilepsy: A Population-Based Retrospective Cohort Study." Yu-Tzu Chang, Pei-Chun Chen, I-Ju Tsai, Fung-Chang Sung, Zheng-Nan Chin, Huang-Tsung Kuo, Chang-Hai Tsai and I-Ching Chou. Epilepsia; Published Online: September 19, 2011 (DOI: 10.1111/j.1528-1167.2011.03268.x).
http://doi.wiley.com/10.1111/j.1528-1167.2011.03268.x

http://www.eurekalert.org/pub_releases/2011-09/aaft-wan091411.php

We are not only eating 'materials', we are also eating 'information'

In a new study, Chen-Yu Zhang's group at Nanjing university present a rather striking finding that plant miRNAs could make into the host blood and tissues via the route of food-intake.

Moreover, once inside the host, they can elicit functions by regulating host "target" genes and thus regulate host physiology.

MicroRNAs are a class of 19-24 nucleotide non-coding RNAs that do not code for proteins. MicroRNAs bind to target messenger RNAs to inhibit protein translation. In previous studies, the same group has demonstrated that stable microRNAs (miRNAs) in mammalian serum and plasma are actively secreted from tissues and cells and can serve as a novel class of biomarkers for disease and act as signaling molecules in intercellular communication.

Here, they report the surprising finding that exogenous plant miRNAs are present in the sera and tissues of various animals and that these exogenous plant miRNAs are primarily acquired orally, through food intake. MIR168a is abundant in rice and is one of the most highly enriched exogenous plant miRNAs in the sera of Chinese subjects. Functional studies in vitro and in vivo demonstrated that MIR168a could bind to the human/mouse low density lipoprotein receptor adapter protein 1 (LDLRAP1) mRNA, inhibit LDLRAP1 expression in liver, and consequently decrease LDL removal from mouse plasma. These findings demonstrate that exogenous plant miRNAs in food can regulate the expression of target genes in and thus physiology of mammals.

The finding is obviously very thought-provoking; for instance, it would indicate that in addition to eating "materials" (in the form of carbohydrates, proteins, etc), you are also eating "information" (as different miRNAs from distinct food sources could well bear different consequences on the regulation of host physiology once taken by the host due to potential regulation of different target genes as determined by the "information" contained within the miRNA sequence), thus providing a whole new dimension to "You are what you eat".

Furthermore, the potential significances of this finding would be:

1 has significantly expanded the functions of miRNAs;

2 is an extremely intriguing and novel idea that has far-ranging implications for human health and metabolism;
3 shed new light on our understanding of cross-domain (such as animal-plant) interactions, or perhaps even the 'co-evolution', and to open new ways of thinking about regulation of miRNAs, and about the potential roles of exogenous miRNAs such as those from food, plants and insects in prey-predator interactions;
4 provides evidence that plant miRNAs maybe the seventh "nutrient" in the food (the six others are: H2O, protein, FFA, carbohydrate, vitamins and real elements);
5 provides a novel mechanism of development of metabolic disorder.
6 provides evidence that plant miRNAs may represent essential functional molecules in Chinese traditional herb medicine.

Importantly, these results have far-reaching implications, including the establishment of a powerful experimental methodology to deliver small RNAs to animals for in vivo gene silencing and miRNA gain-of-function studies. These findings also have major implications for the genetic engineering of plants using RNAi technologies and for the development of therapeutics that rely on small RNA delivery, since those interested in therapeutic applications of small RNAs inject doses of formulated or non-formulated RNAs that are up to 100mg/kg body weight - unimaginably higher - and have difficulty seeing an effect.

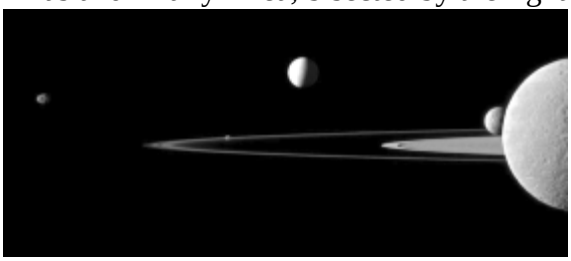
The researchers of this project include Lin Zhang1,, Dongxia Hou1,*, Xi Chen1,*, Lingyun Zhu1, Yujing Zhang1, Jing Li1, Zhen Bian1, Xiangying Liang1, Xing Cai1, Yuan Yin1, Cheng Wang1, Tianfu Zhang1, Dihan Zhu1, Dianmu Zhang1, Jie Xu1, Qun Chen1, Yi Ba2, Jing Liu1, Qiang Wang1, Jianqun Chen1, Jin Wang1, Qipeng Zhang1, Junfeng Zhang1,†, Ke Zen1,†, and Chen-Yu Zhang1,†of Jiangsu Engineering Research Center for MicroRNA Biology and Biotechnology, State Key Laboratory of Pharmaceutical Biotechnology, Nanjing University, 22 Hankou Road, Nanjing, Jiangsu 210093, China*
This work was supported by grants from the National Natural Science Foundation of China (no. 30225037, 30471991, 30570731), the 973 Program of China (no. 2006CB503909, 2004CB518603), the "111" Project, the Natural Science Foundation of Jiangsu Province (no. BK2004082, BK2006714)
Zhang et al.: " Exogenous plant MIR168a specifically targets mammalian LDLRAP1: an evidence of cross-kingdom regulation by microRNA " Publishing on Cell Research, September 20, 2011.

http://www.physorg.com/news/2011-09-cassini-saturn-moon-quintet.html

Cassini presents Saturn moon quintet

With the artistry of a magazine cover shoot, NASA's Cassini spacecraft captured this portrait of five of Saturn's moons poised along the planet's rings.

(PhysOrg.com) - From left to right are Janus, Pandora, Enceladus, Mimas and finally Rhea, bisected by the right side of the frame. The view was acquired at a distance of approximately 684,000 miles (1.1 million kilometers) from Rhea and 1.1 million miles (1.8 million kilometers) from Enceladus.



The image was taken in visible green light with the Cassini spacecraft narrow-angle camera on July 29, 2011. Image scale is about 4 miles (7 kilometers) per pixel on Rhea and 7 miles (11 kilometers) per pixel on Enceladus.

A quintet of Saturn's moons come together in the Cassini spacecraft's field of view for this portrait. Credit: NASA/JPL-Caltech/Space Science Institute

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for NASA's Science Mission Directorate, Washington. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging operations center is based at the Space Science Institute in Boulder, Colo. *Provided by JPL/NASA*

http://www.eurekalert.org/pub_releases/2011-09/uocm-fad091511.php

Food and drugs: Administer together

A regulatory bias against taking oral anti-cancer medications with food places many patients at increased risk for an overdose and forces them to "flush costly medicines down the toilet," argues Mark Ratain, MD, an authority on cancer-drug dosing.

In a commentary published early online Sept. 19 in the Journal of Clinical Oncology, Ratain, the Leon O. Jacobson professor of medicine and director of the Center for Personalized Therapeutics at the University of Chicago Medical Center, says it could be safer, more effective and more cost-efficient if the many cancer drugs that are better absorbed with food were studied and, when appropriate, prescribed to be taken with food.

"Instead of taking high doses on a empty stomach - which is how most of these drugs are labeled - patients would be better off taking much lower doses along with a meal," Ratain said. "This could reduce the risks of an overdose, save money and give patients more control over their daily lives."

In the last two decades, drug treatment for cancer has shifted away from drugs given through an intravenous line to drugs taken by mouth. Drug makers have set dose levels for these drugs based on data from patients who take their pills on an empty stomach. But many drugs are absorbed much more effectively with food, especially with a high-fat meal. "With a monthly outlay measured in thousands of dollars," Ratain said, "we should view drug-drug or drug-food interactions as opportunities to lower costs."

Abiraterone acetate (ZYTIGA), approved April 28, 2011, for the treatment of metastatic prostate cancer, is a perfect example. It has a "food effect" greater than any other marketed drug. The dose can increase fivefold with a low-fat meal and tenfold with a high-fat meal. Patients are instructed to take it while fasting. "No food should be consumed for at least two hours before the dose of ZYTIGA is taken and for at least one hour after the dose of ZYTIGA is taken," warns the package insert. "The tablets should be swallowed whole with water."

"Taking this drug according to instructions means the amount of the drug available to fight cancer is decreased by 80 to 90 percent," Ratain points out. "At least three-quarters of it, at a per-patient cost of about $5,000 a month, is literally wasted. It gets excreted and flushed away."

More worrisome is the risk of an overdose if a patient takes the standard dose - 1,000 mg daily - after fasting for two hours, then gets hungry and, rather than fast for one more hour, eats a meal. Depending on the caloric intake, he could get up to 10 times the intended dose. Instead, offers Ratain, patients could take one-fourth of the dose with a healthy, low-fat breakfast. They could get the same anti-cancer benefit, eat when they are hungry and save an estimated $3,750 per month. "This way, the patient gets a simplified schedule, the convenience of eating whenever he wants, and shares the savings with his the insurance company."

Patients should "never launch such experiments on their own," he cautions. Physicians should assess the effects, note person-to-person variations, and learn to predict how individual patients will take up and metabolize such drugs in the presence of certain foods.

Another drug with a similar food boost is lapatinib (TYKERB), used to treat breast cancer. A meal increases the bioavailability of the drug by 167 percent; a high-fat meal increases uptake by 325 percent.

Although the food effect is smaller than for abiraterone, "we could potentially use 40 percent of the drug and save each patient about $1,740 a month," Ratain said. The major toxicity associated with the drug is diarrhea, which may be caused by unabsorbed drug. So "taking a lower dose with food should increase absorption and potentially reduce this side effect."

A third example is nilotinib (Tasigna) capsules, approved in 2007 for treatment of chronic myeloid leukemia. Patients take nilotinib twice a day on a stomach that has been empty for two hours and must remain empty for another hour. Because elevated nilotinib levels can cause heart-rhythm irregularities and sudden death, the no-food alert appears 11 times in the package insert. Two of those alerts are "black-box" warnings, which is "the industry's way of saying 'if you take this drug with food you might die,' " Ratain said.

For drugs whose absorption is decreased when taken with food, the FDA generally advises taking the pills while fasting. For non-cancer drugs where uptake is enhanced by food, the FDA favors taking them with a meal.

Yet for oral anti-cancer drugs, the FDA appears to have "an apparent bias for fasting," Ratain said. "That is inconsistent with labeling in other therapeutic areas, and with fundamental principles of clinical pharmacology."

http://www.eurekalert.org/pub_releases/2011-09/sp-fr6091511.php

Fukushima: Reflections 6 months on

Bulletin of the Atomic Scientists publish special issue on Fukushima

London, UK (Sept 19, 2011) – When the Tohoku earthquake and subsequent tsunami hit the Fukushima Daiichi Nuclear Power Station on March 11, 2011, the world witnessed the largest nuclear incident since the 1986 Chernobyl disaster. In ***a special Fukushima issue*** of the Bulletin of the Atomic Scientists, published today by SAGE, experts examine the current and future impact of Fukushima, what might have been done to lessen the scale of the accident, and the steps we need to take both in Japan and worldwide to prevent another nuclear tragedy. This content will be free to access for a limited period here. The translated September issue of the Bulletin of the Atomic Scientists is published today (19 Sept, 2011). All content will be freely available at ***www.thebulletin.org*** .

In the article D***econstructing the zero-risk mindset: The lessons and future responsibilities for a post-Fukushima nuclear Japan***, Tatsujiro Suzuki revisits the tragedy at the nuclear power station, and highlights a few of the most pressing – and most challenging – of the government's plans. "Fukushima should not just contain lessons for Japan, but for all 31 countries with nuclear power," says Suzuki, who is vice-chairman of the Japan Atomic Energy Commission.

Nuclear or not? The complex and uncertain politics of Japan's post-Fukushima energy policy by Masa Takubo, an independent analyst on nuclear issues and a member of the International Panel on Fissile Materials,

highlights the complex power struggle underway over the future of nuclear energy in Japan. "Despite the seriousness of the Fukushima crisis, Japan's historical commitment to nuclear power – and a fuel cycle that includes reprocessing and breeder reactors – still has powerful supporters," Takubo says. Even with a scale-down of nuclear power, the political inertia in addressing spent nuclear fuel reprocessing will most likely continue.

Frank N. von Hippel, co-founder of the Program on Science and Global Security at Princeton University and co-chair of the International Panel on Fissile Materials, looks at the projected health impacts following Fukushima in his article, ***The radiological and psychological consequences of the Fukushima Daiichi accident***. Using the known after effects from Chernobyl and contrasting the extent of the incidents, von Hippel finds that the area in Japan contaminated with cesium-137 – at the same levels that caused evacuation around Chernobyl – is about one-tenth as large. The number of thyroid cancer cases is likely to be much smaller due partly to action taken by the Japanese Government in terms of evacuation and stopping people from consuming contaminated milk. However he cautions that the psychological effect on those living in the contaminated area could be substantial and must be addressed.

Physicist Edwin S. Lyman challenges nuclear industry claims that a Fukushima-type event is unlikely to happen in the United States, because few US nuclear power plants are vulnerable to tsunamis. In his article ***Surviving the one-two nuclear punch: Assessing risk and policy in a post-Fukushima world***, he writes that every nuclear plant is vulnerable to natural disaster or deliberate attack, and a nuclear plant can only handle events it is engineered to withstand. "Many US nuclear plants appear to be subject to greater risks than they were designed to handle," he says, "particularly in regard to earthquakes." The author suggests that the US Nuclear Regulatory Commission should require reactors to be upgraded to withstand a greater range of eventualities.

Sharon M. Friedman looks at media coverage in her article, ***Three Mile Island, Chernobyl, and Fukushima: An analysis of traditional and new media coverage of nuclear accidents and radiation***. A significant difference in Fukushima coverage compared with the earlier incidents was the enormous amount of information available on the Internet. In addition to journalist contributions, citizens contributed significantly via social media. The Internet also provided many opportunities for better coverage, with more space for articles and the ability to present interactive graphics and videos. "Radiation coverage of the Fukushima accident was better than that for the Three Mile Island or Chernobyl accidents," says Friedman, although "television reporting still presented some problems."

In their article ***Fukushima: The myth of safety, the reality of geoscience***, Johannis Nöggerath, Robert J. Geller, and Viacheslav K. Gusiakov look at the anzen shinwa (safety myth) image portrayed by the Japanese Government and electric power companies, and how it stifled honest and open discussion of the risks to nuclear installations from seismic events. Opportunities were missed: Between the 1970s and the 2011 disaster, new scientific knowledge emerged about the likelihood of a large earthquake and resulting tsunami. "Japan's seismological agencies are locked into outdated and unsuccessful paradigms that lead them to focus on the hazard of a supposedly imminent earthquake in the Tokai district, located between Tokyo and Nagoya, while downplaying earthquake hazards elsewhere in Japan," the authors say.

http://www.eurekalert.org/pub_releases/2011-09/pu-prm091911.php

More than a sign of sleepiness, yawning may cool the brain

Though considered a mark of boredom or fatigue, yawning might also be a trait of the hot-headed. Literally.

A study led by Andrew Gallup, a postdoctoral research associate in Princeton University's Department of Ecology and Evolutionary Biology, is the first involving humans to show that yawning frequency varies with the season and that people are less likely to yawn when the heat outdoors exceeds body temperature. Gallup and his co-author Omar Eldakar, a postdoctoral fellow in the University of Arizona's Center for Insect Science, report this month in the journal Frontiers in Evolutionary Neuroscience that this seasonal disparity indicates that yawning could serve as a method for regulating brain temperature.

People yawn less frequently when outdoor temperatures exceed body temperature, suggesting that yawning could be a natural brain-cooling mechanism, Princeton University and University of Arizona researchers reported. They recorded yawning frequency in 160 people in summer and winter in Tucson, Ariz., 80 for each season. They found that nearly half of participants yawned in winter, opposed to less than a quarter in the summertime. **Image by Andrew Gallup**

Gallup and Eldakar documented the yawning frequency of 160 people in the winter and summer in Tucson, Arizona, with 80 people for each season. They found that participants were more likely to yawn in the winter, as opposed to the summer when ambient temperatures were equal to or exceeding body temperature. The researchers concluded that warmer temperatures provide no relief for overheated brains, which, according to the thermoregulatory theory of yawning, stay cool via a heat exchange with the air drawn in during a yawn.

Gallup describes the findings as follows:

"This provides additional support for the view that the mechanisms controlling the expression of yawning are involved in thermoregulatory physiology. Despite numerous theories posited in the past few decades, very little experimental research has been done to uncover the biological function of yawning, and there is still no consensus about its purpose among the dozen or so researchers studying the topic today.

"Enter the brain cooling, or thermoregulatory, hypothesis, which proposes that yawning is triggered by increases in brain temperature, and that the physiological consequences of a yawn act to promote brain cooling. I participated in a study [published in Frontiers in Evolutionary Neuroscience in September 2010] that confirmed this dynamic after we observed changes in the brain temperature of rats before and after the animals yawned. The cooling effect of yawning is thought to result from enhanced blood flow to the brain caused by stretching of the jaw, as well as countercurrent heat exchange with the ambient air that accompanies the deep inhalation.

"According to the brain cooling hypothesis, it is the temperature of the ambient air that gives a yawn its utility. Thus yawning should be counterproductive - and therefore suppressed - in ambient temperatures at or exceeding body temperature because taking a deep inhalation of air would not promote cooling. In other words, there should be a 'thermal window' or a relatively narrow range of ambient temperatures in which to expect highest rates of yawning.

"To test this theory in humans, I worked with Omar Eldakar to conduct a field-observational experiment that explored the relationship between ambient temperature and yawning frequency. We measured the incidence of yawning among people outdoors during the summer and winter months in Arizona. Summer conditions provided temperatures that matched or slightly exceeded body temperature (an average of 98.6 degrees Fahrenheit) with relatively low humidity, while winter conditions exhibited milder temperatures (71 degrees Fahrenheit on average) and slightly higher humidity. We randomly selected 160 pedestrians (80 for each season) and, because yawning is contagious, had them view images of people yawning.

"Our study accordingly showed a higher incidence of yawning across seasons when ambient temperatures were lower, even after statistically controlling for other features such as humidity, time spent outside and the amount of sleep the night before. Nearly half of the people in the winter session yawned, as opposed to less than a quarter of summer participants.

"Furthermore, when analyzing data for each season separately, we observed that yawning was related to the length of time a person spent outside exposed to the climate conditions. This was particularly true during the summer when the proportion of individuals yawning dropped significantly as the length of time spent outside increased prior to testing. Nearly 40 percent of participants yawned within the first five minutes outside, but the percentage of summertime yawners dropped to less than 10 percent thereafter. An inverse effect was observed in the winter, but the proportion of people who yawned increased only slightly for those who spent more than five minutes outdoors.

"This is the first report to show that yawning frequency varies from season to season. The applications of this research are intriguing, not only in terms of basic physiological knowledge, but also for better understanding diseases and conditions, such as multiple sclerosis or epilepsy, that are accompanied by frequent yawning and thermoregulatory dysfunction. These results provide additional support for the view that excessive yawning may be used as a diagnostic tool for identifying instances of diminished thermoregulation."

This research was supported, by a grant from the National Institutes of Health.

http://www.eurekalert.org/pub_releases/2011-09/yu-pbs091611.php

Primitive birds shared dinosaurs' fate

A new study puts an end to the longstanding debate about how archaic birds went extinct, suggesting they were virtually wiped out by the same meteorite impact that put an end to dinosaurs 65 million years ago.

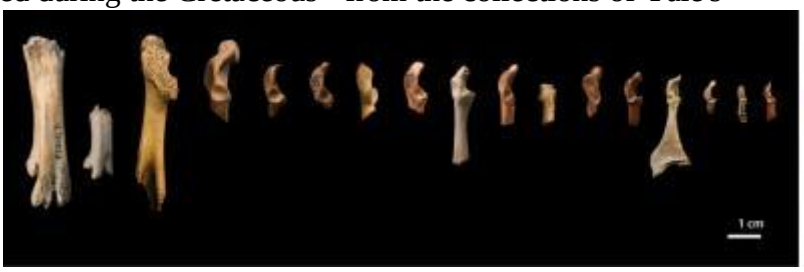
For decades, scientists have debated whether birds from the Cretaceous period - which are very different from today's modern bird species - died out slowly or were killed suddenly by the Chicxulub meteorite. The uncertainty was due in part to the fact that very few fossil birds from the end of this era have been discovered.

Now a team of paleontologists led by Yale researcher Nicholas Longrich has provided clear evidence that many primitive bird species survived right up until the time of the meteorite impact. They identified and dated a

large collection of bird fossils representing a range of different species, many of which were alive within 300,000 years of the impact.

"This proves that these species went extinct very abruptly, in terms of geological time scales," said Longrich. The study appears the week of Sept. 19 in the journal Proceedings of the National Academy of Sciences.

The team examined a large collection of about two dozen bird fossils discovered in North America - representing a wide range of the species that existed during the Cretaceous - from the collections of Yale's Peabody Museum of Natural History, the American Museum of Natural History, the University of California Museum of Paleontology, and the Royal Saskatchewan Museum. Fossil birds from the Cretaceous are extremely rare, Longrich said, because bird bones are so light and fragile that they are easily damaged or swept away in streams.



The bones are from the 17 species of Cretaceous birds which went extinct around the time of the dinosaurs. The two on the far left are foot bones and the rest are shoulder bones. **Courtesy Yale University**

"The birds that had been discovered hadn't really been studied in a rigorous way," Longrich said. "We took a much more detailed look at the relationships between these bones and these birds than anyone had done before."

Longrich believes a small fraction of the Cretaceous bird species survived the impact, giving rise to today's birds. The birds he examined showed much more diversity than had yet been seen in birds from the late Cretaceous, ranging in size from that of a starling up to a small goose. Some had long beaks full of teeth.

Yet modern birds are very different from those that existed during the late Cretaceous, Longrich said. For instance, today's birds have developed a much wider range of specialized features and behaviors, from penguins to hummingbirds to flamingoes, while the primitive birds would have occupied a narrower range of ecological niches.

"The basic bird design was in place, but all of the specialized features developed after the mass extinction, when birds sort of re-evolved with all the diversity they display today," Longrich said. "It's similar to what happened with mammals after the age of the dinosaurs."

Longrich adds that this study is not the first to suggest that archaic birds went extinct abruptly. "There's been growing evidence that these birds were wiped out at the same time as the dinosaurs," Longrich said. "But this new evidence effectively closes the book on the debate."

Other authors of the paper include Tim Tokaryk (Royal Saskatchewan Museum) and Daniel Field (Yale University).

http://www.eurekalert.org/pub_releases/2011-09/uoic-sp091911.php

Soy peptide + chemo drug block colon cancer's spread to liver

A University of Illinois study reports a promising new weapon in treating metastatic colon cancer, particularly in patients who have developed resistance to chemotherapy.

URBANA – U of I researcher Elvira de Mejia has found that the soy peptide lunasin binds to a specific receptor in highly metastatic colon cancer cells, preventing them from attaching to the liver. "When lunasin was used in combination with the chemotherapy drug oxaliplatin, we saw a sixfold reduction in the number of new tumor sites," said de Mejia, a U of I associate professor of food chemistry and food toxicology.

The study appears in the most recent issue of Cancer Letters and can be ***accessed online***. In a separate study, the scientists showed that lunasin induces cell death in highly metastatic human colon cancer cells.

According to de Mejia, almost all colon cancer deaths are caused when cancer metastasizes - or spreads - to the liver. Until now chemotherapy has targeted the primary tumor because the process of metastasis is not well understood, she said. "In this study, we have learned that lunasin can penetrate the cancer cell, cause cell death, and interact with at least one type of receptor in a cell that is ready to metastasize," said Vermont P. Dia, a U of I postdoctoral fellow in the de Mejia laboratory and lead author of the study.

When that receptor is blocked, new blood vessels can't form and differentiate, and that prevents cancer from spreading. Binding such receptors has emerged as a promising target for developing cancer therapies, he said.

In the study, which mimicked the spread of colon cancer in humans, mice were separated into four groups: a control group; a group that was injected daily with lunasin; a group injected with the chemo drug oxaliplatin; and a group that received both lunasin and oxaliplatin. After 28 days, the mice were examined to learn the extent of cancer's involvement in the liver.

"The group that received lunasin alone had 50 percent fewer metastatic sites. But an even more exciting result was seen in the group that received both lunasin and the chemotherapy drug - only 5 new cancer sites when compared with 28 in the control group," de Mejia noted.

"This huge reduction in metastasis was achieved with the amount of lunasin in only 25 daily grams of soy protein, the amount recommended in the FDA health claim," Dia said.

The researchers said they recently analyzed commercial soy milks available in their area, and all contained lunasin. However, the amount of lunasin depended on the type of soy product that was used to prepare the soy milk. "Two glasses of soy milk a day generally provide half the amount of lunasin used in our study," said de Mejia. "It certainly seems feasible to create a lunasin-enriched product that people could consume in a preventive way."

The scientists said their next step will be a colon cancer study in which they make lunasin part of the animals' diet - rather than injecting the peptide - to see if digestion and absorption alter its effectiveness. Soon they hope to be able to move on to human trials.

Dia received the American Oil Chemists Society's 2011 Hans Kaunitz Award for his work with lunasin.

Vermont P. Dia and Elvira de Mejia of the U of I are co-authors of both the study published in Cancer Letters and the in vitro study of lunasin's effect on human cancer cells published in Molecular Nutrition & Food Research, vol. 55, p. 623-634, 2011, available online at www://onlinelibrary.wiley.com/doi/10.1002/mnfr.201000419/pdf. Funding was provided by the USDA, the U of I College of ACES Office of Research, and the Illinois Soybean Association.

http://www.eurekalert.org/pub_releases/2011-09/uog-bpm091911.php

Back pain? Move, don't rest!

Move if you have back pain, this is the advice of a researcher at the Sahlgrenska Academy, University of Gothenburg.

Patients with acute low back pain who were advised to stay active despite the pain fared better than those who were told to adjust their activity in line with their pain.

The thesis looked at 109 patients with acute severe low back pain. They were randomly advised in one of two ways: "stay active even though it hurts" or "adjust your activity to the pain". They were also asked to keep a diary for seven days and to note how many steps they took each day, to what extent they could carry out their day-to-day activities and how they felt physically. They also completed a form to show whether they felt depressed or not.

In spite of having more pain, the group that was advised to be as active as possible recovered more quickly and did not feel depressed at the end of the follow-up.

"The other category, who had been advised from the very start to adjust their activity to their pain, were less mobile and felt slightly depressed compared to the patients who were active," says Olaya-Contreras, a researcher at the Sahlgrenska Academy's Department of Orthopaedics.

She believes that this could be because some people who are depressed and in pain experience the pain more acutely. Another explanation could be that the more acute the pain is perceived to be, the less a person wants or is able to move. This, according to Olaya-Contreras, is in line with previous research.

"I think that if you're suffering with acute low back pain you should try to remain as active as possible and go about your daily business as well as you can. If you don't keep moving, it's easy to get locked into a downward spiral, as inactivity combined with pain can, in a worst case scenario, turn into long-term disability and an inability to work that, in turn, can lead to depressed mood and more pain."

Olaya-Contreras therefore feels that the health service should introduce a routine investigation to determine the underlying psycho-social causes of patients' back problems. This could measure the degree of perceived depression as well as anxiety and fear of movement.

"The results of the investigation and associated discussion could lead to patients taking a more active role and taking responsibility for their treatment," says Olaya-Contreras. "I also believe that it can help patients to focus more on the positive resources they themselves have to handle the pain and master various physical movements even though it hurts."

The thesis has been successfully defended.

BACK PROBLEMS: Low back pain affects up to 80% of people of working age at some time in their lives, though most will get better. Low back pain can be recurring, and some people will continue to suffer with some degree of pain. In 85-90% of cases the pain cannot be attributed to a specific illness or injury.

http://www.huffingtonpost.com/2011/09/20/polio-china-pakistan_n_971787.html

Polio Strain Spreads To China From Pakistan, WHO Says

The World Health Organization has warned countries that a 'dangerous' strain of polio has spread to China from Pakistan.

GENEVA - The U.N. health agency says a genetic link has been confirmed between wild poliovirus type 1 detected in China and a strain circulating in Pakistan. It says there have been seven confirmed cases involving the WPV1 strain detected in China's Xinjiang province, which borders Pakistan, in the past two months.

WHO spokesman Oliver Rosenbauer says type 1 is more dangerous than type 3 because it is more likely to cause paralysis and spreads more easily. Type 2 polio has been eradicated.

The global health body says countries should strengthen their disease surveillance systems and travellers to Pakistan should be vaccinated against polio.

http://www.scientificamerican.com/podcast/episode.cfm?id=solar-system-likely-once-had-anothe-11-09-19

Solar System Likely Once Had Another Gas-Giant Planet

To evolve into our current solar system, the original version probably had a fifth gas giant, computer simulations indicate. John Matson reports

Jupiter, Saturn, Uranus and Neptune. Those are the gas giants, the four heavyweights of the solar system. But was there once a fifth?

Maybe so, says a new study by David Nesvorny of the Southwest Research Institute in Boulder, Colorado. He used computer simulations to explore what the solar system may have looked like some four billion years ago.

Early on, the giant planets migrated, tugged on each other and generally shook things up before settling into their current orbits. So the simulation tested different initial arrangements of planets to see which would evolve into the solar system we know so well.

With just four giant planets at the outset, the solar system hardly ever wound up looking like ours. But with a fifth planet, the simulations produced familiar solar systems 10 times more often. ***[David Nesvorny, "Young Solar System's Fifth Giant Planet?" on arXiv.org]***

So what happened to the extra planet? It would have run afoul of Jupiter and been chucked into interstellar space. Astronomers have recently discovered that the galaxy is filled with such orphaned planets. Billions of them. So, if an extra planet did get cast out of the solar system, at least it has plenty of company.

http://www.eurekalert.org/pub_releases/2011-09/uons-lis092011.php

Landmark international study confirms common genetic contribution to mental illness

Largest study of its kind confirms common genetic contributors to bipolar disorder and schizophrenia

Sydney- An international research consortium has confirmed that common genetic variants contribute to a person's risk of schizophrenia and bipolar disorder. The largest study of its kind provides new molecular evidence that 11 regions have strong association with these diseases, including six regions not previously observed. The researchers also found that many of these DNA variations contribute to both diseases. The findings, reported by the Psychiatric Genome-Wide Association Study Consortium (PGC) and published online in two papers in the journal Nature Genetics, represent significant advances in the understanding the causes of these severe and often debilitating disorders.

Scientia Professor Philip Mitchell, Head of the School of Psychiatry at the University of New South Wales (UNSW), and Director of the Bipolar Disorders Clinic at Black Dog Institute and Professor Peter Schofield, Executive Director Neuroscience Research Australia, were involved in the bipolar disorder paper, while Professor Vaughan Carr from UNSW's School of Psychiatry contributed to the paper on schizophrenia.

Professor Mitchell said: "This is ground-breaking research. The bipolar disorder study involved 12,000 patients and 52,000 controls – the largest ever study of this condition. The research confirmed that a gene for a component of the calcium channel (CACNA1C) is involved in causing bipolar disorder and also identified a novel gene involved in cell surface signaling (ODZ4). Both findings were highly statistically significant and the research indicates new targets for the development of improved treatments for this severe and disabling condition. "Moreover, when both the bipolar disorder and schizophrenia groups were combined, there was evidence that CACNA1C was involved in both conditions – verifying a number of research strands indicating some genetic overlap between these two disorders."

Professor Schofield said the study was a testimony to international spirit of collaboration between psychiatric genetics researchers from around the world. "We have shared our data so that together we can make new insights into the biology of bipolar disorder. "Bipolar is an illness with a strong heritable or genetic component. However, unlike many other genetic disorders, it arises not by mutations or errors in a single gene,

but rather by subtle variants in dozens, maybe even thousands of genes. This study shows that an international consensus is beginning to emerge on the beginnings of an understanding of the biology of bipolar disorder."

Professor Vaughan Carr, who is also CEO of the Schizophrenia Research Institute, said a strong new finding was of a genomic region known to regulate neuronal development and which may contribute to developmental brain abnormalities found in schizophrenia. "Replication is very important in science. The finding that a genomic region associated with histocompatibility has again been confirmed in relation to schizophrenia highlights the potential role of inflammation in the development of schizophrenia and opens up the possibility of new treatments based on immunological processes."

Schizophrenia and bipolar disorder are common and often devastating brain disorders. Some of the most prominent symptoms in schizophrenia are persistent delusions, hallucinations and cognitive problems. Bipolar disorder (or manic-depressive illness) is characterized by episodes of severe mood problems including mania and depression. Both usually strike in late adolescence or early adulthood.

Despite the availability of treatments, these illnesses are either chronic or recurrent, and response to treatment is often incomplete leading to prolonged disability and personal suffering. Family history, which reflects genetic inheritance, is a strong risk factor for both schizophrenia and bipolar disorder, and it has generally been assumed that many genes, along with environmental factors, contribute to disease risk.

The research was funded by numerous European, US, and Australian funding bodies. Funding to coordinate the consortium was provided by the US National Institute of Mental Health.
The Australian component of this research was supported by the National Health and Medical Research Council.

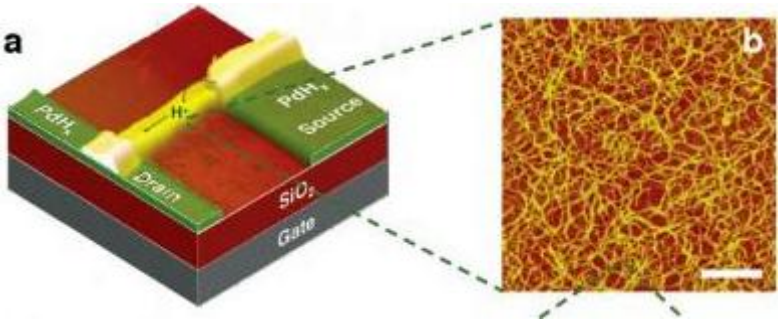
http://www.eurekalert.org/pub_releases/2011-09/uow-ptc091611.php

Proton-based transistor could let machines communicate with living things

Human devices, from light bulbs to iPods, send information using electrons. Human bodies and all other living things, on the other hand, send signals and perform work using ions or protons.

Materials scientists at the University of Washington have built a novel transistor that uses protons, creating a key piece for devices that can communicate directly with living things. The study is published online this week in the interdisciplinary journal Nature Communications. Devices that connect with the human body's processes are being explored for biological sensing or for prosthetics, but they typically communicate using electrons, which are negatively charged particles, rather than protons, which are positively charged hydrogen atoms, or ions, which are atoms with positive or negative charge.

"So there's always this issue, a challenge, at the interface – how does an electronic signal translate into an ionic signal, or vice versa?" said lead author Marco Rolandi, a UW assistant professor of materials science and engineering. "We found a biomaterial that is very good at conducting protons, and allows the potential to interface with living systems."



On the left is a colored photo of the University of Washington device overlaid on a graphic of the other components. On the right is a magnified image of the chitosan fibers. The white scale bar is 200 nanometers. **University of Washington**

In the body, protons activate "on" and "off" switches and are key players in biological energy transfer. Ions open and close channels in the cell membrane to pump things in and out of the cell. Animals including humans use ions to flex their muscles and transmit brain signals. A machine that was compatible with a living system in this way could, in the short term, monitor such processes. Someday it could generate proton currents to control certain functions directly.

A first step toward this type of control is a transistor that can send pulses of proton current. The prototype device is a field-effect transistor, a basic type of transistor that includes a gate, a drain and a source terminal for the current. The UW prototype is the first such device to use protons. It measures about 5 microns wide, roughly a twentieth the width of a human hair.

"In our device large bioinspired molecules can move protons, and a proton current can be switched on and off, in a way that's completely analogous to an electronic current in any other field effect transistor," Rolandi said. The device uses a modified form of the compound chitosan originally extracted from squid pen, a structure that survives from when squids had shells. The material is compatible with living things, is easily manufactured, and can be recycled from crab shells and squid pen discarded by the food industry.

First author Chao Zhong, a UW postdoctoral researcher, and second author Yingxin Deng, a UW graduate student, discovered that this form of chitosan works remarkably well at moving protons. The chitosan absorbs water and forms many hydrogen bonds; protons are then able to hop from one hydrogen bond to the next.

Computer models of charge transport developed by co-authors M.P. Anantram, a UW professor of electrical engineering, and Anita Fadavi Roudsari at Canada's University of Waterloo, were a good match for the experimental results. "So we now have a protonic parallel to electronic circuitry that we actually start to understand rather well," Rolandi said.

Applications in the next decade or so, Rolandi said, would likely be for direct sensing of cells in a laboratory. The current prototype has a silicon base and could not be used in a human body. Longer term, however, a biocompatible version could be implanted directly in living things to monitor, or even control, certain biological processes directly.

The other co-author is UW materials science and engineering graduate student Adnan Kapetanovic. The research was funded by the University of Washington, a 3M Untenured Faculty Grant, a National Cancer Institute fellowship and the UW's Center for Nanotechnology, which is funded by the National Science Foundation.

http://www.bbc.co.uk/news/health-14974605

Dogfish shark chemical squalamine 'stops human viruses'

A chemical found in the dogfish shark could be a safe and potent weapon against human viruses, say scientists.

Noting how powerful the shark's natural immunity to viral infections is, the researchers set about finding out why. They already knew that the fish makes a compound called squalamine that it uses to fighting off bacteria.

Lab tests revealed squalamine is also a good antiviral candidate, killing a broad spectrum of human and animal viruses, PNAS journal reports.

Treatment hope

Synthetic squalamine has already been given to patients in clinical trials to stop blood vessel growth in cancers, with no major side effects. Given its safety profile and how easy it is to make, it could quickly be tested as a potential new treatment for viral diseases ranging from dengue and yellow fever to hepatitis, say the US investigators from Georgetown University Medical Center in Washington.

Their lab work shows squalamine disrupts the membrane interactions needed for viral replication. In tissue cultures, squalamine was shown to inhibit the infection of blood vessel cells by the dengue virus, and human liver cells by hepatitis B and D. Animal studies showed that squalamine controlled infections of yellow fever, Eastern equine encephalitis virus, and murine cytomegalovirus. In some cases, the animals were cured.

Lead researcher Prof Michael Zasloff said: "I was interested in sharks because of their seemingly primitive but effective immune system. "No-one could explain why the shark was so hardy."

He said that realising squalamine potentially has broad antiviral properties was "immensely exciting".

"Squalamine appears to protect against viruses that attack the liver and blood tissues, and other similar compounds that we know exist in the shark likely protect against respiratory viral infections, and so on.

"We may be able to harness the shark's novel immune system to turn all of these antiviral compounds into agents that protect humans against a wide variety of viruses. That would be revolutionary. "While many antibacterial agents exist, doctors have few antiviral drugs to help their patients, and few of those are broadly active." He said much more work was now needed to test this new drug candidate.

http://www.bbc.co.uk/news/science-environment-14975165

Stimulating brain with electricity aids learning speed

Electrically stimulating the brain can help to speed up the process of learning, scientists have shown.

By Leila Battison Science reporter

Applying a small current to specific parts of the brain can increase its activity, making learning easier.

Researchers from the University of Oxford have studied the changing structure of the brain in stroke patients and in healthy adults.

Prof Heidi Johansen-Berg presented their findings at the British Science Festival in Bradford.

The team at Oxford has been conducting research into how the structure of the brain changes in adulthood, and in particular what changes occur after a stroke. They have used an approach called functional MRI to monitor activity in the brain as stroke patients re-learn motor skills that were lost as a result of their illness.

One of the major findings is that the brain is very flexible and can restructure itself, growing new connections and reassigning tasks to different areas, when damage occurs or a specific task is practised.

As part of this research, they investigated the possibility of using non-invasive electric brain stimulation to improve the recovery of these motor skills; the short-term improvement in stroke patients had already been

noted. But an unexpected result was found when the same brain stimulation was applied to healthy adults: their speed of learning was also significantly increased.

Increasing activity

To observe this effect, the team devised an experiment whereby volunteers memorised a sequence of buttons to press "like playing a tune on a piano". While they were doing this, they were fitted with a "trans-cranial current stimulation" device, in which two electrodes are placed in a specific position on the head.

A very small current was passed between the electrodes in an arc through the brain and, depending on the direction of that current, either increased or decreased the activity of that part of the brain.

Prof Johansen-Berg explained that "an increase in activity of the brain cells makes them more susceptible to the kinds of changes that occur during learning".

The results of the button-pressing experiments showed the positive effects of just 10 minutes of the brain stimulation on learning, compared to a similar "placebo" setup in which the electrical stimulation was not used.

"While the stimulation didn't improve the participant's best performance, the speed at which they reached their best was significantly increased," said Prof Johansen-Berg.

Targeting the area of the brain that controls motor skills allows movement tasks to be learned more quickly, and the researchers envisage the technique could be used to help in the training of athletes.

The experiments have explicitly shown that stimulating the motor cortex of the brain can increase the speed of learning motor skills. It is the hope of the researchers that the same method may be applied to other parts of the brain to improve educational learning, simply by positioning the electrodes in different locations so the current is focussed on the correct area.

The relative simplicity, low price (around £2,000 per unit), and portability of the technology may mean that, following further research, a device could be designed to be automated for use at home. Looking to the future, Prof Johansen-Berg and her team plan to investigate the potential for increasing the effect, by stimulating daily over a period of weeks to months. In the treatment of stroke patients, the technique could be used in parallel with current physiotherapy treatments to improve overall outcomes, which tend to vary widely.

http://www.sci-tech-today.com/story.xhtml?story_id=80236&full_skip=1

Whooping Cough Vaccination Fades in 3 Years

A new study shows that the risk of getting whooping cough was as much as 20 times higher in kids three years or more after they finished receiving a series of vaccinations.

By AP / MIKE STOBBE

But kids vaccinated more recently were well protected. The findings may explain why significant numbers of immunized kids got whooping cough in the recent outbreaks.

The vaccine against whooping cough falters after only about three years, a preliminary study suggests, adding support to school rules requiring kids to get the vaccination periodically. California schools have turned away thousands of middle and high school students this fall who haven't gotten the booster shot typically given at age 11 or 12. That state had a huge spike in whooping cough cases last year, during which more than 9,100 people were sickened and 10 babies died after exposure from adults or older children.

The study of cases in Marin County, Calif., found the risk of getting the disease was as much as 20 times higher in kids three years or more after they finished receiving a recommended series of vaccinations. But kids vaccinated more recently were well protected. The findings may help explain why significant numbers of fully immunized children got whooping cough in the recent outbreaks.

"I was disturbed to find maybe we had a little more confidence in the vaccine than it might deserve," said the lead researcher, Dr. David Witt. He is chief of infectious disease at the Kaiser Permanente Medical Center in San Rafael. Witt presented his findings Monday at an infectious diseases medical conference in Chicago.

Whooping cough is very contagious and in rare cases can be fatal, especially for babies too young to be vaccinated. The disease starts like a cold but leads to severe coughing that can last for weeks.

It also is considered one of the hardest-to-control bacterial illnesses for which a common childhood vaccine is available. Health officials say the vaccine is effective in most people, and yet there are periodic outbreaks in places with high vaccination rates.

More than 80 percent of the children who developed whooping cough in Witt's study were fully vaccinated.

Young children are recommended to get five doses of a vaccine against whooping cough -- at 2, 4, 6 and 15-18 months, and then one more between ages 4 and 6.

The new study found that younger kids who got the fifth dose less than three years before being tested were much less likely to get whooping cough than slightly older kids who were more than three years past their last vaccination.

The study observed what was happening during the California outbreak. It is based on a review last year of roughly 15,000 children in Marin County, including 132 who got whooping cough.

Health officials have acknowledged the long-term effectiveness of whooping cough vaccine is not well understood. The nation switched over to a new type of childhood whooping cough vaccine in the late 1990s, one deemed safer than the version used for decades before. Short-term effectiveness of the new vaccine has been shown to be 90 percent or greater. But the long-term effectiveness of the childhood vaccine has not been studied as much.

A preliminary study by the Centers for Disease Control and Prevention, conducted last year, found it ebbs. The five doses for young children were about 70 percent effective five years after the last shot. Witt found that rates of whooping cough -- also known as pertussis -- dropped dramatically after kids were age 11 and 12, when many get the recommended booster shot. But the long-term effectiveness of that booster also is not known and has received relatively little study.

"It's a little too soon to say much" about the longer-term effectiveness of that booster, said Lara Misegades, a CDC epidemiologist who has been studying how well whooping cough vaccines work.

California health officials last year told doctors they could give the booster to kids as young as 7 in an effort to stifle the outbreaks.

CDC officials say that it's too soon to say if the booster should regularly be given to children that young, but that they are studying the issue.

http://www.physorg.com/news/2011-09-body.html

The body rids itself of damage when it really matters

Although the body is constantly replacing cells and cell constituents, damage and imperfections accumulate over time. Cleanup efforts are saved for when it really matters.

Researchers from the University of Gothenburg, Sweden, are able to show how the body rids itself of damage when it is time to reproduce and create new life.

'I have a daughter. She is made of my cells yet has much less cellular damage than my cells. Why didn't she inherit my cells including the damaged proteins? That's the process I'm interested in,' says Malin Hernebring from the Department of Cell- and Molecular Biology at the University of Gothenburg.

A few days after conception, the cells in the embryo all look the same – they are unspecified stem cells that can develop into any bodily cell type. As the process of cell specification (differentiation) begins, they go from being able to keep dividing infinitely to being able to do so only a limited number of times. This is when they start cleansing themselves.

'Quite unexpectedly we found that the level of protein damage was relatively high in the embryo's unspecified cells, but then it decreased dramatically. A few days after the onset of cell differentiation, the protein damage level had gone down by 80-90 percent. We think this is a result of the damaged material being broken down.'

In the past, researchers have believed that the body keeps cells involved in reproduction isolated and protected from damage. Now it has been shown that these types of cells go through a rejuvenation process that rids them of the inherited damage.

Some types of protein damage in the body increase with age. Although all the necessary information is stored in the DNA, something keeps the body from using it to keep repairing the body. 'These types of protein damages are what make us appear old, like wrinkles around the eyes. While wrinkles are relatively harmless, serious problems may arise elsewhere in the body. I'm thinking of age-related diseases like Parkinson's, Alzheimer's, type 2 diabetes and cancer.'

Malin Hernebring can show that the damaged proteins in the cells are probably broken down by molecular machines called proteasomes. The proteasome activity increases considerably during the initial steps of embryonic stem cell differentiation in mice. Deciphering this rejuvenation process helps us better understand what ageing really is, which in turn may help us slow it down and also prevent the occurrence and ill effects of age-related diseases. *Provided by University of Gothenburg*

http://medicalxpress.com/news/2011-09-promiscuous-parasites-hijack-host-immune.html

'Promiscuous parasites' hijack host immune cells

Toxoplasma gondii parasites can invade your bloodstream, break into your brain and prompt behavioral changes from recklessness to neuroticism.

These highly contagious protozoa infect more than half the world's population, and most people's immune systems never purge the intruders.

Cornell researchers recently discovered how T. gondii evades our defenses by hacking immune cells, making it the first known parasite to control its host's immune system. Immunologists from the College of

Veterinary Medicine published the study Sept. 8 in PLoS Pathogens, describing a forced partnership between parasite and host that challenges common conceptions of how pathogens interact with the body.

"Toxoplasma is an especially promiscuous parasite," said Eric Denkers, professor of immunology. "It infects nearly all warm-blooded species, most nucleated cell types and much of the human population. Although it lives in vital brain and muscle tissues, it usually causes no obvious reaction. Infection can seriously harm people with weak immune systems, yet most hosts experience no overt symptoms because Toxoplasma has found a way to coerce cooperation."

Famous for its manipulative powers, T. gondii has been shown to alter the brain chemistry of rodents so that they fearlessly pursue cats. Cats eat the rodents, delivering the parasites to their breeding ground in feline intestines. Similar manipulations have surfaced in human studies linking T. gondii infections to behavioral and personality shifts, schizophrenia and population variations, including cultural differences and skewed sex ratios. Denkers' study maps T. gondii's newfound ability to manipulate cells in the immune system at the molecular level.

"We found that Toxoplasma quiets its host's alarm system by blocking immune cells from producing certain cytokines, proteins that stimulate inflammation," said Denkers. "Cytokines are double-edged swords: They summon the immune system's reinforcements, but if too many accumulate they can damage the body they're trying to defend. An unregulated immune response can kill you."

When immune cells meet intruders, they release cytokines that summon more immune cells, which produce more cytokines, rapidly causing inflammation. T. gondii must allow cytokines to trigger enough of an immune response to keep its own numbers in check and ensure host survival. But too many cytokines cause an overwhelming immune response that could damage the host or eliminate the parasites.

"Toxoplasma hijacks immune cells to enforce a mutually beneficial balance," Denkers said. "Until recently we thought it walled itself away inside cells without interacting with its environment. It's now clear that the parasite actively releases messages into cells that change cell behavior."

To prove this, Barbara Butcher, a senior research associate working with Denkers, exposed immune cells in the lab to bacterial factors that typically stimulate the release of inflammatory cytokines. "Cells infected with Toxoplasma produced no messages to trigger inflammation," Denkers said. "Our colleagues at Stanford University found that Toxoplasma produces a specific protein called ROP16 to suppress inflammatory responses. Collaborating with parasitologists at Dartmouth Medical School, we found that Toxoplasma sends ROP16 to infiltrate communication channels in immune cells, causing them to lower cytokine production.

"We are excited to have found the first non-bacterial pathogen able to exert this kind of control," said Denkers. "If Toxoplasma can do this, maybe other parasites can too. This is the first case where the whole process of immune system manipulation is close to being completely mapped out at the molecular level."

That map may help steer future investigations into how pathogens interact with hosts, unveiling the inner workings of a spectrum of infectious diseases. *Provided by Cornell University*

http://www.eurekalert.org/pub_releases/2011-09/kcl-tsr092111.php

Twin study reveals epigenetic alterations of psychiatric disorders

The first study to investigate genome-wide epigenetic differences in a large number of psychosis discordant twin-pairs provides further evidence that epigenetic processes play an important role in neuropsychiatric disease.

In the first study to systematically investigate genome-wide epigenetic differences in a large number of psychosis discordant twin-pairs, research at the Institute of Psychiatry (IoP) at King's College London provides further evidence that epigenetic processes play an important role in neuropsychiatric disease. Published in Human Molecular Genetics, the findings may offer potential new avenues for treatment.

Previous quantitative genetic analyses of schizophrenia and bipolar disorder reveal strong inherited components to both. However, although heritability for schizophrenia and bipolar disorder is estimated at 70%, disease concordance between twin-pairs is far from 100%, indicating that non-genetic factors play an important role in the onset of the diseases.

Dr. Jonathan Mill, lead author of the study at the IoP says, 'We studied a group of 22 identical twin-pairs, so 44 individuals in all, one of the largest twin studies performed for any complex disease to date. In each twin-pair, one had either schizophrenia or bipolar disorder. Because we know that twins are genetically identical, we can rule out any genetic cause of illness in the affected twin – the aim of our study was to investigate epigenetic variations associated with these disorders.'

Epigenetic mechanisms are linked to heritable, but reversible, changes in gene expression without a change in the underlying DNA sequence. This happens principally through alterations in DNA methylation and chromatin structure. Epigenetic changes in the brain have previously been associated with a range of biological

and cognitive processes, including neurogenesis, drug addiction and neurodegeneration. It has also been suggested that epigenetic changes in the brain may be involved in a spectrum of psychiatric disorders including psychosis.

The researchers looked at differences in DNA methylation across the genome using DNA taken from both the affected and unaffected twins in each monozygotic twin-pair. The findings were then compared to DNA samples taken from post-mortem brain material from psychosis patients and controls.

Whilst the researchers found no alterations in overall DNA methylation content between affected and unaffected twins, there were considerable disease-associated differences between twins at specific sites across the genome. The findings confirmed previously known sites implicated in psychiatric disorders as well as revealing previously unknown ones.

Dr. Mill adds, 'Our findings suggest that it is not only genetic variations that are important. The epigenetic differences we see may tell us more about the causes or schizophrenia and bipolar disorder, as some alterations were specific to either disease. Importantly, epigenetic processes are potentially reversible meaning that our research could open up new avenues for the development of novel therapeutic drugs.'

Full paper: Dempster, E. et al. 'Disease-associated epigenetic changes in monozygotic twins discordant for schizophrenia and bipolar disorder', Human Molecular Genetics doi: 10.1093/hmg/ddr416
http://hmg.oxfordjournals.org/content/early/2011/09/09/hmg.ddr416.abstract
The research was funded by the National Alliance for Research on Schizophrenia and Depression (NARSAD), the National Institute of Health (NIH), the Medical Research Council (MRC) and the Wellcome Trust. The work was supported by the European Community's Sixth Framework Programme through a Marie Curie Training Network called the European Twin Study Network on Schizophrenia (EUTwinsS). Postmortem brains were donated by The Stanley Medical Research Institute courtesy of Michael B. Knable, E. Fuller Torrey, Maree J. Webster, and Robert H. Yolken.

http://www.eurekalert.org/pub_releases/2011-09/uoh-maa092111.php

Marijuana administration after a traumatic experience prevents post-traumatic stress symptoms

In a study performed on rats, the researchers found that marijuana does not erase the traumatic experience, but only the development of post-trauma symptoms

Cannabinoids (marijuana) administration after experiencing a traumatic event blocks the development of post-traumatic stress disorder (PTSD)-like symptoms in rats, according to a new study conducted at the University of Haifa and published in the journal Neuropsychopharmacology. "We found that there is a 'window of opportunity' during which administering synthetic marijuana helps deal with symptoms simulating PTSD in rats," said Dr. Irit Akirav of the University of Haifa's Department of Psychology, who led the study.

In the study, which Dr. Akirav conducted with research student Eti Ganon-Elazar, the researchers set out to examine how administering cannabinoids (synthetic marijuana) affects the development of PTSD-like symptoms in rats, whose physiological reactions to traumatic and stressful events is similar to human reactions.

In the first part of the study, the researchers exposed a group of rats to extreme stress, and observed that the rats did indeed display symptoms resembling PTSD in humans, such as an enhanced startle reflex, impaired extinction learning, and disruption of the negative feedback cycle of the stress-influenced HPA axis.

The rats were then divided into four groups. One was given no marijuana at all; the second was given a marijuana injection two hours after being exposed to a traumatic event; the third group after 24 hours and the fourth group after 48 hours. A week later, the researchers examined the rats and found that the group that had not been administered marijuana and the group that got the injection 48 hours after experiencing trauma continued to display PTSD symptoms as well as a high level of anxiety.

By contrast, the PTSD symptoms disappeared in the rats that were given marijuana 2 or 24 hours after experiencing trauma, even though these rats had also developed a high level of anxiety.

"This indicates that the marijuana did not erase the experience of the trauma, but that it specifically prevented the development of post-trauma symptoms in the rat model," said Dr. Akirav, who added that the results suggest there is a particular window of time during which administering marijuana is effective. Because the human life span is significantly longer than that of rats, Dr. Akirav explained, one could assume that this window of time would be longer for humans.

The second stage of the study sought to understand the brain mechanism that is put into operation during the administering of marijuana. To do this, they repeated stage one of the experiment, but after the trauma they injected the synthetic marijuana directly into the amygdala area of the brain, the area known to be responsible for response to trauma. The researchers found that the marijuana blocked development of PTSD symptoms in these cases as well. From this the researchers were able to conclude that the effect of the marijuana is mediated by a CB1 receptor in the amygdala.

http://www.eurekalert.org/pub_releases/2011-09/uoc--aqf092111.php

A gene for Lou Gehrig's disease and frontotemporal dementia identified

Frontotemporal dementia and amyotrophic lateral sclerosis, also known as Lou Gehrig's disease -- two fatal neurodegenerative disease with distinct symptoms -- are triggered by a common mutation in many cases, according to researchers who say they have identified the mutated gene.

In the study, reported in the September 21 online issue of Neuron, the scientists described the discovery of a genetic mutation that is accountable for almost 12 percent of familial FTD and more than 22 percent of familial ALS samples studied. They also report that the defect is the strongest genetic risk factor found to date for the more common, non-inherited, sporadic forms of these diseases. It was found in 3 percent of sporadic FTD and 4 percent of sporadic ALS samples in the largest clinical patient series.

The study was led by scientists at the Mayo Clinic in Florida, in collaboration with researchers at UCSF, the University of British Columbia and UCLA. The finding emerged from the identification and study of a family stricken by both ALS and FTD, reported last year. In that study, led by the UCSF scientists and published in the Journal of Neurology, Neurosurgery and Psychiatry, the researchers honed in on the region in which the gene was located.

"Both clinically and at the molecular level this discovery is going to significantly improve our understanding of these diseases," said co-author Adam Boxer, MD, PhD, of the UCSF Memory and Aging Center, the lead author on the 2010 paper. The discovery makes it possible to develop a diagnostic test for the mutation, as well as to create animal models that may be used to help unravel the molecular mysteries connecting the mutation to the diseases, he said.

In the current study, a detailed molecular genetic characterization of the family that Boxer described was done in the laboratory of senior author Rosa Rademakers, PhD, from the Mayo Clinic. She and colleagues identified the gene and the specific mutation within it. The mutation consists of from hundreds to thousands of extra copies of a six-letter DNA sequence GGGGCC strung end to end within a region of human chromosome nine. The mutation occurs within a gene of unknown function called C9ORF72.

After identifying the mutation, the Mayo researchers searched for it in DNA from other patients with both familial and sporadic forms of the diseases, where they found the strong associations.

FTD is characterized by disturbances in decision making, language skills, behavior and emotional expression, and is as common as Alzheimer's disease in people younger than 65, according to Boxer. ALS is a neuromuscular disease, leading to muscle paralysis and respiratory failure, often within three to five years. However, it is not unusual for patients diagnosed with one of the two diseases to exhibit symptoms of the other.

Since 2006, six separate groups have reported evidence for a genetic link between the disorders and the same chromosomal region. In the study led by Boxer last year, the researchers described clinical aspects of the disease within the family, and homed in more closely to the gene than others had.

The pattern of protein deposition in the brains of family members in the study may eventually shed light on common aspects of the neurodegenerative process that occurs in both diseases, Boxer said.

There is only one standard medical treatment for ALS, riluzole, which extend life for about six months, he said.

There is no known effective treatment to slow FTD. However, neurologists have generally become much better at recognizing the degenerative disorder, according to Boxer.

Boxer and Bruce Miller, MD, the director of the UCSF Memory and Aging Center and a co-author of both studies, are leaders in FTD research, diagnosis and patient care.

"Ten years ago some neurologists did not acknowledge the existence of FTD," Boxer says. "Today we are much better at diagnosing the disease, although sometimes it still takes an expert to distinguish it from Alzheimer's or from psychiatric disorders. "We're actively trying to develop treatments for FTD, and we believe this discovery will pave the way for major advances in these efforts."

The researchers used a technique called linkage analysis to narrow the search for the gene by comparing affected and unaffected family members. Another group of scientists -- reporting in the same online edition of Neuron on the same gene -- found that C9ORF72 emerged as being significantly associated with FTD and ALS in a genome-wide scan of patients in Finland.

The Mayo portion of the study was funded by the National Institutes of Health and the ALS association (ALSA). The UCSF portion was funded by the NIH, the John Douglas French Foundation; the Hellman Family Foundation and the Tau Research Consortium and the Larry Hillblom Foundation and the state of California.

UCSF is a leading university dedicated to promoting health worldwide through advanced biomedical research, graduate-level education in the life sciences and health professions, and excellence in patient care.

http://www.eurekalert.org/pub_releases/2011-09/hu-ssr091911.php

Slippery slope:Researchers take advice from a carnivorous plant

Bio-inspired coating resists liquids and could lead to a broad range of advances in fuel transport, anti-bacterial surfaces and more

Cambridge, Mass. –After a rain, the cupped leaf of a pitcher plant becomes a virtually frictionless surface. Sweet-smelling and elegant, the carnivore attracts ants, spiders, and even little frogs. One by one, they slide to their doom.

Adopting the plant's slick strategy, a group of applied scientists at Harvard have created a material that repels just about any type of liquid, including blood and oil, and does so even under harsh conditions like high pressure and freezing temperatures. The bio-inspired liquid repellence technology, described in the September 22 issue of Nature, should find applications in biomedical fluid handling, fuel transport, and anti-fouling and anti-icing technologies. It could even lead to self-cleaning windows and improved optical devices.

"Inspired by the pitcher plant, we developed a new coating that outperforms its natural and synthetic counterparts and provides a simple and versatile solution for liquid and solid repellency," says lead author Joanna Aizenberg, Amy Smith Berylson Professor of Materials Science at the Harvard School of Engineering and Applied Sciences (SEAS), Director of the Kavli Institute for Bionano Science and Technology at Harvard, and a Core Faculty member at the Wyss Institute for Biologically Inspired Engineering at Harvard.

By contrast, current state-of-the-art liquid repellent surfaces have taken cues from a different member of the plant world. The leaves of the lotus resist water due to the tiny microtextures on the surface; droplets balance on the cushion of air on the tips of the surface and bead up.

The so-called lotus effect, however, does not work well for organic or complex liquids. Moreover, if the surface is damaged (e.g., scratched) or subject to extreme conditions, liquid drops tend to stick to or sink into the textures rather than roll away. Finally, it has proven costly and difficult to manufacture surfaces based on the lotus strategy. The pitcher plant takes a fundamentally different approach. Instead of using burr-like, air-filled nanostructures to repel water, the plant locks in a water layer, creating a slick coating on the top. In short, the fluid itself becomes the repellent surface.

"The effect is similar to when a car hydroplanes, the tires literally gliding on the water rather than the road," says lead author Tak-Sing Wong, a postdoctoral fellow in the Aizenberg lab. "In the case of the unlucky ants, the oil on the bottom of their feet will not stick to the slippery coating on the plant. It's like oil floating on the surface of a puddle." Inspired by the pitcher plant's elegant solution, the scientists designed a strategy for creating slippery surfaces by infusing a nano/microstructured porous material with a lubricating fluid. They are calling the resulting bio-inspired surfaces "SLIPS" (Slippery Liquid-Infused Porous Surfaces).

"Like the pitcher plant, SLIPS are slippery for insects, but they are now designed to do much more: they repel a wide variety of liquids and solids," says Aizenberg. SLIPS show virtually no retention, as very little tilt is needed to coax the liquid or solid into sliding down and off the surface.

"The repellent fluid surface offers additional benefits, as it is intrinsically smooth and free of defects," says Wong. "Even after we damage a sample by scraping it with a knife or blade, the surface repairs itself almost instantaneously and the repellent qualities remain, making SLIPS self-healing." Unlike the lotus, the SLIPS can be made optically transparent, and therefore ideal for optical applications and self-cleaning, clear surfaces.

In addition, the near frictionless effect persists under extreme conditions: high pressures (as much as 675 atmospheres, equivalent to seven kilometers under the sea) and humidity, and in colder temperatures. The team conducted studies outside after a snowstorm; SLIPS withstood the freezing temperatures and even repelled ice.

"Not only is our bio-inspired surface able to work in a variety of conditions, but it is also simple and cheap to manufacture," says co-author Sung Hoon Kang, a Ph.D. candidate in the Aizenberg lab. "It is easily scalable because you can choose just about any porous material and a variety of liquids."

To see if the surface was truly up to nature's high standards, they even did a few experiments with ants. In tests, the insects slid off the artificial surface or retreated to safer ground after only a few timorous steps.

The researchers anticipate that the pitcher plant-inspired technology, for which they are seeking a patent, could one day be used for fuel- and water-transport pipes, and medical tubing (such as catheters and blood transfusion systems), which are sensitive to drag and pressure and are compromised by unwanted liquid-surface interactions. Other potential applications include self-cleaning windows and surfaces that resist bacteria and other types of fouling (such as the buildup that forms on ship hulls). The advance may also find applications in ice-resistant materials and may lead to anti-sticking surfaces that repel fingerprints or graffiti.

"The versatility of SLIPS, their robustness and unique ability to self-heal makes it possible to design these surfaces for use almost anywhere, even under extreme temperature and pressure conditions," says Aizenberg.

"It potentially opens up applications in harsh environments, such as polar or deep sea exploration, where no satisfactory solutions exist at present. Everything SLIPS!"

Aizenberg is also Professor of Chemistry and Chemical Biology in the Department of Chemistry and Chemical Biology, and Susan S. and Kenneth L. Wallach Professor at the Radcliffe Institute for Advanced Study. Her co-authors included Tak-Sing Wong, Sung Hoon Kang, Sindy K.Y. Tang, Benjamin D. Hatton, and Alison Grinthal, all at SEAS, and Elizabeth J. Smythe, at the Schlumberger-Doll Research Center.

The authors acknowledge support from the Croucher Foundation Postdoctoral Fellowship, the Air Force Office of Scientific Research, and the Army Research Office; and the use of the facilities at the Harvard Center for Nanoscale Systems (CNS), supported by the National Science Foundation.

http://www.eurekalert.org/pub_releases/2011-09/bgi-aat092211.php

Aboriginal Australians: The first explorers

In an exciting development, an international team of researchers have, for the first time, pieced together the human genome from an Aboriginal Australian.

The results, now to be published in the international journal Science, re-interpret the prehistory of our species. By sequencing the genome, the researchers demonstrate that Aboriginal Australians descend directly from an early human expansion into Asia that took place some 70,000 years ago, at least 24,000 years before the population movements that gave rise to present-day Europeans and Asians. The results imply that modern day Aboriginal Australians are in fact the direct descendents of the first people who arrived in Australia as early as 50,000 years ago.

The study derived from a lock of hair donated to a British anthropologist by an Aboriginal man from the Goldfields region of Western Australia in the early 20th century. One hundred years later, researchers have isolated DNA from this same hair, using it to explore the genetics of the first Australians and to provide insights into how humans first dispersed across the globe. The genome, shown to have no genetic input from modern European Australians, reveals that the ancestors of the Aboriginal man separated from the ancestors of other human populations some 64-75 thousand years ago. Aboriginal Australians therefore descend directly from the earliest modern explorers, people who migrated into Asia before finally reaching Australia about 50,000 years ago. In showing this, the study establishes Aboriginal Australians as the population with the longest association with the land on which they live today. This research is presented with the full endorsement of the Goldfields Land and Sea Council, the organization that represents the Aboriginal traditional owners for the region.

The history of Aboriginal Australians plays a key role in understanding the dispersal of the first humans to leave Africa. Archaeological evidence establishes modern human presence in Australia by about 50,000 years ago, but this study re-writes the story of their journey there. Previously, the most widely accepted theory was that all modern humans derive from a single out-of-Africa migration wave into Europe, Asia, and Australia. In that model, the first Australians would have branched off from an Asian population, already separated from the ancestors of Europeans. However, this study shows that when ancestral Aboriginal Australians begun their private journey, the ancestors of Asians and Europeans had not yet differentiated from each other. Once they did, some 24,000 years after the first Australians had begun their explorations, Asians and remnants of the ancestral Australians intermixed for a period of time.

Professor Eske Willerslev from the University of Copenhagen, who headed the study, explains: "Aboriginal Australians descend from the first human explorers. While the ancestors of Europeans and Asians were sitting somewhere in Africa or the Middle East, yet to explore their world further, the ancestors of Aboriginal Australians spread rapidly; the first modern humans traversing unknown territory in Asia and finally crossing the sea into Australia. It was a truly amazing journey that must have demanded exceptional survival skills and bravery."

The study has wide implications for understanding of how our human ancestors moved across the globe. So far the only ancient human genomes have been obtained from hair preserved under frozen conditions. The researchers have now shown that hair preserved in much less ideal conditions can be used for genome sequencing without risk of modern human contamination that is typical in ancient bones and teeth. Through analysis of museum collections, and in collaboration with descendent groups, researchers can now study the genetic history of many indigenous populations worldwide, even where groups have recently moved about or intermingled.

"This study will be of great interest to a wide range of researches in Anthropological genetics and Molecular biology. It will also advance our scientific understanding and the construction of human global dispersal patterns." said Professor Jun Wang, another head of the study and Executive Director of BGI, "With the advanced genome sequencing capability and bioinformatics technologies, we are confident that we will achieve more important breakthroughs in accelerating human genomics research to decipher the conundrum of origin, migration and evolution of our species."

http://www.eurekalert.org/pub_releases/2011-09/arrs-rct092211.php

Resident conferences that focus on mistakes result in higher quality of care

Residents who attend conferences that focus on missed or misinterpreted cases are 67% less likely to miss important findings when reading on-call musculoskeletal x-ray images, a new study shows.

"Residents had 55 major discrepancies out of 5,326 x-ray studies of the shoulder, elbow, hand, wrist, ankle, foot, pelvis and knee before we began holding regular focused missed case conferences," said Dr. Jason Itri, of the Hospital of the University of Pennsylvania, and one of the authors of the study. That number dropped to 18 major discrepancies out of 5,272 x-rays studies after the focus missed-case conferences became part of the resident education program, he said.

The value of the conferences was emphasized by the fact that the major discrepancy rates for residents who attended the conferences was lower than that for board certified fellows who did not attend the conferences, Dr. Itri said. "During the time of the study, fellows had an overall major discrepancy rate of 1.5% diagnosing musculoskeletal injuries related to topics discussed during the missed-case conferences, while the residents overall major discrepancy rate was only 0.8%, nearly one-half the miss rate for fellows," he said.

The results of the study have encouraged Dr. Itri's department to include 10 focused missed cased conferences as part of a three week course residents take before they can take independent call. In addition, Dr. Itri and his colleagues are developing fellow-specific missed case conferences in each specialty.

The study is published in the October, 2011 American Journal of Roentgenology.

http://www.eurekalert.org/pub_releases/2011-09/uoc--sub091911.php

Scientists use brain imaging to reveal the movies in our mind

UC Berkeley researchers decode and reconstruct dynamic visual experiences, in this case Hollywood movie trailers

Imagine tapping into the mind of a coma patient, or watching one's own dream on YouTube. With a cutting-edge blend of brain imaging and computer simulation, scientists at the University of California, Berkeley, are bringing these futuristic scenarios within reach. Using functional Magnetic Resonance Imaging (fMRI) and computational models, UC Berkeley researchers have succeeded in decoding and reconstructing people's dynamic visual experiences – in this case, watching Hollywood movie trailers.

As yet, the technology can only reconstruct movie clips people have already viewed. However, the breakthrough paves the way for reproducing the movies inside our heads that no one else sees, such as dreams and memories, according to researchers. "This is a major leap toward reconstructing internal imagery," said Professor Jack Gallant, a UC Berkeley neuroscientist and coauthor of the study to be published online Sept. 22 in the journal Current Biology. "We are opening a window into the movies in our minds."

Eventually, practical applications of the technology could include a better understanding of what goes on in the minds of people who cannot communicate verbally, such as stroke victims, coma patients and people with neurodegenerative diseases. It may also lay the groundwork for brain-machine interface so that people with cerebral palsy or paralysis, for example, can guide computers with their minds. However, researchers point out that the technology is decades from allowing users to read others' thoughts and intentions, as portrayed in such sci-fi classics as "Brainstorm," in which scientists recorded a person's sensations so that others could experience them.

Previously, Gallant and fellow researchers recorded brain activity in the visual cortex while a subject viewed black-and-white photographs. They then built a computational model that enabled them to predict with overwhelming accuracy which picture the subject was looking at.

In their latest experiment, researchers say they have solved a much more difficult problem by actually decoding brain signals generated by moving pictures. "Our natural visual experience is like watching a movie," said Shinji Nishimoto, lead author of the study and a post-doctoral researcher in Gallant's lab. "In order for this technology to have wide applicability, we must understand how the brain processes these dynamic visual experiences."

Nishimoto and two other research team members served as subjects for the experiment, because the procedure requires volunteers to remain still inside the MRI scanner for hours at a time.

They watched two separate sets of Hollywood movie trailers, while fMRI was used to measure blood flow through the visual cortex, the part of the brain that processes visual information. On the computer, the brain was divided into small, three-dimensional cubes known as volumetric pixels, or "voxels."

"We built a model for each voxel that describes how shape and motion information in the movie is mapped into brain activity," Nishimoto said.

The brain activity recorded while subjects viewed the first set of clips was fed into a computer program that learned, second by second, to associate visual patterns in the movie with the corresponding brain activity.

Brain activity evoked by the second set of clips was used to test the movie reconstruction algorithm. This was done by feeding 18 million seconds of random YouTube videos into the computer program so that it could predict the brain activity that each film clip would most likely evoke in each subject.

Finally, the 100 clips that the computer program decided were most similar to the clip that the subject had probably seen were merged to produce a blurry yet continuous reconstruction of the original movie.

Reconstructing movies using brain scans has been challenging because the blood flow signals measured using fMRI change much more slowly than the neural signals that encode dynamic information in movies, researchers said. For this reason, most previous attempts to decode brain activity have focused on static images.

"We addressed this problem by developing a two-stage model that separately describes the underlying neural population and blood flow signals," Nishimoto said.

Ultimately, Nishimoto said, scientists need to understand how the brain processes dynamic visual events that we experience in everyday life. "We need to know how the brain works in naturalistic conditions," he said. "For that, we need to first understand how the brain works while we are watching movies."

Other coauthors of the study are Thomas Naselaris with UC Berkeley's Helen Wills Neuroscience Institute; An T. Vu with UC Berkeley's Joint Graduate Group in Bioengineering; and Yuval Benjamini and Professor Bin Yu with the UC Berkeley Department of Statistics.

http://www.eurekalert.org/pub_releases/2011-09/hms-dk091611.php

DNA study suggests Asia was settled in multiple waves of migration

Analysis reveals archaic Denisovans lived from Siberia to Southeast Asia

An international team of researchers studying DNA patterns from modern and archaic humans has uncovered new clues about the movement and intermixing of populations more than 40,000 years ago in Asia.

Using state-of-the-art genome analysis methods, scientists from Harvard Medical School and the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, have found that Denisovans—a recently identified group of archaic humans whose DNA was extracted last year from a finger bone excavated in Siberia—contributed DNA not just to present-day New Guineans, but also to aboriginal Australian and Philippine populations.

The study demonstrates that contrary to the findings of the largest previous genetic studies, modern humans settled Asia in more than one migration. According to David Reich, a professor of genetics at Harvard Medical School, "Denisova DNA is like a medical imaging dye that traces a person's blood vessels. It is so recognizable that you can detect even a little bit of it in one individual. In a similar way, we were able to trace Denisova DNA in the migrations of people. This shows the power of sequencing ancient DNA as a tool for understanding human history."

The patterns the researchers found can only be explained by at least two waves of human migration: the first giving rise to the aboriginal populations that currently live in Southeast Asia and Oceania, and later migrations giving rise to relatives of East Asians who now are the primary population of Southeast Asia.

The study also provides new insights about where the ancient Denisovans lived. According to Mark Stoneking, a professor at the Max Planck Institute who is senior author of the paper, Denisovans must have inhabited an extraordinarily large ecological and geographic range, from Siberia to tropical Southeast Asia. "The fact that Denisovan DNA is present in some aboriginal populations of Southeast Asia but not in others shows that there was a checkerboard of populations with and without Denisova material more than 44,000 years ago," he said. "The presence of Denisovan genetic material in some but not all the groups there can most easily be explained if Denisovans lived in Southeast Asia itself."

The findings appear on September 22 in the American Journal of Human Genetics.

This research builds on previous work by Reich and colleagues at the Max Planck Institute, in which they analyzed an ancient pinky bone uncovered by Russian archaeologists in the Siberian Denisova Cave in 2008. The Max Planck Institute team led by Svante Pääbo sequenced the bone's nuclear genome, and Reich led the population genetic analysis using algorithms that he and colleagues developed.

Reporting December 2010 in Nature, the team identified Denisovans as a distinct group of archaic humans (hominins) that lived more than 30,000 years ago and contributed genes to present-day New Guineans. They concluded that Denisovans were neither Neandertals nor early modern humans, though they shared a common ancestry.

This paper helped fill in some empty pieces in the evolutionary puzzle that began after early humans left Africa and reinforces the view that humans have intermixed throughout history.

Genetic footprints

The new study was initiated by Stoneking, an expert on genetic variation in Southeast Asia and Oceania who has assembled diverse samples from that region. The study takes a closer look at the Denisovans' genetic footprint. The researchers analyzed DNA from dozens of present-day populations in Southeast Asia and Oceania, including Borneo, Fiji, Indonesia, Malaysia, Australia, the Philippines, Papua New Guinea and Polynesia. Some of the data already existed, and some were newly collected for the study.

Their analysis shows that, in addition to New Guineans, Denisovans contributed genetic material to Australian aborigines, a Philippine "Negrito" group called Mamanwa, and several other populations in eastern Southeast Asia and Oceania. However, groups in the west or northwest, including other Negrito groups such as the Onge in the Andaman Islands and the Jehai in Malaysia, as well as mainland East Asians, did not interbreed with Denisovans.

The researchers concluded that:

* Denisovans interbred with modern humans in Southeast Asia at least 44,000 years ago before the time of the separation of the Australians and New Guineans.
* Southeast Asia was first colonized by modern humans unrelated to present-day Chinese and Indonesians, and that these and other East Asians arrived in later migrations. This "southern route" hypothesis has previously been supported by archaeological evidence, but has never had strong genetic support.

Investigators from the Broad Institute of MIT and Harvard, from Germany, India, Taiwan, Japan, Malaysia, and The Netherlands also contributed. This study was funded by the Max Planck Society and the National Science Foundation HOMINID program. ***Written by Debra Ruder***

http://www.newscientist.com/article/dn20948-double-whammy-gene-therapy-clears-hiv-from-body.html

Double whammy gene therapy clears HIV from body

A person with HIV who didn't take antiretroviral drugs for three months remained free of the virus, thanks to a groundbreaking gene therapy.

10:25 22 September 2011 by Andy Coghlan

The success raises the prospect of keeping HIV in check permanently without antiretrovirals. The gene therapy works by locking the virus out of the CD4 white blood cells it normally infects. Of six people with HIV given the treatment, one cleared the virus completely and another two saw 10-fold drops in circulating virus.

"We're over the moon to have seen that in this small phase I study," says Jeff Nichol, executive vice president for research at Sangamo BioSciences, the company in Richmond, California, that is developing the treatment. "Having one virus-free patient and 10-fold reductions in another two is amazing."

Most importantly, analysis of data from the six patients, and from four others in a separate trial, revealed the secret of the more successful outcomes, paving the way for the therapy to work better in future.

Zinc fingers

To deliver the treatment, doctors remove blood from the patient and isolate CD4 and other white blood cells. Specialised molecular "scissors" called zinc finger proteins enter the cells and sabotage a gene called CCR5, which makes a protein that helps HIV to enter cells. It is unclear what role CCR5 plays normally, although researchers know that cells can survive without it – and will remain uninfected by HIV.

These cells are then returned to the patient in the hope that they will multiply and provide a permanent source of cells immune to HIV, potentially locking out HIV completely. The link between CCR5 and HIV was first suggested in 1996. The concept was first tested inadvertently in Germany in 2006, when a person with leukaemia who was also HIV positive received a bone marrow transplant that happened to come from someone whose blood cells couldn't make CCR5 proteins. The patient was HIV-free by 2008.

Most people have two working copies of CCR5, one from each parent. The patient who did best in the Sangamo trial already had one defective copy, which is thought to explain why the therapy worked better in him than in the others. Further analysis showed that after the treatment he had twice as many cells in which both copies of the CCR5 gene had been sabotaged than any other trial participant.

The two patients who saw 10-fold reductions in circulating virus also had more doubly sabotaged cells than the three who didn't respond as well.

Double sabotage

The secret to making the treatment work best, Sangamo says, is therefore to eliminate both genes in as many cells as possible. If only one is sabotaged, cells can still make enough CCR5 protein to allow the virus to invade. In doubly sabotaged, or "bi-allelic" cells, there is no way in.

"The way forward is to get as many bi-allelic cells as possible back into the patient," says Nichol.

In the light of the findings, Sangamo has plans to try depleting the patient's native blood system with drugs before returning the altered cells. Depletion causes blood cells to multiply faster than normal to compensate for the shortage, resulting in a more rapid expansion of the numbers of HIV-resistant bi-allelic cells.

Nichol's colleagues presented the results on Sunday at the Interscience Conference on Antimicrobial Agents and Chemotherapy in Chicago.

http://www.eurekalert.org/pub_releases/2011-09/uoc--usf092211.php

UCLA scientists find H1N1 flu virus prevalent in animals in Africa

UCLA life scientists and their colleagues have discovered the first evidence of the H1N1 virus in animals in Africa.

In one village in northern Cameroon, a staggering 89 percent of the pigs studied had been exposed to the H1N1 virus, commonly known as the swine flu. "I was amazed that virtually every pig in this village was exposed," said Thomas B. Smith, director of UCLA's Center for Tropical Research and the senior author of the research. "Africa is ground zero for a new pandemic. Many people are in poor health there, and disease can spread very rapidly without authorities knowing about it."

H1N1 triggered a human pandemic in the spring of 2009, infecting people in more than 200 countries. In the U.S., it led to an estimated 60 million illnesses, 270,000 hospitalizations and 12,500 deaths, according to the Centers for Disease Control. The virus, known scientifically as Influenza A (H1N1), is made up of genetic elements of swine, avian and human influenza viruses. The pigs in Cameroon, the researchers say, were infected by humans.

"The pigs were running wild in that area," said lead author Kevin Njabo, a researcher in UCLA's department of ecology and evolutionary biology and associate director of the Center for Tropical Research. "I was shocked when we found out it was H1N1. Any virus in any part of the world can reach another continent within days by air travel. We need to understand where viruses originate and how they spread, so we can destroy a deadly virus before it spreads. We have to be prepared for a pandemic, but so many countries are not well-prepared — not even the United States."

Njabo and his colleagues randomly collected nasal swabs and blood samples from domestic pigs that were part of 11 herds in villages and farms in Cameroon in 2009 and 2010. The results are published in the current issue of Veterinary Microbiology, a peer-reviewed scientific journal specializing in microbial animal diseases.

Nasal swabs can detect a current infection, and blood samples reveal past exposure to a virus. Because an active infection lasts only about five days, "we have to be lucky to get an active infection in the field, but evidence of the infection stays in the blood." In the village in northern Cameroon, Njabo found two pigs with active H1N1 infections, and virtually every other pig had evidence of a past infection in its blood.

"The pigs got H1N1 from humans," Njabo said. "The fact that pigs in Africa are infected with the H1N1 flu virus illustrates the remarkable interconnectedness of the modern world with respect to diseases. The H1N1 virus that we found in livestock in Cameroon is virtually identical to a virus found in people in San Diego just a year earlier, providing an astonishing example of how quickly the flu can spread all over the globe.

"The discovery of H1N1 in African swine is also important because it shows how farming practices can trigger disease outbreaks and suggests opportunities for improving human and livestock health. Our studies indicate that H1N1 infections are more common in swine that wander freely in villages than in animals that are confined to farms." The biologists used a diagnostic test called ELISA - enzyme-linked immunosorbent assay - to test for potential viruses. ELISA revealed the pigs had the human strain of H1N1. Viruses in pigs can mix into a much more virulent strain that can spread extremely fast, Smith and Njabo warned. "We are studying the interface between viruses in humans, wild animals and domestic animals and how viruses move among them," Njabo said.

A pandemic as in 'Contagion' could occur

"This particular H1N1 strain is ubiquitous," said Smith, who is also a professor of ecology and evolutionary biology and a member of UCLA's Institute of the Environment and Sustainability. "When different strains of influenza are mixed in pigs, such as an avian strain with a human strain, you can get new hybrid strains that may affect humans much more severely and can potentially produce a pandemic that can allow human-to-human infection. This is how a pandemic can arise; we need to be very vigilant. "It would be comforting to believe that the deaths of tens of millions of people, or more, as depicted in the movie 'Contagion' is merely science fiction, but something that resembles what is depicted there could happen under a certain set of circumstances."

In the 20th century, the world experienced three influenza pandemics that collectively killed more than 40 million people, Smith and Njabo noted.

In addition to studying pigs, Njabo and colleagues have also collected samples from hundreds of wild birds, ducks and chickens in Cameroon and Egypt. Their colleagues at other institutions are conducting similar studies in China, Bangladesh and elsewhere. Smith and Njabo work with UCLA's Global Bio Lab, in collaboration with Hilary Godwin, a professor of environmental health sciences at the UCLA School of Public Health, to identify new diseases, speed up the development of new vaccines and try to prevent the next pandemic.

"The world is a global village; no area is truly isolated," said Njabo, who was born and raised in Cameroon. "There are so many unknowns about the transmission rates of viruses between humans and wild animals. We have to expand screening."

Since 2007, Njabo has gone to Cameroon two to three times a year to collect samples and is there currently. He informed the government's Ministry of Livestock, Fisheries, and Animal Industries of the findings to try to reduce the spread of the disease. Smith, Njabo and colleagues will hold a workshop in Cameroon next year to tell people how to raise pigs in a way that reduces the risk of disease.

Co-authors of the study included Trevon Fuller, a UCLA postdoctoral scholar at the Institute of the Environment and Sustainability; Anthony Chasar, a UCLA research associate at UCLA's Institute of the Environment and Sustainability; John Pollinger, director of UCLA's Conservation Genetics Resource Center and assistant director of UCLA's Center for Tropical Research; Giovanni Cattoli, Calogero Terregino and Isabella Monne at Italy's Istituto Zooprofilattico Sperimentale delle Venezie; and Jean-Marc Reynes and Richard Njouom at Cameroon's Centre Pasteur.

The research was conducted under the auspices of the Zoonotic Influenza Collaborative Network, led by the Fogarty International Center at the National Institutes of Health. The collaborative network is supported by international influenza funds from the Office of the Secretary of the Department of Health and Human Services.

http://medicalxpress.com/news/2011-09-brain-imaging-reveals-movies-mind.html

Brain imaging reveals the movies in our mind

Imagine tapping into the mind of a coma patient, or watching one's own dream on YouTube. With a cutting-edge blend of brain imaging and computer simulation, scientists at the University of California, Berkeley, are bringing these futuristic scenarios within reach.

Using functional Magnetic Resonance Imaging (fMRI) and computational models, UC Berkeley researchers have succeeded in decoding and reconstructing people's dynamic visual experiences – in this case, watching Hollywood movie trailers. As yet, the technology can only reconstruct movie clips people have already viewed. However, the breakthrough paves the way for reproducing the movies inside our heads that no one else sees, such as dreams and memories, according to researchers. "This is a major leap toward reconstructing internal imagery," said Professor Jack Gallant, a UC Berkeley neuroscientist and coauthor of the study to be published online Sept. 22 in the journal Current Biology. "We are opening a window into the movies in our minds."

This set of paired images provided by Shinji Nishimoto of the University of California, Berkeley on Wednesday, Sept. 21, 2011 shows original video images, upper row, and those images reconstructed by computer from brain scans. While volunteers watched movie clips, a scanner watched their brains. And from their brain activity, a computer made rough reconstructions of what they viewed. Scientists reported that result Thursday, Sept. 22, 2011 and speculated such an approach might be able to reveal dreams and hallucinations someday. In the future, it might help stroke victims or others who have no other way to communicate, said Jack Gallant, a neuroscientist at the University of California, Berkeley, and co-author of the paper. **University of California, Berkeley, Shinji Nishimoto**

Eventually, practical applications of the technology could include a better understanding of what goes on in the minds of people who cannot communicate verbally, such as stroke victims, coma patients and people with neurodegenerative diseases. It may also lay the groundwork for brain-machine interface so that people with cerebral palsy or paralysis, for example, can guide computers with their minds.

However, researchers point out that the technology is decades from allowing users to read others' thoughts and intentions, as portrayed in such sci-fi classics as "Brainstorm," in which scientists recorded a person's sensations so that others could experience them.

Previously, Gallant and fellow researchers recorded brain activity in the visual cortex while a subject viewed black-and-white photographs. They then built a computational model that enabled them to predict with overwhelming accuracy which picture the subject was looking at.

In their latest experiment, researchers say they have solved a much more difficult problem by actually decoding brain signals generated by moving pictures. "Our natural visual experience is like watching a movie,"

said Shinji Nishimoto, lead author of the study and a post-doctoral researcher in Gallant's lab. "In order for this technology to have wide applicability, we must understand how the brain processes these dynamic visual experiences."

Nishimoto and two other research team members served as subjects for the experiment, because the procedure requires volunteers to remain still inside the MRI scanner for hours at a time. They watched two separate sets of Hollywood movie trailers, while fMRI was used to measure blood flow through the visual cortex, the part of the brain that processes visual information. On the computer, the brain was divided into small, three-dimensional cubes known as volumetric pixels, or "voxels." "We built a model for each voxel that describes how shape and motion information in the movie is mapped into brain activity," Nishimoto said.

The brain activity recorded while subjects viewed the first set of clips was fed into a computer program that learned, second by second, to associate visual patterns in the movie with the corresponding brain activity.

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Reconstructing movies using brain scans has been challenging because the blood flow signals measured using fMRI change much more slowly than the neural signals that encode dynamic information in movies, researchers said. For this reason, most previous attempts to decode brain activity have focused on static images.

"We addressed this problem by developing a two-stage model that separately describes the underlying neural population and blood flow signals," Nishimoto said.

Ultimately, Nishimoto said, scientists need to understand how the brain processes dynamic visual events that we experience in everyday life. "We need to know how the brain works in naturalistic conditions," he said. "For that, we need to first understand how the brain works while we are watching movies."

http://www.scientificamerican.com/article.cfm?id=particles-found-to-travel

Particles Found to Travel Faster than Speed of Light

Neutrino results challenge a cornerstone of Albert Einstein's special theory of relativity, which itself forms the foundation of modern physics.

By Geoff Brumfiel and Nature magazine | Thursday, September 22, 2011 | 108

An Italian experiment has unveiled evidence that fundamental particles known as neutrinos can travel faster than light. Other researchers are cautious about the result, but if it stands further scrutiny, the finding would overturn the most fundamental rule of modern physics—that nothing travels faster than 299,792,458 meters per second.

The experiment is called OPERA (Oscillation Project with Emulsion-tRacking Apparatus), and lies 1,400 meters underground in the Gran Sasso National Laboratory in Italy. It is designed to study a beam of neutrinos coming from CERN, Europe's premier high-energy physics laboratory located 730 kilometers away near Geneva, Switzerland. Neutrinos are fundamental particles that are electrically neutral, rarely interact with other matter, and have a vanishingly small mass. But they are all around us—the sun produces so many neutrinos as a by-product of nuclear reactions that many billions pass through your eye every second.

The 1,800-tonne OPERA detector is a complex array of electronics and photographic emulsion plates, but the new result is simple - the neutrinos are arriving 60 nanoseconds faster than the speed of light allows. "We are shocked," says Antonio Ereditato, a physicist at the University of Bern in Switzerland and OPERA's spokesman.

Breaking the law

The idea that nothing can travel faster than light in a vacuum is the cornerstone of Albert Einstein's special theory of relativity, which itself forms the foundation of modern physics. If neutrinos are traveling faster than light speed, then one of the most fundamental assumptions of science—that the rules of physics are the same for all observers - would be invalidated. "If it's true, then it's truly extraordinary," says John Ellis, a theoretical physicist at CERN.

Ereditato says that he is confident enough in the new result to make it public. The researchers claim to have measured the 730-kilometer trip between CERN and its detector to within 20 centimeters. They can measure the time of the trip to within 10 nanoseconds, and they have seen the effect in more than 16,000 events measured over the past two years. Given all this, they believe the result has a significance of six-sigma—the physicists' way of saying it is certainly correct. The group will present their results September 23 at CERN, and a preprint of their results will be posted on the physics website ArXiv.org.

At least one other experiment has seen a similar effect before, albeit with a much lower confidence level. In 2007, the Main Injector Neutrino Oscillation Search (MINOS) experiment in Minnesota saw neutrinos from the

particle-physics facility Fermilab in Illinois arriving slightly ahead of schedule. At the time, the MINOS team downplayed the result, in part because there was too much uncertainty in the detector's exact position to be sure of its significance, says Jenny Thomas, a spokeswoman for the experiment. Thomas says that MINOS was already planning more accurate follow-up experiments before the latest OPERA result. "I'm hoping that we could get that going and make a measurement in a year or two," she says.

Reasonable doubt

If MINOS were to confirm OPERA's find, the consequences would be enormous. "If you give up the speed of light, then the construction of special relativity falls down," says Antonino Zichichi, a theoretical physicist and emeritus professor at the University of Bologna, Italy. Zichichi speculates that the "superluminal" neutrinos detected by OPERA could be slipping through extra dimensions in space, as predicted by theories such as string theory.

Ellis, however, remains skeptical. Many experiments have looked for particles traveling faster than light speed in the past and have come up empty-handed, he says. Most troubling for OPERA is a separate analysis of a pulse of neutrinos from a nearby supernova known as 1987a. If the speeds seen by OPERA were achievable by all neutrinos, then the pulse from the supernova would have shown up years earlier than the exploding star's flash of light; instead, they arrived within hours of each other. "It's difficult to reconcile with what OPERA is seeing," Ellis says.

Ereditato says that he welcomes skepticism from outsiders, but adds that the researchers have been unable to find any other explanation for their remarkable result. "Whenever you are in these conditions, then you have to go to the community," he says.

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http://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-15023711

Edinburgh and Cambridge scientists make virus discovery

Scientists have gained new knowledge into how viruses such as flu and HIV jump between species.

The research, by Edinburgh and Cambridge universities, should help predict the appearance of new diseases.

The scientists wanted to understand how viruses such as bird flu infect distant species like humans. They found they were better able to infect species closely related to their typical target species than species that were distantly related. However, the research also suggested that when diseases make a big leap they may then spread easily in species closely related to the new victim, regardless of how closely related these are to the original target species.

Dr Ben Longdon, of Edinburgh University's school of biological sciences, who led the study, said: "Emerging diseases such as Sars, HIV and some types of flu have all got into humans from other species. "Understanding how diseases jump between different species is essential if we want to predict the appearance of new diseases in the future."

More susceptible

By infecting more than 50 species of flies with three different viruses, the researchers showed that species closely related to a virus's usual target species were more susceptible than distantly related flies.

They also showed that groups of flies that were closely related were similarly susceptible to the same viruses.

The study, funded by the Biotechnology and Biological Sciences Research Council, Natural Environment Research Council, the Wellcome Trust and the Royal Society, was published in the journal PLoS Pathogens.

http://medicalxpress.com/news/2011-09-rotavirus-vaccination-large-decreases-health.html

Rotavirus vaccination leads to large decreases in health care costs, doctor visits

Vaccinating infants against rotavirus has resulted in dramatic decreases in health care use and treatment costs for diarrhea-related illness in U.S. infants and young children, according to a new study by the Centers for Disease Control and Prevention.

Medical Xpress - "This is good news for parents and our health system overall," said Dr. Umesh Parashar, medical epidemiologist and team leader for the Viral Gastroenteritis Team in CDC's Division of Viral Diseases. "Rotavirus vaccine is one of the most effective ways to prevent severe diarrhea-related illness in young children and keep them healthy." The study is published in the current issue of the New England Journal of Medicine.

Rotavirus is a major cause of severe diarrhea in infants and young children in the United States. Before vaccines were introduced in 2006, rotavirus was responsible for about 400,000 visits to doctor's offices, 200,000 emergency room visits, 55,000 to 70,000 hospitalizations, and 20 to 60 deaths each year in children under 5 years old.

RotaTeq and Rotarix, the two U.S. licensed rotavirus vaccines, were 85 to 98 percent effective at preventing severe rotavirus disease in clinical trials in middle and high income countries, including the United States.

This new study used data from a large U.S. insurance database for 2001 to 2009 to assess rotavirus vaccine coverage and its impact on health care use and treatment costs for diarrhea-related illness in children under 5 years old. The study examined direct benefits to vaccinated children and indirect protective benefits to unvaccinated children. National declines in health care use and treatment costs were estimated by applying the declines seen in this study to children under 5 years old in the U.S. population.

By the end of 2008, 73 percent of children under 1 year of age, 64 percent of 1-year-olds, and 8 percent of 2-to-4-year-olds had received at least one dose of rotavirus vaccine. Rotavirus-related hospitalizations decreased substantially compared with pre-vaccine levels in children under 5 years old--75 percent decline for 2007-2008 and 60 percent decline for 2008-2009.

Vaccinated children had 44 to 58 percent fewer diarrhea-related hospitalizations and 37 to 48 percent fewer emergency room visits for diarrhea than unvaccinated children during the 2008 and 2009 rotavirus seasons (January to June). Even in unvaccinated children, there were substantial declines in health care use during the 2008 rotavirus season compared with pre-vaccine levels--showing indirect protective benefits.

The study estimated that about 65,000 hospitalizations of children under 5 years old from 2007 to 2009 were averted nationally with a health care cost savings of about $278 million.

"This study provides more evidence that vaccinating against rotavirus substantially reduces suffering and health care costs for this common childhood illness," said Dr. Mark Pallansch, director of CDC's Division of Viral Diseases. "As more children get vaccinated against rotavirus, we expect to see even greater reductions in disease among all age groups." *Provided by Centers for Disease Control and Prevention*

http://www.physorg.com/news/2011-09-life-arisen-serpentine.html

First life may have arisen above serpentine rock, researchers say

Researchers demonstrate the plausibility of one theory: that life originated above serpentinite rock on the ocean bottom

PhysOrg.com - About 3.8 billion years ago, Earth was teeming with unicellular life. A little more than 4.5 billion years ago, the Earth was a ball of vaporous rock. And somewhere in between, the first organisms spontaneously arose. Pinpointing exactly when and how that shift happened has proven a difficult bit of interdisciplinary detective work.

A team of Stanford geologists hasn't quite solved the problem, but they've come closer. By examining the geology and environment of the early Earth, the researchers demonstrate the plausibility of one theory: that life originated above serpentinite rock on the ocean bottom. Because the necessary conditions only existed for a few million years, the findings provide a potential timestamp for the appearance of the Earth's first organism.

The paper, authored by geophysics professor Norm Sleep, geological and environmental sciences professor Dennis Bird, and former graduate student Emily Pope, appears in this week's Philosophical Transactions of the Royal Society B.

Serpentinite under the sea

Greenish-colored serpentinite is common enough in California to be the official state rock. But geologists are more interested in deep-sea serpentinite deposits, where the mineral forms "white smoker chimneys" – hydrothermal vents – in which alkaline vent fluids interact with more acidic seawater.

The resulting reaction can form microscopic "pore spaces" in the chimney stone. This honeycombed rock acts as a percolator for white smoker fluid, concentrating dissolved substances inside the tiny spaces. Because the nucleic acids that make up RNA may have occurred naturally in vent fluids, this process increased the probability of spontaneously forming complete RNA strands. The tiny pores could have even allowed the resultant organisms to survive without cell membranes, using the rock itself for structure and protection.

The pH difference between the vent fluids and the ocean also could have provided an important energy supply for early organisms. When serpentinite is oxidized by seawater, hydrogen is formed. Microbes can react hydrogen with carbon dioxide to form methane or acetate, both of which serve as sources of chemical energy.

An outcrop of serpentinite from the Isua Supracrustal sequence of West Greenland, at the western margin of the Greenland Icecap. Under the West Greenland ice fields, the researchers have identified serpentinite among some of the oldest rocks yet found.

"These same conditions exist wherever water comes out of serpentine in the Bay Area," explained Sleep. "If you look, you can see hydrogen bubbling out of the ground." But this model of life's origins is only feasible under very specific conditions. Serpentinite, a cool Earth, and an acidic ocean all must have coexisted for a time.

Serpentinite was likely present when life arose. Unfortunately, the geological record only reliably goes back approximately 3.8 billion years, making a definitive statement impossible. Still, under the West Greenland ice fields, Bird and Pope have recently identified serpentinite among some of the oldest rocks yet found.

The temperature of the Earth was also habitable at the time in question. A few hundred million years after its formation, the planet had cooled below 120°C – hot by human standards, but livable for certain microorganisms.

Acid enough?

The single most time-restricted requirement for early life would have been the acidity of the ocean. In order for early life to make use of a pH gradient between hydrothermal vents and seawater, the oceans must have been 100 times as acidic as they are today – a state of affairs that overlapped with a cool Earth for only a few million years.

The early oceans would have remained acidic as long as the early earth's atmosphere remained high in carbon dioxide. Much of the gas was eventually trapped in the earth's mantle by subducting continental plates.

"This leaves a relatively brief window for the origin of life, at least by this mechanism," said Sleep.

Smoking-gun evidence in support of the origin-of-life theory remains hard to come by. Geologists are currently looking deep in the Earth's crust for ancient white smoker structures. And the search continues for a modern-day version of membrane-less rock-living microbes.

"It's conceivable that a biologist might get lucky," Sleep said. "But I'm not holding my breath."

Provided by Stanford University

http://www.bbc.co.uk/news/world-europe-15032614

'First Irish case' of death by spontaneous combustion

A man who burned to death in his home died as a result of spontaneous combustion, an Irish coroner has ruled.

West Galway coroner Dr Ciaran McLoughlin said it was the first time in 25 years of investigating deaths that he had recorded such a verdict. Michael Faherty, 76, died at his home in Galway on 22 December 2010.

Deaths attributed by some to "spontaneous combustion" occur when a living human body is burned without an apparent external source of ignition.

Typically police or fire investigators find burned corpses but no burned furniture.

An inquest in Galway on Thursday heard how investigators had been baffled as to the cause of Mr Faherty's death at his home at Clareview Park, Ballybane.

Forensic experts found that a fire in the fireplace of the sitting room where the badly burnt body was found, had not been the cause of the blaze that killed Mr Faherty. The court was told that no trace of an accelerant had been found and there had been nothing to suggest foul play.

The court heard Mr Faherty had been found lying on his back with his head closest to an open fireplace.

The fire had been confined to the sitting room. The only damage was to the body, which was totally burnt, the ceiling above him and the floor underneath him.

Dr McLoughlin said he had consulted medical textbooks and carried out other research in an attempt to find an explanation. He said Professor Bernard Knight, in his book on forensic pathology, had written about spontaneous combustion and noted that such reported cases were almost always near an open fireplace or chimney.

"This fire was thoroughly investigated and I'm left with the conclusion that this fits into the category of spontaneous human combustion, for which there is no adequate explanation," he said.

'Sharp intake of breath'

Retired professor of pathology Mike Green said he had examined one suspected case in his career. He said he would not use the term spontaneous combustion, as there had to be some source of ignition, possibly a lit match or cigarette. "There is a source of ignition somewhere, but because the body is so badly destroyed the source can't be found," he said.

He said the circumstances in the Galway case were very similar to other possible cases. "This is the picture which is described time and time again," he said. "Even the most experienced rescue worker or forensic scientist takes a sharp intake of breath (when they come across the scene)."

Mr Green said he doubted explanations centred on divine intervention. "I think if the heavens were striking in cases of spontaneous combustion then there would be a lot more cases. I go for the practical, the mundane explanation," he said.

http://medicalxpress.com/news/2011-09-infusing-chemotherapy-liver-extra-months.html

Infusing chemotherapy into the liver gives extra months of disease-free life in melanoma patients

Melanoma of the eye (ocular or uveal melanoma) frequently spreads to the liver and, once this has happened, there is no effective treatment and patients die within an average of two to four months.

Only about one in ten patients live for a year. Now, final results from a phase III study have demonstrated that a new treatment significantly extends the time patients can live without the disease progressing.

James Pingpank, associate professor of surgery at the University of Pittsburgh Cancer Institute (Pittsburgh, USA), will tell the 2011 European Multidisciplinary Cancer Congress on Saturday that, by April 2011, the length of time that patients survived without the metastases spreading further in the liver (disease progression) was an average of 8.1 months for those receiving the new treatment compared to 1.6 months in the group of patients that had been randomised to receive the best alternative care.

The new treatment is called percutaneous hepatic perfusion (PHP) and is designed to saturate the liver with high doses of chemotherapy without affecting the rest of the body. The chemotherapy drug melphalan is infused directly into the liver via an intra-arterial catheter over a period of 30 minutes. Blood in the veins leading out of the liver is then captured and filtered through a specially designed, double-balloon catheter to extract the drug before the cleaned blood is returned to the body. This enables the drug to be delivered directly to the liver to target the melanoma metastases there, but in a minimally invasive manner. The patient is monitored in intensive care before being allowed home. Once the liver has recovered from the toxicity of the treatment, the procedure is repeated every four to eight weeks.

In a phase III, randomised trial that took place in nine US clinics, 93 patients were randomised to receive PHP or best alternative care between February 2006 and July 2009. Best alternative care (BAC) was decided by the patient's treatment team and could involve interleukin 2, ipilimumab, transcatheter arterial chemoembolisation (TACE), systemic chemotherapy or inclusion in a clinical trial.

As the study was not designed to show an overall survival benefit, and most of the patients had no other treatment options available to them, patients were allowed to cross over from the BAC arm of the study to the PHP arm once the benefits of PHP became apparent.

PHP patients had an overall progression-free survival time of 6.1 months versus 1.6 months in the BAC group. Overall survival at one year was 29% on PHP versus 26% on BAC. Due to the fact that 51% of patients crossed over from the BAC arm to the PHP arm, overall survival was not significantly different between the two groups: 11.4 months on PHP versus 9.9 months on BAC. However, those patients who did cross over seemed to do well despite being amongst the sickest, surviving for 9.2 months without the disease progressing in the liver, and 6.5 months without any overall progression of the disease.

Prof Pingpank will say: "This is the first phase III study of PHP in patients with liver-dominant metastatic melanoma and shows that PHP with melphalan significantly improves overall response rates and progression-free survival, providing a new treatment option for the disease. This report includes all data on patients who are more than one year on from inclusion in the trial and we now have all the final response rates. The only thing that may change over time is the examination of the possible long-term benefits, as all but one of the surviving patients were treated with PHP or crossed over to receive it."

For a disease that currently has few treatment options and no chance of a cure, Prof Pingpank says PHP offers patients extra months of, usually, good quality life. Although the adverse effects of PHP were more severe than BAC, they were short-lived. "Side effects were predominantly neutropenia [low white blood cell count] and thrombocytopenia [low platelet count]. The majority of patients were able to undergo multiple treatments in the PHP arm, as toxicity resolved, whereas the major toxicity in the control arm was liver failure and/or death on treatment from disease progression," he will say.

"This is the first treatment to show a clinical benefit in patients with liver metastases from ocular melanoma. Most patients retain 80% or more of their daily functional status, and return to full performance once therapy is completed. If subsequent recurrence is noted in the liver, retreatment is possible and effective. At this point, it appears that there are groups of patients surviving substantially longer than those control arm of the study, with good quality of liver and preservation of liver function."

PHP potentially could be used for other cancers that have spread to the liver. "We have demonstrated efficacy in a phase II setting for patients with metastatic neuroendocrine tumours [2], so the application of this technology is likely to expand to other tumour types," says Prof Pingpank. "In addition, we have previously demonstrated efficacy of high dose regional melphalan for patients with metastatic colorectal cancer, albeit through a different circuit."

The device that delivers and filters the melphalan has been approved in Europe for use in all malignant liver tumours, while approval is pending in the USA for melanoma only.

Prof Pingpank will conclude: "Certainly, with 50 percent of melanoma patients with metastatic liver disease dying of liver failure, we see this as a frontline therapy for patients with this disease. There is always controversy surrounding the application of regional therapy to patients with metastatic disease, especially when there is a high risk for metastases elsewhere in the body. However, at present, the dearth of options for patients with metastatic melanoma renders this a moot point, and this therapy will be an early choice for patients with liver-only disease."

Former president of ECCO and Director General of the Institut de Cancérologie Gustave Roussy (Paris, France), Professor Alexander Eggermont said: "The maturity of the data presented today better depicts the value as well as the limitations of percutaneous hepatic perfusion. One of the interesting points is that, in these relatively good patients, those that crossed over from the BAC arm of the study have good progression-free survival after a 'late' PHP that is about the same as when PHP is given upfront. In the absence of identified targets for targeted drugs in uveal melanoma, one might consider testing the role of ipilimumab following a PHP."

ESMO spokesman, Professor Ulrich Keilholz, of the Department of Hematology and Medical Oncology and Deputy Director at the Charité Comprehensive Cancer Center, Berlin, Germany, said: "The study by Pingpank is the first phase III trial in uveal melanoma and the first trial to show a benefit of regional treatment for liver metastases in this disease. Given the current lack of targeted drugs in this disease – in contrast to the emerging treatments in cutaneous melanoma – the clinically relevant benefit achieved with melphalan perfusion provides a new reference treatment for patients with hepatic metastases of uveal melanoma."

Provided by ECCO-the European CanCer Organisation

http://www.eurekalert.org/pub_releases/2011-09/elf-gci092211.php

Goats could increase the risk of a rare lung cancer

Exposure to goats could increase the risk of a certain type of lung cancer, according to French researchers.

Amsterdam, The Netherlands:The study, which will be presented at the European Respiratory Society's Annual Congress in Amsterdam today (25 September 2011), has linked a professional exposure to goats with a distinct subset of lung cancer, known as pneumonic-type lung adenocarcinoma (P-ADC).

This form of lung cancer has a weak association with tobacco smoking when compared with other types of the disease. In attempting to identify other triggers that may cause the disease, scientists have previously noticed similarities between P-ADC and a viral infection which causes growths in the lungs of sheep. Given these similarities, the researchers have investigated whether a viral agent found in sheep and goats could be easily transferred to people who work with the animals, leading to a partiality for P-ADC.

The current epidemiologic study involved 44 patients with P-ADC and 132 controls without the disease. All participants were given a questionnaire assessing a number of risk factors including their smoking status, their personal history of cancer and their exposure to goats. The results showed that people who had experienced a professional exposure to goats during their lifetime were five times more likely to get P-ADC compared with other types of lung cancer. The findings also showed that P-ADC was significantly associated with females, and people who had never smoked or had any personal history of cancer.

Dr Nicolas Girard, from the Louis Pradel Hospital, Hospices Civils de Lyon, said: "Scientists have noticed similarities between P-ADC and a contagious viral infection in sheep before. This led us to explore the possibility that professional exposure to cattle could make humans more susceptible to P-ADC. These findings demonstrate that exposure to goats could be a risk factor for this type of lung cancer, however further studies are needed to assess other potential risk factors for the disease."

http://www.newscientist.com/article/mg21128314.800-resurrected-ancient-protein-is-a-potent-antibiotic.html

Resurrected ancient protein is a potent antibiotic

If modern medicine cannot provide an answer to multidrug-resistant microbes, perhaps ancient animals can.

24 September 2011 by Wendy Zukerman

Biologists have resurrected a mammalian antimicrobial compound that was last seen on Earth 59 million years ago when mammals were recovering from the Cretaceous-Tertiary extinction that wiped out the dinosaurs. Even now it is potent enough to destroy some of our most troublesome pathogens.

Last year the Infectious Diseases Society of America launched an initiative with the aim of producing 10 antibiotics to tackle multidrug-resistant bugs by 2020. The lower reaches of the tree of life are being explored for those antibiotics, says Ben Cocks of La Trobe University in Bundoora, Australia.

Already, promising molecules have been found in the tissues of primitive fish called lampreys (Proceedings of the National Academy of Sciences, DOI: 10.1073/pnas.1108558108).

Such an approach is effective because these molecules are so simple, says Cocks. Conventional antibiotics target precise flaws in a pathogen's armour, such as a particular enzyme. This is similar to how the adaptive immune system found in vertebrates works: it learns how to fight a new pathogen and then remembers the lesson for future battles. The trouble is that the pathogens patch their armour, requiring the immune system - and drug companies - to identify new weaknesses. Cocks says this evolutionary arms race can be side-stepped by falling back on the cruder innate immune system that is found in all plants and animals - and which has largely been ignored in our fight with multidrug-resistant pathogens.

The molecules of the innate immune system use simple chemistry to target the lipids in cell membranes. They can either disrupt and weaken bacterial membranes, or subtly alter the properties of the host's healthy cells so that pathogens can no longer attack them. But there's a problem: animals with the strongest innate immune systems tend to be so distantly related to humans that molecules taken from them can have toxic effects in humans. Cocks's solution is to study the mammals with the best innate immune systems, the molecules of which are more likely to be compatible with humans. His work has taken him inside the wallaby's pouch.

As marsupials, wallabies give birth to young at a much earlier stage in their development than placental mammals. For example, the tammar wallaby, Macropus eugenii, is born after 26 days, equivalent to a 6-week-old human fetus. The tiny wallabies then crawl into their mother's pouch to grow larger.

"It's not a clean environment," says Cocks. Bacteria closely related to the superbugs affecting humans in hospitals have been found in the wallaby pouch. But the baby wallabies are so underdeveloped that they lack an adaptive immune system to fight them; their survival depends on their innate immune system.

Cocks's team scoured the wallaby genome and found genes that code for 14 cathelicidin peptides, a component of the innate immune system. Lab tests revealed that many of the peptides could kill a range of multidrug-resistant pathogens - without damaging human cells.

The team noticed that genes in five of the cathelicidins were remarkably similar and probably evolved from a single ancestor. "We thought that the ancestral form would have a special broad-range activity," says Cocks.

Using the changes within the five peptides, Cocks and his collaborators at the University of Sydney, Australia, worked backwards to predict the genetic sequence that codes for the original peptide. His team then used it to produce a synthetic version of the peptide, effectively resurrecting it.

"The amazing thing was that it worked well against a broad range of pathogens," he says. Lab tests showed it destroyed six of seven multidrug-resistant bacteria, and was 10 to 30 times more potent than modern antibiotics such as tetracycline (PLoS One, DOI: 10.1371/journal.pone.0024030). "This is really significant," Cocks says. "Now we have access to ancient peptides for future drug development."

Damian Dowling at Monash University in Melbourne, Australia, says some ancient and extinct peptides might be more effective than those found in living creatures because bacteria haven't been exposed to them for millions of years. "Even if the bacteria once developed resistance against the peptide, it has probably lost it," he says.