Long-term use of vitamin E may decrease COPD risk

ATS 2010, NEW ORLEANS - Long-term, regular use of vitamin E in women 45 years of age and older may help decrease the risk of chronic obstructive pulmonary disease (COPD) by about 10 percent in both smokers and non-smokers, according to a study conducted by researchers at Cornell University and Brigham and Women's Hospital.

"As lung disease develops, damage occurs to sensitive tissues through several proposed processes, including inflammation and damage from free radicals," said Anne Hermetet Agler, doctoral candidate with Cornell University's Division of Nutritional Sciences. "Vitamin E may protect the lung against such damage."

The results of the study will be presented at the ATS 2010 International Conference in New Orleans.

"The findings from our study suggest that increasing vitamin E prevents COPD," said Ms. Agler. "Previous research found that higher intake of vitamin E was associated with a lower risk of COPD, but the studies were not designed to answer the question of whether increasing vitamin E intake would prevent COPD. Using a large, randomized controlled trial to answer this question provided stronger evidence than previous studies."

Ms. Agler and colleagues reviewed data compiled by the Women's Health Study, a multi-year, long-term effort ending in 2004 that focused on the effects of aspirin and vitamin E in the prevention of cardiovascular disease and cancer in nearly 40,000 women aged 45 years and older. Study participants were randomized to receive either 600 mg of vitamin E or a placebo every other day during the course of the research.

Although fewer women taking vitamin E developed COPD, Ms. Agler noted the supplements appeared to have no effect on asthma, and women taking vitamin E supplements were diagnosed with asthma at about the same rate as women taking placebo pills. Importantly, Ms. Agler noted the decreased risk of COPD in women who were given vitamin E was the same for smokers as for non-smokers.

Ms. Agler said further research will explore the way vitamin E affects the lung tissue and function, and will assess the effects of vitamin E supplements on lung diseases in men.

"If results of this study are borne out by further research, clinicians may recommend that women take vitamin E supplements to prevent COPD," Ms. Agler noted. "Remember that vitamin E supplements are known to have detrimental effects in some people; for example vitamin E supplementation increased risk of congestive heart failure in cardiovascular disease patients. Broader recommendations would need to balance both benefits and risks. "

"Randomized Vitamin E Supplementation and Risk of Chronic Lung Disease (CLD) in the Women's Health Study" (Session C103, Tuesday, May 18, 1:30- 4:00 p.m., CC-Room 353-355 (Third Level), Morial Convention Center; Abstract 3727)

New technique may quickly distinguish between active and latent TB

ATS 2010, NEW ORLEANS - An emerging technique designed to quickly distinguish between people with active and dormant tuberculosis may help health professionals diagnose the disease sooner, thereby potentially limiting early exposure to the disease, according to a study conducted by researchers at Duke University Medical Center.

"Current blood tests for tuberculosis are reasonably good at distinguishing between uninfected and infected persons, but cannot tell the whether an infected person has active, and possibly infectious, tuberculosis or has latent infection," said senior author Jason Stout, M.D., M.H.S., assistant professor of medicine at Duke University Medical Center. "Generally a culture is required to tell the difference between latent infection and active tuberculosis, but a culture usually requires weeks to deliver a result. A rapid test that could tell the difference between latent and active tuberculosis would be a major step forward."

The findings will be reported at the ATS 2010 International Conference in New Orleans.

"This pilot study explored whether using patterns in the immune response to tuberculosis could be helpful in improving rapid diagnosis of the disease," Dr. Stout said.

Dr. Stout and colleagues collected whole blood samples from 71 people belonging to one of three groups: those with active tuberculosis, those with latent tuberculosis infection, and those who were not infected with tuberculosis. After exposing the samples to pieces of the tuberculosis bacteria to stimulate an immune response, researchers measured the levels of 25 specific proteins, called cytokines, to determine the presence of a pattern that could allow them to differentiate among the three groups.

"We found that a pattern of two cytokines, called MCP-1 and IL-15, was reasonably good at differentiating between persons sick with TB and persons infected but not sick," Stout said. "In addition, a third cytokine, called IP-10, looked promising in distinguishing between uninfected persons and infected individuals."

Stout said that while previous studies identified all three cytokines as possible individual predictors of tuberculosis infection, the usefulness of the combination of MCP-1 and IL-15 was unexpected.

"These findings could lead to earlier diagnosis of active tuberculosis, which could be beneficial for both the sick person and others around her or him who might be spared from infection," Dr. Stout noted. "There is also

the potential for avoiding unnecessary and potentially toxic medications in persons who are not sick with tuberculosis."

Although the initial results were promising, Dr. Stout noted the sampling for this pilot study was limited, and added that further research would be needed to determine if the results could be replicated in a larger population, "ideally a group of persons suspected of having tuberculosis." "Future studies may also help researchers determine whether examining additional cytokines would improve on the accuracy of our results," he added.

"Multi-Cytokine Profiles After Tuberculosis Antigen Stimulation: A Search for New Biomarkers for Latent and Active Tuberculosis" (Session A93, Sunday, May 16, 1:30- 4:00 p.m., CC-Room 260-262 (Second Level), Morial Convention Center; Abstract 4463)

Stem cells restore tissue affected by ALI

ATS 2010, NEW ORLEANS - Human stem cells administered intravenously can restore alveolar epithelial tissue to a normal function in a novel ex vivo perfused human lung after E. coli endotoxin-induced acute lung injury (ALI), according to research from the University of California San Francisco.

The findings will be reported at the ATS 2010 International Conference in New Orleans.

ALI is a common cause of respiratory failure in the intensive care units, often leading to death. It can be caused by both direct injury such as aspiration and pneumonia, and indirect injury such as sepsis and from trauma. ALI is characterized by diffuse bilateral infiltrates on chest x-ray, hypoxemia and both lung endothelial and epithelial injury. Because ALI causes injury to the alveolar epithelium, it impairs its ability to reabsorb pulmonary edema fluid from the airspaces of the lung. Yearly, ALI affects approximately 200,000 patients in the US and has a 40 percent mortality rate despite extensive investigations into its causes and pathophysiology. Innovative therapies are desperately needed.

To determine whether stem cell therapy given intravenously would be able to repair the damaged alveolar epithelium, researchers used right human lungs that had been declined for transplantation by the Northern California Transplant Donor Network. The lungs were perfused with whole blood and ventilated with continuous positive airway pressure. The researchers then infused the right middle lung with endotoxin, which induces acute lung injury. One hour following injury, clinical grade human mesenchymal stem cells (hMSC) - those that are derived from bone marrow of healthy adults - were given intravenously.

"We found that intravenous infusion of clinical grade cryo-preserved allogeneic hMSC were effective in restoring the capacity of the alveolar epithelium to resolve pulmonary edema when given after the establishment of E. coli endotoxin-induced acute lung injury in an ex vivo perfused human lung preparation," explained Jae-Woo Lee, M.D., who led the study in the laboratory of Michael A. Matthay, M.D. "In addition, we found that intravenous infusion of hMSC preferentially homed to the injured areas of the lung, which means that the cells find their way from the bloodstream to the sites in the lung of injury."

Prior research from the group focused on delivering stem cells intrabronchially. Importantly, in this study, the group found that intravenous delivery of hMSC worked as well as intrabronchial administration. Intravenous administration would be preferred in critically ill mechanically ventilated patients with ALI because bronchoscopy may lead to transient problems with oxygenation and ventilation.

In addition to having restored function of alveolar epithelial cells, lungs treated with hMSC showed a reduction in inflammatory cytokine, IL-1▪ and IL-8, levels suggesting a favorable shift away from a proinflammatory environment in the injured alveolus.

"These results suggest that the intravenous route would be ideal for potential clinical trials of hMSC for severe acute lung injury, a syndrome of acute respiratory failure in critically ill patients that is associated with 40 percent mortality," said Dr. Lee. "These results extend our recent publication, which demonstrated that hMSC may have therapeutic potential clinically in patients with severe acute lung injury. We need to do more experiments with testing the effect of hMSC against live bacterial induced lung injury in the perfused human lung and now advance to doing Phase I and II safety and efficacy studies in patients."

"Intravenous Allogeneic Human Mesenchymal Stem Cells Home to The Site of Injury and Restore Alveolar Fluid Clearance to a Normal Level in an Ex Vivo Perfused Human Lung Injured by E.Coli Endotoxin" (Session B98 and B81, Monday, May 17, 1:30 to 4 p.m., CC-Room 238-239 (Second Level) and CC Room 243-245 (Second Level), Morial Convention Center; Abstract 2736)

Prehistoric fish extinction paved the way for modern vertebrates

Event of unknown origin occurred as first vertebrates tested land

A mass extinction of fish 360 million years ago hit the reset button on Earth's life, setting the stage for modern vertebrate biodiversity, a new study reports.

The mass extinction scrambled the species pool near the time at which the first vertebrates crawled from water towards land, University of Chicago scientists report. Those few species that survived the bottleneck

were the evolutionary starting point for all vertebrates – including humans – that exist today, according to a study published today in the Proceedings of the National Academy of Sciences.

"Everything was hit, the extinction was global," said Lauren Sallan, University of Chicago graduate student and lead author of the paper. "It reset vertebrate diversity in every single environment, both freshwater and marine, and created a completely different world."

The Devonian Period, which spanned from 416 to 359 million years ago, is also known as the Age of Fishes for the broad array of species present in Earth's aquatic environments. Armored placoderms such as the gigantic Dunkleosteus and lobe-finned fishes – similar to the modern lungfish – dominated the waters, while ray-finned fishes, sharks, and tetrapods were in the minority. But between the latest Devonian Period and the subsequent Carboniferous period, placoderms disappeared and ray-finned fishes rapidly replaced lobe-finned fishes as the dominant group, a demographic shift that persists to today.

"The Devonian period is known as the Age of Fishes, but it's the wrong kind of fish," Sallan said. "Just about everything dominant in Devonian died at the end of the period and was replaced."

"There's some sort of pinch at the end of the Devonian," said second author Michael Coates, PhD, professor of organismal biology and anatomy at the University of Chicago. "It's as if the roles persist, but the players change: the cast is transformed dramatically. Something happened that almost wiped the slate clean, and, of the few stragglers that made it through, a handful then re-radiate spectacularly."

Scientists have long theorized that the Late Devonian Kellwasser event – considered to be one of the "Big Five" extinctions in Earth's history – was responsible for a marine invertebrate species shake-up. But an analysis of the vertebrate fossil record by Sallan and Coates, pinpointed a critical shift in their diversity to the Hangenberg extinction event 15 million years later.

Prior to the extinction, lobe-finned forms such as Tiktaalik and the earliest limbed tetrapods such as Ichthyostega had made the first tentative "steps" toward a land-dwelling existence. But after the extinction, a long stretch of the fossil record known as "Romer's Gap," is almost barren of tetrapods, a puzzle that had confused paleontologists for many years. Sallan and Coates' data suggest that the 15-million-year gap was the hangover after the traumatic Hangenberg event.

"The gap is real. Something that is classically seen after an extinction event is a gap in the records of survivors," Sallan said. "You have a very low diversity fauna, because most things have been killed off."

When tetrapods finally recovered, those survivors were likely the great-great-grandfathers to the vast majority of land vertebrates present today. Modern vertebrate traits – such as the motif of five-digit limbs that is shared by all mammals, birds, and reptiles in utero – may have been set by this early common ancestor, the authors propose.

"Extinction events remove a huge amount of biodiversity," Coates said. "That shapes in a very significant way the patchiness of biodiversity that persists to the present day."

The analysis benefitted from recent advances in filling in the vertebrate fossil record, Coates said. Previously, estimates of the earlier extinction had been made using fossils of invertebrates such as mollusks and clams, which are far more abundant. With a larger dataset of vertebrates and analytical techniques borrowed from modern ecology, Sallan and Coates were able to see the abrupt changes in species composition before and after the Hangenberg event.

"It's a big extinction during what was already considered a critical time in vertebrate evolution, so it's surprising that it went unnoticed for so long," Sallan said. "But it took the right methods to reveal its magnitude."

What remains mysterious is exactly what happened 360 million years ago to trigger this mass extinction, the authors said. Other researchers have found evidence of substantial glacier formation at the end of the Devonian period, which would dramatically lower sea levels and affect the life within. The first appearance of forest-like environments in some regions might also have produced atmospheric changes catastrophic to animal life.

The research also raises questions about the pattern of evolution after the extinction event. It remains unclear why groups that were abundant before the event did not recover, while other groups spread and diversified in radical new ways. Regardless of these questions, the consequences are still being felt hundreds of millions of years later, the authors said. “It is a pivotal episode that shaped modern vertebrate biodiversity," Coates said. "We are only now beginning to place that important event in the history of life and the history of the planet, which we weren't able to do before."

The paper, "The End-Devonian Extinction: a Bottleneck in the Evolution of Modern Jawed Vertebrates," was electronically published on May 17, 2010, in the Proceedings of the National Academy of Sciences. Funding for the research was provided by the National Science Foundation, the University of Chicago Hinds Fund, the Paleontological Society, the Palaeontological Association, the American Society of Ichthyologists and Herpetologists, and the Evolving Earth Foundation.

Did the end of smallpox vaccination cause the explosive spread of HIV?

Vaccinia immunization, as given to prevent the spread of smallpox, produces a five-fold reduction in HIV replication in the laboratory. Researchers writing in the open access journal BMC Immunology suggest that the end of smallpox vaccination in the mid-20th century may have caused a loss of protection that contributed to the rapid contemporary spread of HIV.

Raymond Weinstein, a family doctor turned laboratory scientist at George Mason University, Manassas, Virginia, USA, worked with a team of researchers from George Washington University and UCLA. The researchers looked at the ability of white blood cells taken from people recently immunised with vaccinia to support HIV replication compared to unvaccinated controls. They found significantly lower viral replication in blood cells from vaccinated individuals. Weinstein said, "There have been several proposed explanations for the rapid spread of HIV in Africa, including wars, the reuse of unsterilized needles and the contamination of early batches of polio vaccine. However, all of these have been either disproved or do not sufficiently explain the behavior of the HIV pandemic. Our finding that prior immunization with vaccinia virus may provide an individual with some degree of protection to subsequent HIV infection suggests that the withdrawal of such vaccination may be a partial explanation".

Smallpox immunization was gradually withdrawn from the 1950s to the 1970s following the worldwide eradication of the disease, and HIV has been spreading exponentially since approximately the same time period. Weinstein and his colleagues propose that vaccination may confer protection against HIV by producing long term alterations in the immune system, possibly including the expression of a certain receptor, CCR5, on the surface of a person's white blood cells which is exploited by both viruses. Speaking about the results, Weinstein said, "While these results are very interesting and hopefully may lead to a new weapon against the HIV pandemic, they are very preliminary and it is far too soon to recommend the general use of vaccinia immunization for fighting HIV".

1. Significantly Reduced CCR5-tropic HIV-1 Replication in vitro in Cells from Subjects Previously Immunized with Vaccinia Virus Raymond S Weinstein, Michael M Weinstein, Kenneth Alibek, Michael I Bukrinsky and Brichacek Beda
BMC Immunology (in press) During embargo, article available here:
http://www.biomedcentral.com/imedia/1059058911315787_article.pdf?random=246213

Eating processed meats, but not unprocessed red meats, may raise risk of heart disease and diabetes

Boston, MA – In a new study, researchers from the Harvard School of Public Health (HSPH) have found that eating processed meat, such as bacon, sausage or processed deli meats, was associated with a 42% higher risk of heart disease and a 19% higher risk of type 2 diabetes. In contrast, the researchers did not find any higher risk of heart disease or diabetes among individuals eating unprocessed red meat, such as from beef, pork, or lamb. This work is the first systematic review and meta-analysis of the worldwide evidence for how eating unprocessed red meat and processed meat relates to risk of cardiovascular diseases and diabetes.

"Although most dietary guidelines recommend reducing meat consumption, prior individual studies have shown mixed results for relationships between meat consumption and cardiovascular diseases and diabetes," said Renata Micha, a research fellow in the department of epidemiology at HSPH and lead author of the study. "Most prior studies also did not separately consider the health effects of eating unprocessed red versus processed meats."

The study appears online May 17, 2010, on the website of the journal Circulation.

The researchers, led by Renata Micha, a research fellow in the department of epidemiology, and HSPH colleagues Dariush Mozaffarian, assistant professor in the department of epidemiology and Sarah Wallace, junior research fellow in the department of epidemiology, systematically reviewed nearly 1,600 studies. Twenty relevant studies were identified, which included a total of 1,218,380 individuals from 10 countries on four continents (United States, Europe, Australia, and Asia).

The researchers defined unprocessed red meat as any unprocessed meat from beef, lamb or pork, excluding poultry. Processed meat was defined as any meat preserved by smoking, curing or salting, or with the addition of chemical preservatives; examples include bacon, salami, sausages, hot dogs or processed deli or luncheon meats. Vegetable or seafood protein sources were not evaluated in these studies.

The results showed that, on average, each 50 gram (1.8 oz) daily serving of processed meat (about 1-2 slices of deli meats or 1 hot dog) was associated with a 42% higher risk of developing heart disease and a 19% higher risk of developing diabetes. In contrast, eating unprocessed red meat was not associated with risk of developing heart disease or diabetes. Too few studies evaluated the relationship between eating meat and risk of stroke to enable the researchers to draw any conclusions.

"Although cause-and-effect cannot be proven by these types of long-term observational studies, all of these studies adjusted for other risk factors, which may have been different between people who were eating more versus less meats," said Mozaffarian. "Also, the lifestyle factors associated with eating unprocessed red meats and processed meats were similar, but only processed meats were linked to higher risk."

"When we looked at average nutrients in unprocessed red and processed meats eaten in the United States, we found that they contained similar average amounts of saturated fat and cholesterol. In contrast, processed meats contained, on average, 4 times more sodium and 50% more nitrate preservatives," said Micha. "This suggests that differences in salt and preservatives, rather than fats, might explain the higher risk of heart disease and diabetes seen with processed meats, but not with unprocessed red meats."

Dietary sodium (salt) is known to increase blood pressure, a strong risk factor for heart disease. In animal experiments, nitrate preservatives can promote atherosclerosis and reduce glucose tolerance, effects which could increase risk of heart disease and diabetes.

Given the differences in health risks seen with eating processed meats versus unprocessed red meats, these findings suggest that these types of meats should be studied separately in future research for health effects, including cancer, the authors said. For example, higher intake of total meat and processed meat has been associated with higher risk of colorectal cancer, but unprocessed red meat has not been separately evaluated. They also suggest that more research is needed into which factors (especially salt and other preservatives) in meats are most important for health effects.

Current efforts to update the United States government's Dietary Guidelines for Americans, which are often a reference for other countries around the world, make these findings particularly timely, the researchers say. They recommend that dietary and policy efforts should especially focus on reducing intake of processed meat.

"To lower risk of heart attacks and diabetes, people should consider which types of meats they are eating. Processed meats such as bacon, salami, sausages, hot dogs and processed deli meats may be the most important to avoid," said Micha. "Based on our findings, eating one serving per week or less would be associated with relatively small risk."

"Red and Processed Meat Consumption and Risk of Incident Coronary Heart Disease, Stroke, and Diabetes Mellitus: A Systematic Review and Meta-Analysis," Renata Micha, Sarah K. Wallace, Dariush Mozaffarian, Circulation, online May 17, 2010.

Most patients survive common thyroid cancer regardless of treatment

Individuals with papillary thyroid cancer that has not spread beyond the thyroid gland appear to have favorable outcomes regardless of whether they receive treatment within the first year after diagnosis, according to a report in the May issue of Archives of Otolaryngology–Head & Neck Surgery, one of the JAMA/Archives journals.

Papillary thyroid cancer is commonly found on autopsy among individuals who died of other causes, according to background information in the article. "Studies published as early as 1947 demonstrated it, and more recently, a report has shown that nearly every thyroid gland might be found to have a cancer if examined closely enough," the authors write. "The advent of ultrasonography and fine-needle aspiration biopsy has allowed many previously undetected cancers to be identified, changing the epidemiology of the disease. Over the past 30 years, the detected incidence of thyroid cancer has increased three-fold, the entire increase attributable to papillary thyroid cancer and 87% of the increase attributable to tumors measuring less than 2 centimeters."

Louise Davies, M.D., M.S., of Dartmouth Medical School, Hanover, N.H. and Gilbert Welch, M.D., M.P.H., both also of Department of Veterans Affairs Medical Center, White River Junction, Vt., and The Dartmouth Institute for Health Policy and Clinical Practice, Hanover, studied cancer cases and individual treatment data from National Cancer Institute registries. They then tracked cause of death through the National Vital Statistics System.

The researchers identified 35,663 patients with papillary thyroid cancer that had not spread to the lymph nodes or other areas at diagnosis. Of these, 440 (1.2 percent) did not undergo immediate, definitive treatment. Over an average of six years of follow-up, six of these patients died of their cancer. This was not significantly different from the rate of cancer death among the 35,223 individuals who did undergo treatment (161 over an average of 7.6 years of follow-up).

The 20-year survival rate from cancer was estimated to be 97 percent for those who did not receive treatment and 99 percent for those who did. "These data help put management decisions about localized papillary thyroid cancer in perspective: papillary thyroid cancers of any size that are confined to the thyroid gland, have no lymph node metastases at presentation and do not show extraglandular extension [reach beyond the thyroid gland] are unlikely to result in death due to the cancer," the authors write.

"Thus, clinicians and patients should feel comfortable considering the option to observe for a year or longer cancers that fall into this category," they conclude. "When treatment is elected, the cancers in this category can be managed with either hemithyroidectomy [removal of part of the thyroid] or total thyroidectomy [removal of the complete gland], and the prognosis will be the same."

(Arch Otolaryngol Head Neck Surg. 2010;136[5]:440-444. Available pre-embargo to the media at www.jamamedia.org.)

Editor's Note: This study was supported in part by a Research Enhancement Award from the Department of Veterans Affairs and the Robert Wood Johnson Faculty Scholars Program. Please see the article for additional information, including other authors, author contributions and affiliations, financial disclosures, funding and support, etc.

New evidence caffeine may slow Alzheimer's disease and other dementias, restore cognitive function

Researchers explore potential benefits of caffeine in special supplement to the Journal of Alzheimer's Disease

Amsterdam, The Netherlands – Although caffeine is the most widely consumed psychoactive drug worldwide, its potential beneficial effect for maintenance of proper brain functioning has only recently begun to be adequately appreciated. Substantial evidence from epidemiological studies and fundamental research in animal models suggests that caffeine may be protective against the cognitive decline seen in dementia and Alzheimer's disease (AD). A special supplement to the Journal of Alzheimer's Disease, "Therapeutic Opportunities for Caffeine in Alzheimer's Disease and Other Neurodegenerative Diseases," sheds new light on this topic and presents key findings.

Guest editors Alexandre de Mendonça, Institute of Molecular Medicine and Faculty of Medicine, University of Lisbon, Portugal, and Rodrigo A. Cunha, Center for Neuroscience and Cell Biology of Coimbra and Faculty of Medicine, University of Coimbra, Portugal, have assembled a group of international experts to explore the effects of caffeine on the brain. The resulting collection of original studies conveys multiple perspectives on topics ranging from molecular targets of caffeine, neurophysiological modifications and adaptations, to the potential mechanisms underlying the behavioral and neuroprotective actions of caffeine in distinct brain pathologies.

"Epidemiological studies first revealed an inverse association between the chronic consumption of caffeine and the incidence of Parkinson's disease," according to Mendonça and Cunha. "This was paralleled by animal studies of Parkinson's disease showing that caffeine prevented motor deficits as well as neurodegeneration "Later a few epidemiological studies showed that the consumption of moderate amounts of caffeine was inversely associated with the cognitive decline associated with aging as well as the incidence of Alzheimer's disease. Again, this was paralleled by animal studies showing that chronic caffeine administration prevented memory deterioration and neurodegeneration in animal models of aging and of Alzheimer's disease."

Key findings presented in "Therapeutic Opportunities for Caffeine in Alzheimer's Disease and Other Neurodegenerative Diseases":

* Multiple beneficial effects of caffeine to normalize brain function and prevent its degeneration
* Caffeine's neuroprotective profile and its ability to reduce amyloid-beta production
* Caffeine as a candidate disease-modifying agent for Alzheimer's disease
* Positive impact of caffeine on cognition and memory performance
* Identification of adenosine A2A receptors as the main target for neuroprotection afforded by caffeine consumption
* Confirmation of data through valuable meta-analyses presented
* Epidemiological studies corroborated by meta-analysis suggesting that caffeine may be protective against Parkinson's disease
* Several methodological issues must be solved before advancing to decisive clinical trials

Mendonça and Cunha also observe that "the daily follow-up of patients with AD has taught us that improvement of daily living may be a more significant indicator of amelioration than slight improvements in objective measures of memory performance. One of the most prevalent complications of AD is depression of mood, and the recent observations that caffeine might be a mood normalizer are of particular interest."

The supplement was funded by the Associação Industrial e Comercial do Café, while leaving full scientific independence to all contributors. The entire issue has been made available on a no-fee basis at http://iospress.metapress.com/content/t136147627 31/.

New 'Tree of Life' established for one of the largest groups of bacteria

A new "tree of life" has been constructed by researchers at the Virginia Bioinformatics Institute (VBI) at Virginia Tech for the gamma-proteobacteria, a large group of medically and scientifically important bacteria that includes Escherichia coli, Salmonella typhimurium, and other disease-causing organisms.* By building

powerful phylogenetic trees, scientists are able to quickly identify similarities and differences between the make-up of many different organisms, crucial information in the search for treatments to fight anything from the bugs that cause food poisoning to the pathogens that cause life-threatening diseases such as cholera and the plague.

A "tree of life," or phylogenetic tree, is a way to visualize the evolutionary relationships among different biological species that have descended from a common ancestor. The gamma-proteobacteria tree developed by VBI researchers was reconstructed using powerful computers from as many as 30 million data points of bacterial sequence information.

Kelly Williams, Research Investigator at VBI, remarked: "Ribosomal RNA is one of the central components of the ribosome, the protein manufacturing machinery of all living cells. In the past, researchers have often depended on looking at a single ribosomal RNA gene to construct evolutionary relationships for their tree-building efforts. The method we use to make our tree of life uses hundreds of different genes and integrates much more information than can be gleaned from the traditional single gene approach. We firmly believe that the multi-gene or phylogenomics approach should become the standard for tree-building when several genome sequences are available, which is now the case for most bacterial groups."

The researchers selected 108 available genomes from the more than 200 complete and partial sequences available for the gamma-proteobacteria, placing the emphasis on the diversity of the bacterial species and quality of the original sequence data. Allan Dickerman, Assistant Professor at VBI, remarked: "The consensus tree that we have put together for the gamma-proteobacteria is a powerful tool that can be used to predict shared biology and analyze, for example, the novel ways that bacteria have adapted to their living environments. Phylogenomics provides for very accurate reconstructions of inheritance from common ancestors."

The researchers looked at a very large class of bacteria that lack a well-resolved phylogenetic tree. By placing emphasis on searches for single-copy genes, the scientists were able to radically improve the resolution of the evolutionary tree. Said Williams, "Some parts of our tree were still not fully resolved, but we believe that future work will improve our method further to handle these deficiencies."

Bruno Sobral, Director of the CyberInfrastructure Section at VBI, commented: "The work described in this paper was inspired and funded by the needs of our PATRIC 2.0 project. The effort is part of the on-going work of PATRIC 2.0 team members to build a comprehensive, state-of-the-art bioinformatics resource for bacteria that serves the biomedical research community. Because of the exponentially growing number of bacterial genomes that PATRIC needs to handle, we are now in a phase where whole-genome phylogenetic analysis is both possible and necessary. PATRIC is integrating the very latest phylogenomic information and tools, such as those in this paper and a preceding publication that developed a phylogenetic tree for the alpha-proteobacteria**, into our system." He added: "This work is a great example of how PATRIC implements and deploys an infrastructure that will allow any person to develop these results in the future by going to the PATRIC site."

In October 2009, The National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health (NIH), awarded a 5-year, $27,670,448 contract to Dr. Sobral's CyberInfrastructure Group of VBI to support the biomedical research community's work on infectious diseases. The funding is being used to integrate vital information on pathogens, provide key resources and tools to scientists, and help researchers to analyze genomic, proteomic and other data arising from infectious disease research.

For more information on PATRIC 2.0 please consult http://patricbrc.vbi.vt.edu/portal/portal/patric/Home

** Williams KP, Gillespie JJ, Sobral BW, Nordberg EK, Snyder EE, Shallom JM, Dickerman AW (2010) Phylogeny of Gammaproteobacteria. Journal of Bacteriology 192(9): 2305-2314. [PMID: 20207755]*

*** Williams KP, Sobral BW, Dickerman AW (2007) A robust species tree for the alphaproteobacteria. Journal of Bacteriology 189: 4578-4586. [PMID: 17483224]*

The cost of medicalizing human conditions

Medicalization of human problems is a growth industry -- but what does it cost?

Menopause. Normal pregnancy. Infertility. ADHD. Erectile dysfunction. Over the last several decades, these conditions have come to be defined and treated as medical problems. They've been "medicalized." In the first study of its kind in the current issue of Social Science and Medicine, Brandeis researchers used national data to estimate the costs of these and a handful of other common conditions on escalating U.S. healthcare spending.

The researchers, led by Brandeis sociologist Peter Conrad, evaluated 12 conditions that had been defined as medicalized by physician organizations, and for which there were current medical spending data. The other conditions considered in the study were anxiety and behavioral disorders; body image; male pattern baldness; normal sadness; obesity; sleep disorders, and substance-related disorders.

The robust trend toward ever-greater medicalization of human conditions is undeniable, with an increasing number of medical diagnoses and treatments for behavioral problems and normal life events. Conrad and his colleagues analyzed medical spending on these disorders - payments to hospitals, pharmacies, physicians and other health care providers - and discovered that they accounted for $77.1 billion in medical spending in 2005 - 3.9 percent of total domestic health care expenditures.

"We spend more on these medicalized conditions than on cancer, heart disease, or public health," said Conrad. "While medicalization is unlikely to be a key driver of skyrocketing health care costs, $77 billion represents a substantial dollar sum."

Although the study did not evaluate whether medicalization is good or bad for health and society, it demonstrates the need for understanding the societal and economic impact of growing medicalization. Conrad explained that some researchers attributed medicalization to the growth of medicine's professional jurisdiction, increased consumer demands for medical solutions, and the pharmaceutical industry expanding markets for drugs.

"By estimating the amount spent on medicalized human problems, we've raised the obvious question as to whether this spending is 'appropriate,'" said Conrad. "The next question is whether we can more directly evaluate the appropriateness of these medical interventions and consider policies that curb the growth or even shrink the amount of spending on some medicalized conditions."

Newborn infants learn while asleep; study may lead to later disability tests

Gainesville, Fla. - Sleeping newborns are better learners than thought, says a University of Florida researcher about a study that is the first of its type. The study could lead to identifying those at risk for developmental disorders such as autism and dyslexia. “We found a basic form of learning in sleeping newborns, a type of learning that may not be seen in sleeping adults,” said Dana Byrd, a research affiliate in psychology at UF who collaborated with a team of scientists.

The findings give valuable information about how it is that newborns are able to learn so quickly from the world, when they sleep for 16 to 18 hours a day, Byrd said. “Sleeping newborns are better learners, better ‘data sponges’ than we knew,” she said.

In order to understand how newborns learn while in their most frequent state, Byrd and her colleagues tested the learning abilities of sleeping newborns by repeating tones that were followed by a gentle puff of air to the eyelids. After about 20 minutes, 24 of the 26 babies squeezed their eyelids together when the tone was sounded without the puff of air.

“This methodology opens up research areas into potentially detecting high risk populations, those who show abnormalities in the neural systems underlying this form of learning,” she said. “These would include siblings of individuals with autism and siblings of those with dyslexia.”

The research team’s paper, published online this week in Proceedings of the National Academy of Sciences, describes the results of their experiment with the 1- or 2-day-old infants, comparing them with a control group using EEG and video recordings. The brain waves of the 24 infants were found to change, providing a neural measurement of memory updating.

“While past studies find this type of learning can occur in infants who are awake, this is the first study to document it in their most frequent state, while they are asleep,” Byrd said. “Since newborns sleep so much of the time, it is important that they not only take in information but use the information in such a way to respond appropriately.” Not only did the newborns show they can learn to give this reflex in response to the simple tone, but they gave the response at the right time, she said.

Learned eyelid movement reflects the normal functioning of the circuitry in the cerebellum, a neural structure at the base of the brain. This study’s method potentially offers a unique non-invasive tool for early identification of infants with atypical cerebellar structure, who are potentially at risk for a range of developmental disorders, including autism and dyslexia, she said.

The capacity of infants to learn during sleep contrasts with some researchers’ stance that learning new material does not take place in sleeping adults, Byrd said. The immature nature of sleep patterns in infants could help explain why, she said. “Newborn infants’ sleep patterns are quite different than those of older children or adults in that they show more active sleep where heart and breathing rates are very changeable,” she said. “It may be this sleep state is more amenable to experiencing the world in a way that facilitates learning.”

Another factor is that infants’ brains have greater neural plasticity, which is the ability for the neural connections to be changed, Byrd said. “Newborns may be very adaptive to learning in general simply because their brains have increased plasticity, increased propensity to be changed by experience,” she said.

Byrd collaborated with William Fifer, Michelle Kaku, Joseph Isler, Amanda Tarullo, all of Columbia University; Inge-Marie Eigsti, of the University of Connecticut; Jillian Grose-Fifer of the City University of New York; and Peter Balsam of Barnard College.

Invasive kudzu is major factor in surface ozone pollution, study shows

Kudzu, an invasive vine that is spreading across the southeastern United States and northward, is a major contributor to large-scale increases of the pollutant surface ozone, according to a study published the week of May 17 in the journal Proceedings of the National Academy of Sciences.

Kudzu, a leafy vine native to Japan and southeastern China, produces the chemicals isoprene and nitric oxide, which, when combined with nitrogen in the air, form ozone, an air pollutant that causes significant health problems for humans. Ozone also hinders the growth of many kinds of plants, including crop vegetation.

"We found that this chemical reaction caused by kudzu leads to about a 50 percent increase in the number of days each year in which ozone levels exceed what the Environmental Protection Agency deems as unhealthy," said study co-author Manuel Lerdau, a University of Virginia professor of environmental sciences and biology. "This increase in ozone completely overcomes the reductions in ozone realized from automobile pollution control legislation."

Lerdau and his former graduate student, lead author Jonathan Hickman – now a postdoctoral fellow at Columbia University – used field studies at three sites in Georgia to determine the gas production of kudzu. They then worked with Shiliang Wu and Loretta Mickley, atmospheric scientists at Harvard University, who used atmospheric chemistry computer models to evaluate the potential 50-year effect of kudzu invasion on regional air quality.

"Essentially what we found is that this biological invasion has the capacity to degrade air quality, and in all likelihood over time lead to increases in air pollution, increases in health problems caused by that air pollution, and decreases in agricultural productivity," Lerdau said. "This is yet another compelling reason to begin seriously combating this biological invasion. What was once considered a nuisance, and primarily of concern to ecologists and farmers, is now proving to be a potentially serious health threat."

Ozone acts as an irritant to the eyes, nose and throat, and can damage the lungs, sometimes causing asthma or worsening asthma symptoms. It also is a mutagen and can cause lung cancer.

Ozone, while essential to the health of the Earth in the upper atmosphere where it shields the surface from excess ultraviolet radiation, is hazardous to human health when it forms at the earth's surface. This occurs most often in the summertime as plants grow and produce chemicals that react with the air.

Introduced to the United States in the late 19th century, kudzu, with its unique nitrogen-fixing physiology, allows a rapid, nearly uninhibited rate of growth, about three times the rate of trees and other vegetation. The vine was cultivated more extensively in the 1920s and 1930s as a control for soil erosion and rapidly became known as "the vine that ate the South." In recent, milder winters, Kudzu has expanded its range northward into Pennsylvania and New York.

"What was once a Southern problem is now becoming an East Coast issue," Lerdau said. Various strategies are used for controlling and eradicating kudzu, including livestock grazing, burning, mowing and herbicides.

The Claim: Caffeine Helps Prevent Nighttime Accidents on the Job

By ANAHAD O'CONNOR

THE FACTS About 8.6 million Americans work night shifts, and for many of them fatigue is a serious problem.

Night workers - from health professionals to air traffic controllers - experience more accidents and injuries on the job, report more medical errors and face a greater risk of car crashes after their shifts. Some of the most high-profile accidents linked to human error have occurred on the night shift, including the Exxon Valdez disaster and the nuclear accidents at Chernobyl and Three Mile Island. The recent BP oil spill also occurred at the start of an overnight shift, though the cause is still under investigation.

Scientists have tried melatonin, prescription medications and light therapy to help relieve so-called shift work disorder, caused by disruptions in the body's circadian rhythm. But research shows that nothing seems to work quite as well as caffeine.

In a study published in the latest issue of The Cochrane Library, scientists pooled data from 13 previous studies on performance among shift workers. The studies also looked at performance on tasks like driving and neuropsychological tests. Ultimately, they found that caffeine worked better than a placebo - and even naps - at reducing errors and improving performance on tasks including those involving memory, attention, perception, concept formation and reasoning.

Another study at Harvard Medical School found that caffeine worked best in small doses spread out over time.

THE BOTTOM LINE Caffeine is an effective aid to nighttime job performance.

Significant number of fathers experience prenatal, postpartum depression

About 10 percent of fathers experience prenatal or postpartum depression, with rates being highest in the 3 to 6 month postpartum period, according to an analysis of previous research appearing in the May 19 issue of JAMA, a theme issue on mental health. James F. Paulson, Ph.D., of the Eastern Virginia Medical School, Norfolk, Va., presented the findings of the study at a JAMA media briefing on mental health.

It is well established that maternal prenatal and postpartum depression is prevalent and has negative personal, family, and child developmental outcomes, but the prevalence, risk factors and effects of depression among new fathers is not well understood, and has received little attention from researchers and clinicians, according to background information in the article.

Dr. Paulson and co-author Sharnail D. Bazemore, M.S., of the Eastern Virginia Medical School, conducted a meta-analysis to determine estimates and variability in rates of paternal prenatal and postpartum depression and its association with maternal depression. The authors included studies that documented depression in fathers between the first trimester and the first postpartum year, and identified 43 studies involving 28,004 participants for inclusion in the analysis.

Among the findings of the researchers:

* The overall estimate of paternal depression was 10.4 percent (estimated 12-month prevalence of depression among men in the general population is 4.8 percent).
* There was considerable variability between different time periods, with the 3- to 6-month postpartum period showing the highest rate (25.6 percent) and the first 3 postpartum months showing the lowest rate (7.7 percent).
* Differences were observed across study locations, with higher rates of prenatal and postpartum depression reported in the United States (14.1 percent vs. 8.2 percent internationally).
* There is a moderate correlation between depression in fathers and mothers.

"There are many implications of these findings. The observation that expecting and new fathers disproportionately experience depression suggests that more efforts should be made to improve screening and referral, particularly in light of the mounting evidence that early paternal depression may have substantial emo-tional, behavioral, and developmental effects on children. The correlation between paternal and maternal depression also suggests a screening rubric - depression in one parent should prompt clinical attention to the other. Likewise, prevention and intervention efforts for depression in parents might be focused on the couple and family rather than the individual," the authors write.

"Future research in this area should focus on parents together to examine the onset and joint course of depression in new parents. This may increase our capacity for early identification of parental depression, add leverage for prevention and treat-ment, and increase the understanding of how parental depression conveys risk to infants and young children."

(JAMA. 2010;303[19]:1961-1969. Available pre-embargo to the media at www.jamamedia.org)

Depression care program eliminates suicide

DETROIT – A unique program for patients with depression has resulted in two and a half years without a single suicide from Henry Ford's patient population.

The program, chronicled in an article in this week's issue of the Journal of the American Medical Association, was created by the Behavioral Health Services division of Henry Ford Health System in 2001.

The rate of suicide in Henry Ford's patient population decreased by 75 percent from 89 per 100,000 patients to 22 per 100,000 in the first four years of the program's implementation, significantly lower than the annual rates for suicides in similar patient populations. For the last two and a half years, that rate has been zero per 100,000. This remarkably low rate of patient suicide stands in marked contrast to an expected rate of 230 per 100,000 as reported from scientific research.

"The encouraging results of the initiative suggest that this care model can be highly effective for achieving and sustaining breakthrough quality improvement in mental health care," says C. Edward Coffey, M.D., Henry Ford Health System vice president and CEO of Behavioral Health Services.

"Pursuing perfection is no longer a project or initiative for our team but a principle driving force embedded in the fabric of our clinical care."

Some of the performance improvements in the program include:

* Establish a consumer advisory panel to help with the design of the program.
* Establish a protocol to assign patients into one of three levels of risk for suicide, each of which requires specific intervention.
* Provide training for all psychotherapists to develop competency in Cognitive Behavior Therapy.
* Implement a protocol for having patients remove weapons from the home.

* Establish three means of access for patients: drop-in group medication appointments, advanced (same-day) access to care or support and e-mail visits.
* Develop a website for patients to educate and assist patients.
* Require staff to complete a suicide prevention course.
* Set up a system for staff members to check in on patients by phone.
* Partner and educate the patient's family members.

The National Institute for Mental Health estimates more than 33,000 people die by suicide each year in the United States. More than 90 percent of people who kill themselves have a diagnosable mental disorder, most commonly a depressive disorder or a substance abuse disorder. Risk factors for suicide include a prior suicide attempt; family history of mental disorder, substance abuse or suicide; family violence, including physical or sexual abuse; firearms in the home, the method used in more than half of suicides; and incarceration.

Henry Ford's Perfect Depression Care program has been nationally recognized and awarded the Joint Commission's Ernest Amory Codman Award, a health care award that recognizes excellence in performance measurement.

Henry Ford Health System's Behavioral Health Services provides a full continuum of mental health and substance abuse services through a large integrated delivery system of two hospitals, 10 clinics, and more than 500 employees that serves southeastern Michigan and adjacent states. Through its department of psychiatry, Behavioral Health Services is also engaged in a large academic enterprise, which includes numerous education, training, and research programs.

C. Edward Coffey, M.D., Henry Ford Health System vice president and CEO of Behavioral Health Services, is available for interviews.

Hampton T. Depression Care Effort Brings Dramatic Drop in Large HMO Population's Suicide Rate, Journal of the American Medical Association; May 19, 2010; Volume 303, Number 19, Pages 1903-1905.

Doomsayers Beware, a Bright Future Beckons

By JOHN TIERNEY

Viktor Koen

Long before “sustainable” became a buzzword, intellectuals wondered how long industrial society could survive. In “The Idea of Decline in Western History,” after surveying predictions from the mid-19th century until today, the historian Arthur Herman identifies two consistently dominant schools of thought.

The first school despairs because it foresees inevitable ruin. The second school is hopeful - but only because these intellectuals foresee ruin, too, and can hardly wait for the decadent modern world to be replaced by one more to their liking. Every now and then, someone comes along to note that society has failed to collapse and might go on prospering, but the notion is promptly dismissed in academia as happy talk from a simpleton. Predicting that the world will not end is also pretty good insurance against a prolonged stay on the best-seller list. Have you read Julian Simon’s “The State of Humanity”? Indur Goklany’s “The Improving State of the World”? Gregg Easterbrook’s “Sonic Boom”?

Good books all, and so is the newest addition to this slender canon, “The Rational Optimist,” by Matt Ridley. It does much more than debunk the doomsaying. Dr. Ridley provides a grand unified theory of history from the Stone Age to the better age awaiting us in 2100.

It’s an audacious task, but he has the intellectual breadth for it. A trained zoologist and former editor at The Economist, Dr. Ridley has established himself in previous books, like “The Origins of Virtue” and “Genome,” as the supreme synthesist of lessons from anthropology, psychology, molecular genetics, economics and game theory. This time he takes on all of human history, starting with our mysteriously successful debut. What made Homo sapiens so special? Dr. Ridley argues that it wasn’t our big brain, because Neanderthals had a big brain, too. Nor was it our willingness to help one another, because apes and other social animals also had an instinct for reciprocity.

“At some point,” Dr. Ridley writes, “after millions of years of indulging in reciprocal back-scratching of gradually increasing intensity, one species, and one alone, stumbled upon an entirely different trick. Adam gave Oz an object in exchange for a different object.”

The evidence for this trick is in perforated seashells from more than 80,000 years ago that ended up far from the nearest coast, an indication that inlanders were bartering to get ornamental seashells from coastal dwellers. Unlike the contemporary Neanderthals, who apparently relied just on local resources, those modern humans could shop for imports.

"The extraordinary promise of this event was that Adam potentially now had access to objects he did not know how to make or find; and so did Oz," Dr. Ridley writes. People traded goods, services and, most important, knowledge, creating a collective intelligence: "Ten individuals could know between them ten things, while each understanding one." As they specialized and exchanged, humans learned how to domesticate crops and animals and sell food to passing merchants. Traders congregated in the first cities and built ships that spread goods and ideas around the world.

The Phoenician merchants who sailed the Mediterranean were denounced by Hebrew prophets like Isaiah and Greek intellectuals like Homer. But trading networks enabled the ancient Greeks to develop their alphabet, mathematics and science, and later fostered innovation in the trading hubs of the Roman Empire, India, China, Arabia, Renaissance Italy and other European capitals.

Rulers like to take credit for the advances during their reigns, and scientists like to see their theories as the source of technological progress. But Dr. Ridley argues that they've both got it backward: traders' wealth builds empires, and entrepreneurial tinkerers are more likely to inspire scientists than vice versa. From Stone Age seashells to the steam engine to the personal computer, innovation has mostly been a bottom-up process.

"Forget wars, religions, famines and poems for the moment," Dr. Ridley writes. "This is history's greatest theme: the metastasis of exchange, specialization and the invention it has called forth, the 'creation' of time."

You can appreciate the timesaving benefits through a measure devised by the economist William D. Nordhaus: how long it takes the average worker to pay for an hour of reading light. In ancient Babylon, it took more than 50 hours to pay for that light from a sesame-oil lamp. In 1800, it took more than six hours of work to pay for it from a tallow candle. Today, thanks to the countless specialists producing electricity and compact fluorescent bulbs, it takes less than a second. That technological progress, though, was sporadic. Innovation would flourish in one trading hub for a while but then stagnate, sometimes because of external predators - roving pirates, invading barbarians - but more often because of internal parasites, as Dr. Ridley writes:

"Empires bought stability at the price of creating a parasitic court; monotheistic religions bought social cohesion at the expense of a parasitic priestly class; nationalism bought power at the expense of a parasitic military; socialism bought equality at the price of a parasitic bureaucracy; capitalism bought efficiency at the price of parasitic financiers."

Progress this century could be impeded by politics, wars, plagues or climate change, but Dr. Ridley argues that, as usual, the "apocaholics" are overstating the risks and underestimating innovative responses.

"The modern world is a history of ideas meeting, mixing, mating and mutating," Dr. Ridley writes. "And the reason that economic growth has accelerated so in the past two centuries is down to the fact that ideas have been mixing more than ever before."

Our progress is unsustainable, he argues, only if we stifle innovation and trade, the way China and other empires did in the past. Is that possible? Well, European countries are already banning technologies based on the precautionary principle requiring advance proof that they're risk-free. Americans are turning more protectionist and advocating byzantine restrictions like carbon tariffs. Globalization is denounced by affluent Westerners preaching a return to self-sufficiency.

But with new hubs of innovation emerging elsewhere, and with ideas spreading faster than ever on the Internet, Dr. Ridley expects bottom-up innovators to prevail. His prediction for the rest of the century: "Prosperity spreads, technology progresses, poverty declines, disease retreats, fecundity falls, happiness increases, violence atrophies, freedom grows, knowledge flourishes, the environment improves and wilderness expands."

If you're not ready to trust an optimist, if you still fear a reckoning is at hand, you might consider the words of Thomas B. Macaulay, a British poet, historian and politician who criticized doomsayers of the mid-1800s.

"We cannot absolutely prove," he wrote, "that those are in error who tell us that society has reached a turning point, that we have seen our best days. But so said all who came before us, and with just as much apparent reason."

New Study Reveals Link Between 'Climate Footprints' and Mass Mammal Extinction

An international team of scientists have discovered that climate change played a major role in causing mass extinction of mammals in the late quaternary era, 50,000 years ago. Their study, published in Evolution, takes a new approach to this hotly debated topic by using global data modelling to build continental 'climate footprints.'

"Between 50,000 and 3,000 years before present (BP) 65% of mammal species weighing over 44kg went extinct, together with a lower proportion of small mammals," said lead author Dr David Nogues-Bravo working from the Center for Macroecology, Evolution and Climate in University of Copenhagen. "Why these species became extinct in such large numbers has been hotly debated for over a century."

During the last 50,000 years the global climate became colder and drier, reaching full glacial conditions 21,000 years before present time. Since then the climate has become warmer, and this changing climate created new opportunities for colonization of new regions by humans. While both of these global change actors played significant roles in species extinction this study reveals that changing climate was a significant force driving this mass extinction.

"Until now global evidence to support the climate change argument has been lacking, a large part of existing evidence was based on local or regional estimates between numbers of extinctions, dates of human arrivals and dates of climate change," said Dr Nogues-Bravo.

"Our approach is completely different. By dealing with the issue at a global scale we add a new dimension to the debate by showing that the impact of climate change was not equal across all regions, and we quantify this to reveal each continent's "footprint of climate change."

The study shows that climate change had a global influence over extinctions throughout the late quaternary, but the level of extinction seems to be related to each continent's footprint of climate change. When comparing continents it can then be seen that in Africa, where the climate changed to a relatively lesser extent there were fewer extinctions. However, in North America, more species suffered extinction, as reflected by a greater degree of climate change.

A key piece of evidence in the humans versus climate debate is the size of the extinct mammals. It has always been assumed that humans mainly impacted on populations of large mammals, while if climate change played the key role there should be evidence of large impacts on small mammals as well as the larger animals.

The team's results show that continents which suffered larger climate change impacts suffered larger extinctions of small mammals and viceversa, further strengthening the idea that climate change was a key factor in controlling past extinctions on a global scale.

This research has important implications for the current study of climate change, not only in revealing the role of the climate in causing extinction in mammals, but also by demonstrating how the effect will be different across regions and continents.

"Our results show that continents with the highest 'climate footprints' witnessed more extinctions then continents with lower 'climate footprints'. These results are consistent across species with different body masses, reinforcing the view that past climate changes contributed to global extinctions."

"While climate change is not the only factor behind extinction, past, present or future, we cannot neglect in any way that climate change, directly or indirectly, is a crucial actor to understand past and future species extinctions.", said Miguel Araújo, a co-author of the paper from the National Museum of Natural Sciences in Spain.

Match Making

By C. CLAIBORNE RAY

Q. Is a voice print as distinctive as a fingerprint, or have I just been watching too much "24"?

A. Comparing fingerprints and so-called voice prints is a matter of apples and oranges, experts at the National Institute of Standards and Technology said. Two groups at the institute have been working with fingerprints and speaker recognition for decades, but a direct scientific comparison has not been made, they said.

Scientists have been able to formulate distinctiveness in the case of DNA, but definitive research has yet to provide a similar formulation for a fingerprint or a voice.

Victoria Roberts

Voice identifications on TV, with unique features represented as dots on a fancy graph, are oversimplifications, and in practical use, the experts agreed, fingerprints are well ahead of voice.

Fingerprint identification is based on standard images and standard features from visual samples, while voice identification uses a different kind of data, converting sound signals into a digital stream of samples. The theory behind unique voice features and even the duration of a standard voice sample are still being studied. The standards and technology institute is working to fill this standardization void and last year invited researchers to a pioneering Voice Biometric Symposium.

Techniques used in voice-based security systems usually rely on matching a set of prerecorded words, which is not practical in analyzing a wiretapped conversation. Other problems with voice recognition were discussed in a 2005 article in the F.B.I. Law Enforcement Bulletin, "Person Authentication by Voice: A Need for Caution."

Why deep-water oil spills do their damage deep down

* 16:03 18 May 2010 **by Phil McKenna**

Surface slicks may account for as little as 2 per cent of the oil now spilling into the Gulf of Mexico, according to a study of a controlled deep-water spill conducted in 2000 by the US Minerals Management Service and a consortium of oil companies, including BP.

The study challenges the estimate by federal officials, based on the amount of oil on the sea surface, that around 5000 barrels (800 cubic metres) of oil per day are pouring into the sea from the site where the BP-operated drilling rig Deepwater Horizon was destroyed by fire last month. It also adds weight to reports of massive underwater oil plumes that government officials are now downplaying.

In June 2000, Project Deep Spill released hydrocarbons into the sea off the coast of Norway at a depth of about 800 metres. The tests included releases of 60 cubic metres of crude oil and 60 cubic metres of diesel fuel over separate 1-hour periods. Researchers were unable to calculate the amount of crude oil that surfaced because it emulsifies or mixes with water. They did, however, determine that only between 2 and 28 per cent of the diesel fuel that was released rose to the surface. The average was 8.7 per cent.

Under a controlled, well-monitored experiment, you couldn't find it all, says environmental engineer Eric Adams of the Massachusetts Institute of Technology. "Now you've gone deeper by a factor of 2, with a more violent release; it's not surprising that you might not see it all."

The large percentage of diesel fuel that went missing in the 2000 study was put down to evaporation and natural dispersion. In a 2005 review of the experiment, however, Adams suggests that much of the diesel fuel and crude oil remained submerged in the form of droplets that only slowly made their way to the surface.

In the Deepwater Horizon spill, the chances of oil remaining below the surface are even greater, Adams says. If oil mixes with water at depth, the high density of this water can balance out the hydrocarbons' natural buoyancy. "It can reach a point where the aggregate density of water and oil is neutral to its surrounding environment."

The result could be large quantities of oil remaining suspended in the water column in droplet form. The recent addition of chemical dispersants injected into the plume at depth is likely to encourage this.

Massive subsurface oil plumes have been reported from the Deepwater Horizon spill by the research vessel Pelican, including one up to 90 metres thick that extends for 16 kilometres by 4.8 kilometres. Researchers aboard the Pelican also reported a 30 per cent reduction in oxygen levels in waters near some of the plumes.

But the National Oceanic and Atmospheric Administration, which funds the Pelican, has called the reports misleading and premature. NOAA's Charlie Henry says it is "totally untrue" to call the plumes – samples of which reveal them to be transparent – layers of oil. NOAA also says the reduction in oxygen is not marked enough to be of concern.

Carys Mitchelmore of the University of Maryland's Chesapeake Biological Laboratory says a 30 per cent reduction in oxygen would be "highly significant" to some species. Toxicologists, she says, need detailed information on the chemical make-up, concentration, movement and longevity of the suspended hydrocarbons.

So far, federal agencies haven't been forthcoming, Mitchelmore says. "We don't even know how much oil is being released."

Life in the Third Realm

By OLIVIA JUDSON

It’s that time of the month again. Yes: it’s time for Life-form of the Month. In case you’ve forgotten, this coming Saturday is International Day for Biological Diversity, a day of celebrations and parties to appreciate the other occupants of the planet. So if you do nothing else this weekend, drink a toast to “Other Life-forms!” In honor of this event, my nomination for Life-form of the Month: May is a group of abundant and fascinating beings that are undeservedly obscure: the archaea.

Say who?

Archaea are single-celled microbes with a reputation for living in tough environments like salt lakes, deep sea vents or boiling acid. One strain can grow at temperatures as high as 121 degrees Celsius (249.8 degrees Fahrenheit), a heat that kills most organisms; others thrive at the seriously acidic pH of zero.

They are not restricted to life at the fringes, however. As we have learned how to detect them, archaea have turned up all over the place. One survey estimated that they account for as much as 20 percent of all microbial cells in the ocean, and they’ve been discovered living in soil, swamps, streams and lakes, sediments at the bottom of the ocean, and so on. They are also routinely found in the bowels of the Earth - and the bowels of animals, including humans, cows and termites, where they produce methane. Indeed, the archaeon known as Methanobrevibacter smithii may account for as much as 10 percent of all the microbial cells living in your gut.

But here's the thing. The tree of life falls into three big lineages, or realms of life. (Confession: the technical term is "domains," not "realms," but I'm taking poetic license.) The most familiar realm comprises the eukaryotes - which is the blanket term for most of the organisms we are familiar with, be they mushrooms, water lilies, tsetse flies, humans or the single-celled beasties that cause malaria. Eukaryotes have many distinguishing features, including the fact that they keep their genes in a special compartment known as the cell nucleus.

The second member of the trinity is made up of bacteria. We tend to associate bacteria with disease - for they can cause a range of nasty infections, including pneumonia, syphilis, leprosy, tuberculosis and the like. But in fact, most bacteria lead blameless lives (some of which I have written about in previous columns). There are many differences between eukaryotes and bacteria; but one of the most obvious is that bacteria do not sequester their DNA in a cell nucleus.

The third great lineage of living beings is the archaea. At first glance, they look like bacteria - and were initially presumed to be so. In fact, some scientists still classify them as bacteria; but most now consider that there are enough differences between archaea and bacteria for the archaea to count as a separate realm.

The most prominent of these differences lies in the structure of the ribosome - the piece of cellular machinery that is responsible for turning the information contained in DNA into proteins. Indeed, it was the discovery of the archaeal ribosome by the biologist Carl Woese in the 1970s that led to their being recognized as the third branch of the tree of life.

What else sets them apart? They sometimes come in peculiar shapes: Haloquadratum walsbyi is rectangular, for example. Some archaea are ultra-tiny, with cell volumes around 0.009 cubic microns. (For comparison, human red blood cells have a volume of around 90 cubic microns. A micron is a millionth of a meter - which is extremely small.)

More diagnostic: archaeal cell membranes have a different structure and composition from those of bacteria or eukaryotes. And although archaea organize their DNA much as bacteria do (they also have no cell nucleus, for example), many aspects of the way the DNA gets processed are distinctly different. Instead, the processing is more similar to what goes in within eukaryotic cells. Archaea also have large numbers of genes that are not found in the other groups.

But to me their most telling feature is that they have their own set of extremely weird viruses. Not only do archaeal viruses also come in odd shapes - some of them look like little bottles - but the set of genes they have is unlike that of viruses that parasitize bacteria or eukaryotes. In other words, viruses can also be divided into three big groups: those that attack bacteria, those that attack eukaryotes and those that attack archaea.

The archaea still hold many mysteries. Few of them can be grown in the laboratory, so they are hard to study in detail; many of them are known from their DNA alone. Moreover, their exact position on the tree of life - when they evolved relative to the other two groups - remains disputed. Yet it may be that archaea feature in our ancestry: according to one view, eukaryotes themselves evolved from an ancient fusion between a bacterium and an archaeon.

But whether this is the case, or whether they are merely co-occupants of the planet, let's hear it for these Other Life-forms!

Team led by Scripps Research scientists discovers body's own molecular protection against arthritis

The results may lead to new approach to therapies for joint disease

LA JOLLA, CA – An international team of scientists from The Scripps Research Institute in California and the National Research Institute for Child Health and Development in Japan has discovered that a natural molecule in the body counters the progression of osteoarthritis. The findings could one day lead to new therapies for some common diseases of aging. The study was published in an advanced, online issue of the journal Genes & Development on May 13, 2010, and will be featured as the cover story of the June 1 print edition of the journal.

The molecule the team studied, microRNA 140 (miR-140), is part of a recently discovered category of genetic molecules -"microRNAs" or "non-coding RNAs" which do not code for proteins, yet often play a vital role in gene expression.

"This is the first report showing the critical role of a specific non-coding RNA in bone development," said Hiroshi Asahara, M.D., Ph.D., associate professor of molecular and experimental medicine at Scripps Research. "Moreover, surprisingly, we observed that microRNA 140 acts against arthritis progression. This is among the first evidence that non-coding RNA plays a key role in age-dependent diseases."

"This finding may lead to a new therapeutic strategy for osteoarthritis," said Shigeru Miyaki, senior research associate in the Asahara lab and first author of the paper with Tempei Sato of the National Research Institute

for Child Health and Development, "as well as for conditions that share a similar mechanism, such as spinal disc degeneration."

Broad Impact

Even in comparison with other diseases of aging, osteoarthritis has a remarkably broad impact. Currently affecting about 15 to 20 million Americans, osteoarthritis is the most common joint disorder and is expected to increase by 50 percent over the next two decades with the aging of the population. With no effective treatments, current management strategies for osteoarthritis focus on reducing pain and inflammation.

Osteoarthritis, also known as degenerative arthritis, is a disease that affects joint cartilage, the major weight-bearing "cushion" in joints. The disease results from a combination of wear and tear on cartilage and underlying age-related changes that causes cartilage to deteriorate. Joint trauma can also play a role. Osteoarthritis commonly affects the hands, spine, hips, and knees.

Asahara and other members his laboratory were interested in the question of why some people's joints age normally, while others' spiral toward disease. The scientists suspected that microRNA could play a role. Once thought of as mere genetic helpers, microRNAs are now known to prevent proteins from being produced by messenger RNA, thus acting as an important layer of regulation for biological processes.

"Recent research findings indicate that non-coding RNA should be involved in our development and in diseases," said Asahara, "but we know little about the role of the non-coding RNA for age-related adult disorders."

Breaking New Ground

The team's interest in one type of microRNA in particular, miR-140, was piqued by other work ongoing in the lab, which was published last year. In this study, the team made the observation that miR-140 - which is only expressed in cartilage—was reduced in cartilage samples from osteoarthritis patients. This led the team to hypothesize that miR-140 is a regulator in osteoarthritis pathology. To test this idea, the team tried for several years to make targeted "knockout" mouse models that lacked miR-140. They finally succeeded.

With models lacking miR-140, the scientists were able to figure out its effects. Since the animals lacking miR-140 were short in stature, the scientists concluded that miR-140 affected bone formation during development. The mutant mice were also particularly prone to developing osteoarthritis, suggesting that miR-140 retarded the disease. In contrast, the scientists found, transgenic mice that overexpressed miR-140 were resistant to developing the condition.

The team's findings fit in well with other recent research showing that an enzyme called Adamts-5 is necessary for osteoarthritis progression; miR-140 is known to regulate Adamts-5.

The team continues to investigate to learn more about the factors that control miR-140, the proteins it affects, and potential drugs that might influence its action.

In addition to Asahara, Miyaki, and Sato, authors of the paper "MicroRNA-140 plays dual roles in both cartilage development and homeostasis," are Atsushi Inoue, Yoshiaki Ito, Shigetoshi Yokoyama, Fuko Takemoto, Tomoyuki Nakasa, Satoshi Yamashita, Shuji Takada, and Hiroe Ueno-Kudo of the National Research Institute for Child Health and Development in Japan, Yoshio Kato of the National Institute of Advanced Industrial Science and Technology in Japan, and Shuhei Otsuki and Martin Lotz of Scripps Research.

U.S. sources of funding for this project included the National Institutes of Health, the Arthritis National Research Foundation, and the Arthritis Foundation. Japanese sources of funding included the Japanese Ministry of Health, Labor, and Welfare; the Genome Network Project; National Institute of Biomedical Innovation, Research on Child Health and Development; and The Japan Health Sciences Foundation.

Greenland rapidly rising as ice melt continues

Scientists from the University of Miami are surprised at how rapidly the ice is melting in Greenland and how quickly the land is rising in response. Their findings are published in Nature Geoscience

VIRGINIA KEY, FL - Greenland is situated in the Atlantic Ocean to the northeast of Canada. It has stunning fjords on its rocky coast formed by moving glaciers, and a dense icecap up to 2 km thick that covers much of the island--pressing down the land beneath and lowering its elevation. Now, scientists at the University of Miami say Greenland's ice is melting so quickly that the land underneath is rising at an accelerated pace.

According to the study, some coastal areas are going up by nearly one inch per year and if current trends continue, that number could accelerate to as much as two inches per year by 2025, explains Tim Dixon, professor of geophysics at the University of Miami Rosenstiel School of Marine and Atmospheric Science (RSMAS) and principal investigator of the study.

"It's been known for several years that climate change is contributing to the melting of Greenland's ice sheet," Dixon says. "What's surprising, and a bit worrisome, is that the ice is melting so fast that we can actually

see the land uplift in response," he says. "Even more surprising, the rise seems to be accelerating, implying that melting is accelerating."

Dixon and his collaborators share their findings in a new study titled "Accelerating uplift in the North Atlantic region as an indicator of ice loss," The paper is now available as an advanced online publication, by Nature Geoscience. The idea behind the study is that if Greenland is losing its ice cover, the resulting loss of weight causes the rocky surface beneath to rise. The same process is affecting the islands of Iceland and Svalbard, which also have ice caps, explains Shimon Wdowinski, research associate professor in the University of Miami RSMAS, and co-author of the study.

"During ice ages and in times of ice accumulation, the ice suppresses the land," Wdowinski says. "When the ice melts, the land rebounds upwards," he says. "Our study is consistent with a number of global warming indicators, confirming that ice melt and sea level rise are real and becoming significant."

Using specialized global positioning system (GPS) receivers stationed on the rocky shores of Greenland, the scientists looked at data from 1995 onward. The raw GPS data were analyzed for high accuracy position information, as well as the vertical velocity and acceleration of each GPS site.

The measurements are restricted to places where rock is exposed, limiting the study to coastal areas. However, previous data indicate that ice in Greenland's interior is in approximate balance: yearly losses from ice melting and flowing toward the coast are balanced by new snow accumulation, which gradually turns to ice. Most ice loss occurs at the warmer coast, by melting and iceberg calving and where the GPS data are most sensitive to changes. In western Greenland, the uplift seems to have started in the late 1990's.

Melting of Greenland's ice contributes to global sea level rise. If the acceleration of uplift and the implied acceleration of melting continue, Greenland could soon become the largest contributor to global sea level rise, explains Yan Jiang, Ph.D. candidate at the University of Miami RSMAS and co-author of the study.

"Greenland's ice melt is very important because it has a big impact on global sea level rise," Jiang says. "We hope that our work reaches the general public and that this information is considered by policy makers."

This work was supported by the National Science Foundation and NASA. The team plans to continue its studies, looking at additional GPS stations in sensitive coastal areas, where ice loss is believed to be highest.

In an Ancient Mexican Tomb, High Society

By JOHN NOBLE WILFORD

Last month, in their second season at the site of an ancient settlement in southern Mexico, archaeologists digging into the ruins of a pyramid came upon a row of large, flat stones — the wall of a tomb. Inside, they found skeletons of a prominent man, possibly a ruler, and two human sacrifices. Another apparently elite adult was on a landing just outside the tomb.

The archaeologist in charge, Bruce R. Bachand of Brigham Young University in Utah, determined from the style of ceremonial pottery in the tomb that the burials occurred about 2,700 years ago. He said that could be several centuries earlier than any richly decorated burials previously found in Mesoamerican pyramids.

Dr. Bachand said recently in an interview by telephone from the site that the two principal skeletons bore the hallmarks of persons “at the very top of society.” The one in the tomb was coated with red pigment and adorned with hundreds of jade ornaments, the teeth inlaid with white jade or marine shell. The skeleton outside the tomb, possibly that of a woman, was decorated with jade, pearl and amber, and the upper teeth inlaid with pyrite, commonly known as fool’s gold. The sacrificial skeletons, an adult and a child, were unadorned and lacked ritual offerings.

Anthropologists who specialize in pre-Columbian cultures of Mexico and Central America said it was premature to assess the find’s full significance but agreed with Dr. Bachand that it was an important early example of social ranking in the region’s cultures and the rising political centralization under chiefs.

The discovery was made near the top of a 30-foot-tall pyramid, the highest structure at the central plaza of the ancient site at Chiapa de Corzo in the state of Chiapas, not far from the Guatemala border. The excavations were supported by the National Geographic Society.

The tomb raised a difficult question: What culture was responsible for it? At the time, around 700 B.C., the region was occupied by several societies trading and raiding, exchanging traditions and ceramics and otherwise interacting. Their elites forged alliances and perhaps intermarried.

The Olmec, renowned for their monumental sculpture, spread their influence far inland from their base on the Gulf Coast and were once thought to be the dominant culture. The Maya were emerging in the south. Around Oaxaca, the Zapotec were creating an advanced culture. And Chiapas was home then, as it still is, to people sharing the Zoque language.

Dr. Bachand noted that many artifacts in the tomb were similar or identical to those found at the imposing Olmec ruins of La Venta, in Tabasco. “Did these people come from La Venta?” he said. “Or were they local people who simply reflected their interactions with the Olmec? This is the $10 million question.”

But aspects of the burials differed from the Olmec culture, he said. Some pottery and ritual practices appeared to be in an indigenous style. The tomb’s construction — a stone wall on one side, clay on the others — was unlike that of the few known Olmec tombs.

In a preliminary interpretation, Dr. Bachand said the culture of the tomb builders had Olmec roots, suggesting a need for further research at La Venta. But he raised the possibility that the discovery evoked beginnings of a distinct Zoque culture, in which case, he said, the origin of some early Mesoamerican traditions may not be Olmec or Maya but Zoque, a previously underrated society.

Elsa M. Redmond, an anthropologist at the American Museum of Natural History in New York, said evidence from the Chiapa de Corzo tomb “definitely supports” an emergent consensus among Mesoamerican scholars that the Olmec influence in this formative period, though widespread, was not singular. The view of the Olmec as a “mother culture,” she said, has been generally replaced by a “sister culture” model.

This school of thought, elaborated by Kent V. Flannery and Joyce Marcus, anthropologists at the University of Michigan, holds that many contemporaneous cultures in ancient Mexico shared technologies and traditions arising not so much from one source, like the Olmec, as from independent responses to needs and beliefs or through a complex mix of social and economic interactions.

In these “parallel developments,” Dr. Redmond said, “similar kinds of architecture, ritual and elaborate tomb paraphernalia appeared in their particular cultures.”

She praised Dr. Bachand’s excavations at a site that has long been neglected, and was curious to find out the identity of the woman on the landing beyond the inner sanctum. If she was the ruler’s wife, as her lavish accouterments might indicate, why was she left to spend eternity outside her husband’s tomb?

An explosive pair

The discovery of a new type of supernova may shed light on some universal mysteries

Not all explosions are created equal: It's as true for film effects as it is for the stars. Yet, until now, scientists had only observed two basic kinds of exploding stars, known as supernovae. Now, scientists at the Weizmann Institute of science, in collaboration with others around the world, have identified a third type of supernova. Their findings appeared this week in Nature.

The first two types of supernova are either hot, young giants that go out in a violent display as they collapse under their own weight, or old, dense white dwarves that blow up in a thermonuclear explosion. The new supernova appeared in telescope images in early January, 2005 and scientists, seeing that it had recently begun the process of exploding, started collecting and combining data from different telescope sites around the world, measuring both the amount of material thrown off in the explosion and its chemical makeup. But Dr. Avishay Gal-Yam, Hagai Perets, (now at the Harvard-Smithsonian Center for Astrophysics), Iair Arcavi and Michael Kiewe of the Weizmann Institute's Faculty of Physics, together with Paolo Mazzali of the Max-Planck Institute for Astrophysics, Germany, and the Scuola Normale Superiore, Pisa, and INAF/Padova Observatory in Italy, Prof. David Arnett from the University of Arizona, and researchers from across the USA, Canada, Chile and the UK, soon found that the new supernova did not fit either of the known patterns.

On the one hand, the amount of material hurled out from the supernova was too small for it to have come from an exploding giant. In addition, its location, distant from the busy hubs where new stars form, implied it was an older star that had had time to wander off from its birthplace. On the other hand, its chemical makeup didn't match that commonly seen in the second type. 'It was clear,' says the paper's lead author Perets, 'that we were seeing a new type of supernova.' The scientists turned to computer simulations to see what kind of process could have produced such a result.

The common type of exploding white dwarf (a type Ia supernova) is mainly made up of carbon and oxygen, and the chemical composition of the ejected material reflects this. The newly-discovered supernova had unusually high levels of the elements calcium and titanium; these are the products of a nuclear reaction involving helium, rather than carbon and oxygen. 'We've never before seen a spectrum like this one,' says Mazzali. 'It was clear that the unique chemical composition of this explosion held an important key to understanding it.' Where did the helium come from? The simulations suggest that a pair of white dwarves are involved; one of them stealing helium from the other. When the thief star's helium load rises past a certain point, the explosion occurs. 'The donor star is probably completely destroyed in the process, but we're not quite sure about the fate of the thief star,' says Gal-Yam.

The scientists believe that several other previously observed supernovae may fit this pattern. In fact, these relatively dim explosions might not be all that rare; if so, their occurrence could explain some puzzling

phenomena in the universe. For example, almost all the elements heavier than hydrogen and helium have been created in, and dispersed by supernovae; the new type could help explain the prevalence of calcium in both the universe and in our bodies. It might also account for observed concentrations of particles called positrons in the center of our galaxy. Positrons are identical to electrons, but with an opposite charge, and some have hypothesized that the decay of yet unseen 'dark matter' particles may be responsible for their presence. But one of the products of the new supernova is a radioactive form of titanium that, as it decays, emits positrons. 'Dark matter may or may not exist,' says Gal-Yam, 'but these positrons are perhaps just as easily accounted for by the third type of supernova.'

Dr. Avishay Gal-Yam's research is supported by the Nella and Leon Benoziyo Center for Astrophysics; the Yeda-Sela Center for Basic Research; the Peter and Patricia Gruber Awards; the Legacy Heritage Fund Program of the Israel Science Foundation; the Minerva Foundation with funding from the Federal German Ministry for Education and Research; and Miel de Botton Aynsley, UK.

Popular autism diet does not demonstrate behavioral improvement

Tightly controlled study saw no benefits for sleep, attention and bowel function

A popular belief that specific dietary changes can improve the symptoms of children with autism was not supported by a tightly controlled University of Rochester study, which found that eliminating gluten and casein from the diets of children with autism had no impact on their behavior, sleep or bowel patterns.

The study is the most controlled diet research in autism to date. The researchers took on the difficult yet crucial task of ensuring participants received needed nutrients, as children on gluten-free, casein-free diets may eat inadequate amounts of vitamin D, calcium, iron and high quality protein. Unlike previous studies, they also controlled for other interventions, such as what type of behavioral treatments children received, to ensure all observed changes were due to dietary alterations. Past studies did not control for such factors. And although no improvements were demonstrated, the researchers acknowledged that some subgroups of children, particularly those with significant gastrointestinal (GI) symptoms, might receive some benefit from dietary changes.

"It would have been wonderful for children with autism and their families if we found that the GFCF diet could really help, but this small study didn't show significant benefits," said Susan Hyman, M.D., associate professor of Pediatrics at Golisano Children's Hospital at the University of Rochester Medical Center (URMC) and principal investigator of the study which will be presented Saturday (May 22) at the International Meeting for Autism Research in Philadelphia. "However, the study didn't include children with significant gastrointestinal disease. It's possible those children and other specific groups might see a benefit."

In response to widespread parent-reported benefits, URMC initiated the trial in 2003 to scientifically evaluate the effects of the gluten-free and casein-free diet, which eliminates wheat, rye, barley and milk proteins. Parent observation has played an important role in earlier treatment discoveries in children with autism, such as melatonin's benefits for sleep.

Hyman's study enrolled 22 children between 2 ½- and 5 ½-years-old. Fourteen children completed the intervention, which was planned for 18 weeks for each family. The families had to strictly adhere to a gluten-free and casein-free diet and participate in early intensive behavioral intervention throughout the study. Children were screened for iron and vitamin D deficiency, milk and wheat allergies and celiac disease. One child was excluded because of a positive test for celiac disease and one was excluded for iron deficiency. Other volunteers who were excluded were unable to adhere to the study requirements. The children's diets were carefully monitored throughout the study to make sure they were getting enough vitamin D, iron, calcium, protein and other nutrients.

After at least four weeks on the strict diet, the children were challenged with either gluten, casein, both or placebo in randomized order. They were given a snack once weekly with either 20 grams of wheat flour, 23 grams of non fat dried milk, both, or neither until every child received each snack three times. The type of snack was given in randomized order and presented so that no one observing – including the family, child, research staff and therapy team – knew what it contained. The snacks were carefully engineered to look, taste and feel the same, which was an exercise in innovative cooking. In addition, the nutrition staff worked closely with the families to make a snack that met their child's preferences. Casein was disguised in pudding, yogurt or smoothies and gluten in banana bread, brownies, or cookies depending on the child's food preferences.

Parents, teachers and a research assistant filled out standardized surveys about the child's behavior the day before they received the snack, at two and 24 hours after the snack. (If the child's behavior wasn't usual at the scheduled snack time, the snack would be postponed until the child was back to baseline.) In addition, the parents kept a standard diary of food intake, sleep and bowel habits. Social interaction and language were evaluated through videotaped scoring of a standardized play session with a research assistant.

Following the gluten and casein snacks, study participants had no change in attention, activity, sleep or frequency or quality of bowel habits. Children demonstrated a small increase in social language and interest in interaction after the challenges with gluten or casein on the Ritvo Freeman Real Life Rating Scale; however, it did not reach statistical significance. That means because of the small difference and the small number of participants in the study, the finding may be due to chance alone.

The investigators note that this study was not designed to look at more restrictive diets or the effect of nutritional supplements on behavior. This study was designed to look at the effects of the removal of gluten and casein from the diet of children with autism (without celiac disease) and subsequent effect of challenges with these substances in a group of children getting early intensive behavioral intervention.

Hyman said, "This is really just the tip of the iceberg. There are many possible effects of diet including over- and under-nutrition, on behavior in children with ASD that need to be scientifically investigated so families can make informed decisions about the therapies they choose for their children."

This study was funded by the NIH's National Institutes of Mental Health Studies to Advance Autism Treatment Research and National Center for Research Resources (NCRR).

Easily blocked signaling protein may help scientists stop parasites

Researchers at Washington University School of Medicine in St. Louis have identified a parasite protein that has all the makings of a microbial glass jaw: it's essential, it's vulnerable and humans have nothing like it, meaning scientists can take pharmacological swings at it with minimal fear of collateral damage.

The protein, calcium dependent protein kinase 1 (CDPK1), is made by Toxoplasma gondii, the toxoplasmosis parasite; cryptosporidium, which causes diarrhea; plasmodium, which causes malaria; and other similar parasites known as apicomplexans.

In the May 20 issue of Nature, researchers report that genetically suppressing CDPK1 blocks the signals that toxoplasma parasites use to control their movement, preventing them from moving in and out of host cells. They also found that toxoplasma's version of CDPK1 is easier to disable than expected and identified a compound that effectively blocks its signaling ability.

"Kinases are proteins that are common throughout biology, but the structures of CDPKs in apicomplexans much more closely resemble those found in plants than they do those of animals," says senior author L. David Sibley, PhD, professor of molecular microbiology. "We showed that these differences can be exploited to identify potent and specific inhibitors that may provide new interventions against disease."

Infection with toxoplasma is most familiar to the general public from the recommendation that pregnant women avoid changing cat litter. Cats are commonly infected with the parasite, as are many livestock and wildlife. Humans also can become infected by eating undercooked meat or by drinking water contaminated with spores shed by cats.

Epidemiologists estimate that as many as one in every four humans worldwide is infected with toxoplasma. Infections are typically asymptomatic, only causing serious disease in patients with weakened immune systems. In some rare cases, though, infection in patients with healthy immune systems leads to serious eye or central nervous system disease, or congenital defects in the fetuses of pregnant women.

Sibley studies toxoplasma both to find ways to reduce human infection rates and as a model for learning about other apicomplexans, such as plasmodium, that are more significant sources of disease and death.

The new study, led by graduate student Sebastian Lourido, began as an effort to determine what CDPK1 does for toxoplasma. Researchers genetically modified the parasite, eliminating its normal copy of CDPK1 and replacing it with a version of the gene that they could turn on and off. When they turned the new gene off, they found that they had paralyzed the parasite, preventing it from moving and from breaking into and out of host cells. Turning the gene back on restored these abilities.

Further tests revealed that CDPK1 controls toxoplasma's ability to secrete microneme proteins, sticky proteins that act as handholds and allow the parasites to move about their environment and pass through host cell membranes.

In a separate collaborative paper published earlier this month in Nature Structural and Molecular Biology, scientists in the laboratory of co-author Raymond Hui, PhD, principal investigator of parasitology at the Structural Genomics Consortium of the University of Toronto, determined the three dimensional structure of the CDPK1 protein. Researchers found that the area drugs would normally bind in order to disable the protein was more accessible than in virtually all other kinases, including those that control signaling in humans.

"To our surprise, CDPK1 just has a naturally large keyhole for inhibitors to slide into," Lourido says. "This good fortune allowed us to exploit bulky kinase inhibitors that had been previously pioneered by the laboratory of Kevan Shokat, PhD, professor of cellular and molecular pharmacology at the University of California, San Francisco, and a Howard Hughes Medical Institute investigator."

When tested on parasites, the bulky inhibitors successfully blocked CDPK1 function and parasite infectivity without affecting human cells.

Lourido suspects CDPK1 may play a similar role in plasmodium, but its version of the protein is predicted to be harder to selectively target with inhibitors. Little is known about what CDPK1 does in cryptosporidium, but since it shares close similarity to toxoplasma, it may also be essential and susceptible to inhibition by similar compounds.

Sibley and Lourido plan to learn more of the details of how CDPK1 controls microneme secretion, using toxoplasma as a model to study the functions of parasites and how they differ from human cells. The successful toxoplasma inhibitor is now undergoing further testing in animals to see if it can eventually be adapted for clinical use to prevent infection in humans.

Lourido S, Shuman J, Zhang C, Shokat KM, Hui R, Sibley LD. Calcium-dependent protein kinase 1 is an essential regulator of exocytosis in Toxoplasma. Nature, May 20, 2010.

Funding from the American Heart Association and the National Institutes of Health supported this research.

More than 60 percent of teachers have voice problems

Researchers at the University of Malaga (UMA) have analysed the presence of voice disorders in male and female teachers, in order to obtain a representative statistic: 62.7% of the Early Childhood and Primary Education teaching body suffer from these complaints on a daily or weekly basis.

Professions such as teaching require a high resistance to voice fatigue to be able to deal with vocal overload. "Our aim was to analyse the vocal problems of Early Childhood and Primary Education teachers, and the psychosocial dimensions associated with said disorders in Spain", Rosa Bermúdez, main author of the study and researcher at UMA, explains to SINC.

During the 2004-05 academic year, the scientists studied 282 teachers from 51 public education centres in the Malaga capital, which represented 13% of the teaching population of this sector. To do so, they used two types of questionnaire: one created expressly to assess the profile of voice problems caused by the work of the teachers, and the ISTAS-21 on psychosocial risk factors in the workplace.

The results, which appear in the magazine Folia Phoniatrica et Logopaedica, indicate that 62.7% of male and female teachers experience voice problems on a daily or weekly basis, and state that their work involves more psychological demands and less personal and professional compensation.

As regards the psychosocial compensations of the work, the teaching staff with vocal problems perceive less social support from their colleagues and superiors, less control and influence over decisions, more role conflict, less respect for their work and more insecurity in their duties. Furthermore, the evaluation of the leadership capacity of their superiors was also reduced.

"We have observed a psychosocial work model characterised by an imbalance between professional demands and compensations", highlights Bermúdez, for whom "this combination of great effort and little reward creates cognitive, somatic and behavioural stress, as well as worse indicators of health and professional satisfaction".

For this reason, "it is advisable to promote more institutional policies and changes which favour prevention, in order to reduce the vocal and psychosocial health risks present in the teaching sector", the researcher points out.

Being a teacher isn't such a cushy job

Teaching is an occupation that presents a high risk of developing vocal problems, since the voice is the main tool in interactions with the students, and it is used for long periods of time and in noisy environments. Teachers frequently have to adapt their phonatory pattern to the size of the classroom, its acoustic set-up, the type of audience, the air quality and changes in humidity and temperature.

"Taking into account that the main factors affecting the vocal health of teachers are occupational, these vocal disorders must be prevented, diagnosed and treated as a disease with a professional origin, as has been recommended by the EU for decades", Bermúdez concludes.

It appears as such in the Spanish legislation since 2006, when "laryngeal nodules" were acknowledged as a professional illness of teachers, call centre operators, singers, actors and broadcasters (RD 1299/2006).

***References**: Rosa Bermúdez de Alvear, Ginés Martínez Arquero, Javier Barón López, Antonio Hernández Mendo. "An Interdisciplinary Approach to Teachers' Voice Disorders and Psychosocial Working Conditions". Folia Phoniatrica et Logopaedica 2010; 62: 24-34. DOI: 10.1159/000239060.*

Scientists find protein spurs spread of prostate cancer

PHILADELPHIA Researchers from the Kimmel Cancer Center at Jefferson have found that Stat5, a signaling protein previously found to be key to survival of prostate cancer, is also involved in metastasis.

Their study, published in the online edition of Endocrine-Related Cancer, demonstrates in both laboratory and animal models that nuclear Stat5 over-expression leads to a deadly spread of the cancer. They add that their

work with mice was unique in that it was the first time Stat5 was associated with prostate cancer metastasis processes in an animal model.

"Until now, we thought that Stat5 was involved in primarily promoting tumor growth, but this study indicates it could be one of the key players in pushing prostate cancer to spread," said Marja Nevalainen, M.D., Ph.D., associate professor of Cancer Biology, Urology and Medical Oncology at Jefferson Medical College of Thomas Jefferson University. "This seminal paper is sure to open up a new avenue of research, including investigation of therapies that could target Stat5 expression. Fresh approaches are needed since there are no effective therapies for prostate cancer that has metastasized."

This study is just the latest from Dr. Nevalainen's laboratory to show the increasing importance of the Stat5 transcription factor – a protein that can regulate expression of other genes. In 2004, she found that nuclear Stat5 is often over-expressed in high-grade human prostate cancer, and in 2005, she demonstrated that Stat5 activity was associated with recurrence of prostate cancer in patients who had already been treated. She then showed in 2008 that nuclear Stat5 was especially prevalent in recurrent prostate cancers that are resistant to hormone therapy. Her research has also demonstrated that blocking Stat5 in laboratory and in animal models effectively destroyed prostate cancer.

"We know that Stat5 is absolutely critical to the survival of prostate cancer cells," she said.

In this study, the researchers found that Stat5 is activated in 61 percent of distant metastases of clinical human prostate cancers. Gene expression profiling indicated that 21 percent of Stat5-regulated genes were related to metastases, 7.9 percent were related to proliferation, and 3.9 percent were linked to cell death.

Digging deeper, they found that active Stat5 expression induced rearrangement of parts of the cytoskeleton of prostate cancer cells and suppressed expression of proteins that bind cells to each other – activities that help ready a cell to migrate from a tumor.

Then they made a key finding. When they injected human prostate cancer cells that over-expressed Stat5 into mice, they found that the cancer readily spread to the lungs.

"This result is important because laboratory observations on invasiveness or migration of cells in culture do not necessarily translate into cells having the ability to metastasize in animals," Dr. Nevalainen said. "This work provides the first evidence of the involvement of Stat5 in metastatic progression of human prostate cancer cells in a living system."

The findings need to be replicated in other studies, which are now ongoing. She said they want to use other model systems of metastatic prostate cancer to evaluate whether Stat5 is involved in prostate cancer that spreads to the lymph nodes or to bones.

The normal function of Stat5 is also not yet known, Dr. Nevalainen said.

Dr. Nevalainen's collaborators include scientists from Universita degli Studi 'La Sapienza', Rome, Italy; the University of Delaware; the University of Basel, Basel, Switzerland; and University of Turku, Turku, Finland.

The study was funded by the National Cancer Institute, the American Cancer Society, and the U.S. Department of Defense. The authors declare no conflicts of interest.

UGA researchers find daily ginger consumption eases muscle pain

Genevieve di Leonardo

Athens, Ga. – For centuries, ginger root has been used as a folk remedy for a variety of ailments such as colds and upset stomachs. But now, researchers at the University of Georgia have found that daily ginger consumption also reduces muscle pain caused by exercise.

While ginger had been shown to exert anti-inflammatory effects in rodents, its effect on experimentally-induced human muscle pain was largely unexplored, said Patrick O'Connor, a professor in the College of Education's department of kinesiology. It was also believed that heating ginger, as occurs with cooking, might increase its pain-relieving effects.

O'Connor directed two studies examining the effects of 11 days of raw and heat-treated ginger supplementation on muscle pain. Collaborators included Chris Black, an assistant professor of kinesiology at Georgia College and State University in Milledgeville, UGA doctoral student Matt Herring and David Hurley, an associate professor of population health in UGA's College of Veterinary Medicine.

Participants in the studies, 34 and 40 volunteers, respectively, consumed capsules containing two grams of either raw or heat-treated ginger or a placebo for 11 consecutive days. On the eighth day they performed 18 extensions of the elbow flexors with a heavy weight to induce moderate muscle injury to the arm. Arm function, inflammation, pain and a biochemical involved in pain were assessed prior to and for three days after exercise.

The studies showed that daily ginger supplementation reduced the exercise-induced pain by 25 percent, and the effect was not enhanced by heat-treating the ginger.

"The economic and personal costs of pain are extremely high," said O'Connor. "Muscle pain generally is one of the most common types of pain and eccentric exercise-induced muscle pain specifically is a common type of injury related to sports and/or recreation (e.g., gardening). Anything that can truly relieve this type of pain will be greatly welcomed by the many people who are experiencing it."

The study, which will be published in the September issue of The Journal of Pain, is currently available online at www.jpain.org/home. The study was funded by the McCormick Science Institute.

Smallpox finding prompts HIV 'whodunnit'

Health Science In Society

Debora MacKenzie, consultant

People keep blaming the emergence of HIV on science, or at least medicine. For the longest time this came in the form of the claim that it was all due to contaminated polio vaccine. That turned out to be factually groundless. Now a group of scientists in the US thinks it may all be down to the greatest medical intervention of all: the eradication of smallpox.

It's nice timing: that eradication is officially 30 years old this week (to commemorate the event the World Health Organization unveiled this nice little monument yesterday in Geneva, Switzerland). But how could HIV be due to a dearth of smallpox?

Let's start with a fun fact about HIV: to infect white blood cells, most strains need to be able to latch onto a protein on the cells' surface called CCR5. Many people of European descent have a mutated version of CCR5, and resist HIV as a result.

This means that some other viruses that also use CCR5 to get a foot hold in immune cells, including dengue, herpes and measles, can slow down HIV infection, perhaps because they compete for the protein. As smallpox, and vaccinia, the live virus used as a vaccine against smallpox, also use CCR5, Raymond Weinstein at George Mason University in Manassas, Virginia, and colleagues decided to find out if these pathogens could slow HIV infection rates too (Pdf).

They took lymphocytes from 10 people who had been vaccinated against smallpox up to six months previously, and tried to infect those cells, as well as cells from people who had never been vaccinated against smallpox, with HIV.

Fascinatingly, they found that lymphocytes from people vaccinated up to six months earlier - or in preliminary results from a much larger study, 14 months - were up to 10 times less likely to be infected by HIV strains that need to use CCR5. Viruses like measles only interfere with HIV as long as they are there causing their particular disease, but the effect of the vaccinia virus seemed to last months.

The researchers conclude that vaccinia prevents HIV - and that once smallpox was eradicated, and smallpox vaccination wound down, HIV surged as a result.

What's more, the timing of events supports this argument, claim the researchers. HIV started taking off in the 1950s and 1960s just as smallpox vaccination was winding down.

So far, so good... except that this doesn't take geography into account. Sure, smallpox vaccination was winding down in Europe and North America during this period, but not central Africa, which was where HIV was starting to spread. According to the definitive history of smallpox eradication, written by D. A. Henderson, who masterminded the effort, there wasn't much smallpox vaccination at all in the Congo in the 1950s and early 1960s: only in 1969 and 1970 did vaccination surge, winding down some years later.

An explanation that would fit these dates slightly better might be that it was smallpox itself - not the vaccine - that was keeping HIV at bay. The research team does note in their paper that smallpox virus should have the same effect as vaccinia.

I am also not sure that the researchers' suggestion to use vaccinia virus to fend off HIV is a great idea: vaccinia can have deadly side effects.

A more potentially useful observation about HIV and viruses comes from Jennifer Smith of the University of North Carolina in Chapel Hill and colleagues in the 1 June issue of the Journal of Infectious Diseases, in which they report that men with HPV infection on their penis are nearly twice as likely to catch HIV than men without.

They suspect the virus - which causes cervical cancer in women, and genital warts in men and women - attracts lymphocytes to the skin of the penis for HIV to infect, or creates micro-lesions where it can enter.

That's good news, because we have a vaccine for HPV that appears to be completely safe. The team calculates that vaccinating men against HPV could prevent as many cases of HIV as more widely hailed circumcision efforts.

It just goes to show that vaccination - already one of the biggest success stories of medicine - can continue to throw up unexpected benefits.

Sari cloth a simple sustainable protector from cholera

WASHINGTON, DC - A five-year follow up study in Bangladesh finds that women are literally wearing the answer to better health for themselves, their families and even their neighbors. Using the simple sari to filter household water protects not only the household from cholera, but reduces the incidence of disease in neighboring households that do not filter. The results of this study appear in the inaugural issue of mBio™, the first online, open-access journal published by the American Society for Microbiology (ASM).

"A simple method for filtering pond and river water to reduce the incidence of cholera, field tested in Matlab, Bangladesh, proved effective in reducing the incidence of cholera by 48 percent. This follow-up study conducted 5 years later showed that 31 percent of the village women continued to filter water for their households, with both an expected and an unexpected benefit," says Rita Colwell of the University of Maryland, College Park, a researcher on the study.

In 2003, Colwell and her colleagues reported the results of a field study that demonstrated by simply teaching village women responsible for collecting water to filter the water through folded cotton sari cloth, they could reduce the incidence of cholera in that group by nearly half. Though the results were promising at the time of the research, there was concern that the practice of sari water filtration would not be sustained in later years.

Five years later they conducted the follow-up study to determine whether sari water filtration continued to be practiced by the same population of participants and, if it were, whether there would continue to be a beneficial effect of reduced incidence of cholera.

Over 7,000 village women collecting water daily for their households in Bangladesh were selected from the same population used in the previous study. Survey data showed that 31 percent continued to filter their water, of which 60 percent used a sari. Additionally, they found that of the control group (the one that did not receive any education or training in the first study) 26 percent of households now filter their water.

"This is a clear indication of both compliance with instructions and the sustainability of the method, but it also shows the need for continuing education in the appropriate use and benefits of simple filtration," says Colwell.

The researchers also looked at the incidence of cholera in households during the 5-year follow-up period. While not statistically significant, they found the incidence of hospitalizations for cholera during that period reduced by 25 percent.

"With the lower rate of filtration in this follow-up study, it is not surprising that the observed reduction in disease rate was not as high as the 48 percent observed in the original trial, suggesting that active reinforcement would have been effective in ensuring higher protection," says Colwell.

They also found an indirect benefit. Households that did not filter their water but were located in neighborhoods where water filtration was regularly practiced by others also had a lower incidence of cholera.

"Results of the study showed that the practice of filtration not only was accepted and sustained by the villagers but also benefited those who filtered their water, as well as neighbors not filtering water for household use, in reducing the incidence of cholera," says Colwell.

Immaculate creation: birth of the first synthetic cell

* 17:55 20 May 2010 **by Ewen Callaway**

For the first time, scientists have created life from scratch – well, sort of. Craig Venter's team at the J. Craig Venter Institute in Rockville, Maryland, and San Diego, California, has made a bacterial genome from smaller DNA subunits and then transplanted the whole thing into another cell. So what exactly is the science behind the first synthetic cell, and what is its broader significance?

What did Venter's team do?

The cell was created by stitching together the genome of a goat pathogen called Mycoplasma mycoides from smaller stretches of DNA synthesised in the lab, and inserting the genome into the empty cytoplasm of a related bacterium. The transplanted genome booted up in its host cell, and then divided over and over to make billions of M. mycoides cells.

Venter and his team have previously accomplished both feats – creating a synthetic genome and transplanting a genome from one bacterium into another – but this time they have combined the two.

"It's the first self-replicating cell on the planet that's parent is a computer," says Venter, referring to the fact that his team converted a cell's genome that existed as data on a computer into a living organism.

How can they be sure that the new bacteria are what they intended?

Venter and his team introduced several distinctive markers into their synthesised genome. All of them were found in the synthetic cell when it was sequenced.

These markers do not make any proteins, but they contain the names of 46 scientists on the project and several quotations written out in a secret code. The markers also contain the key to the code.

Crack the code and you can read the messages, but as a hint, Venter revealed the quotations: "To live, to err, to fall, to triumph, to recreate life out of life," from James Joyce's A Portrait of the Artist as a Young Man; "See things not as they are but as they might be," which comes from American Prometheus, a biography of nuclear physicist Robert Oppenheimer; and Richard Feynman's famous words: "What I cannot build I cannot understand."

Does this mean they created life?

It depends on how you define "created" and "life". Venter's team made the new genome out of DNA sequences that had initially been made by a machine, but bacteria and yeast cells were used to stitch together and duplicate the million base pairs that it contains. The cell into which the synthetic genome was then transplanted contained its own proteins, lipids and other molecules.

Venter himself maintains that he has not created life . "We've created the first synthetic cell," he says. "We definitely have not created life from scratch because we used a recipient cell to boot up the synthetic chromosome." Whether you agree or not is a philosophical question, not a scientific one as there is no biological difference between synthetic bacteria and the real thing, says Andy Ellington, a synthetic biologist at the University of Texas in Austin. "The bacteria didn't have a soul, and there wasn't some animistic property of the bacteria that changed," he says.

What can you do with a synthetic cell?

Venter's work was a proof of principle, but future synthetic cells could be used to create drugs, biofuels and other useful products. He is collaborating with Exxon Mobil to produce biofuels from algae and with Novartis to create vaccines. "As soon as next year, the flu vaccine you get could be made synthetically," Venter says.

Ellington also sees synthetic bacteria as having potential as a scientific tool. It would be interesting, he says, to create bacteria that produce a new amino acid – the chemical units that make up proteins – and see how these bacteria evolve, compared with bacteria that produce the usual suite of amino acids. "We can ask these questions about cyborg cells in ways we never could before."

What was the cost of creating life?

About $40 million. Cheap for a deity, expensive if you are a lab scientist looking to create your own synthetic bacterium. "This does not look like the sort of thing that's going to be doable by your average lab in the near future," Ellington says.

This reminds me of Frankenstein's monster! Are synthetic cells safe?

Yes. Venter's team took out the genes that allow M. mycoides to cause disease in goats. The bacterium has also been crippled so it is unlikely to grow outside of the lab. However, some scientists are concerned that synthetic organisms could potentially escape into the environment or be used by bioterrorists.

Ellington brushes aside those concerns, noting that the difficulty of engineering cells is beyond the scope of all would-be bioterrorists. "It's not a real threat," he says. "Unless you are Craig Venter with a crew of 20 postdocs you're not going to do this."

However, George Church, a synthetic biologist at Harvard Medical School, is calling for increased surveillance, licensing and added measures to prevent the accidental release of synthetic life. "Everybody in the synthetic biology ecosystem should be licensed like everybody in the aviation system is licensed."

Journal reference: Science, DOI: 10.1126/1190719

Reducing niacin intake can prevent obesity

Dietary factors have long been known to play a major role in the development of obesity. The global increasing prevalence of obesity suggests that there should be some common changes in diet worldwide. In fact, a significant, yet, often neglected worldwide change in dietary factors in the past few decades is the food fortification-induced marked increase in the content of niacin. However, the effect of long-term exposure to excess niacin on human health remains to be unclear.

A research team from China examined the role of excess nicotinamide in glucose metabolism using co-loading of glucose and nicotinamide test. They proved that excess niacin intake-induced biphasic response, i.e., insulin resistance in the early phase and hypoglycemia in the late phase, may be a primary cause for the increased appetite in obesity. Their study will be published on May 21, 2010 in the World Journal of Gastroenterology.

The study also revealed for the first time that the obesity prevalence among US children and adolescents increased in parallel with the increase of the per capita niacin consumption with a 10-year lag, in which niacin fortification-induced sharp increase in niacin contents in grain products may play a major role. Reducing niacin intake and facilitating niacin elimination through sweat-inducing physical activity may be a key factor in the prevention and treatment of obesity.

It seems that the long-term safety of niacin fortification needs to be carefully evaluated.

Reference: Li D, Sun WP, Zhou YM, Liu QG, Zhou SS, Luo N, Bian FN, Zhao ZG, Guo M. Chronic niacin overload may be involved in the increased prevalence of obesity in US children. World J Gastroenterol 2010; 16(19): 2378-2387

Mini-projectors – maximum performance

The number of mini-projector devotees keeps growing. The combination of a new kind of optical structure with high-performance LEDs enables completely new compact and brilliant lighting and projection systems.

Almost no public presentation today is made without projectors. As the years pass, these devices keep getting smaller – and handier. A market with immense growth potential: According to estimates, by 2012 up to 45 million units are expected to sell worldwide. Important: The miniature projectors have to deliver sharp contrasts and clear colors. In his thesis project, „Design and realization of an ultraslim array projector," Marcel Sieler of the Fraunhofer Institute for Applied Optics and Precision Engineering IOF in Jena developed the bases for an entirely new kind of design in order to realize mini-projectors. In recognition of this, he is awarded the 1st Hugo Geiger Prize.

In all current systems of pocket projectors, a single imaging channel is used. This means a minimal size for the projector is a given – and smaller will not work. Except for Marcel Sieler: His construction method relies on a number of regularly ordered micro-lenses – an array – as the projection lens. Thanks to the many channels, the construction length of the entire system can be clearly reduced, without impeding luminosity. A high-performance LED is used as the light source.

In order to achieve this result, in his thesis project, Sieler initially tested and adapted the theoretical basis for the construction of a micro-lens array. He then devised a corresponding system that was characterized in laboratory experiments and tested for its optical performance capacity. Within nine months, Marcel Sieler transformed his idea into the first prototypes. With these, he could display the immense potential of the concept with which both static as well as mobile image contents can be projected. This project required competence in optical design, in microsystem technology - as well as in project management, strength of purpose and personal commitment. Based on Marcel Sieler‘s work, the Fraunhofer-Gesellschaft was able to apply for a basic patent for this new kind of optical system.

Mount Sinai identifies first drug to demonstrate therapeutic effect in a type of autism

Researchers from Mount Sinai School of Medicine have identified a drug that improves communication between nerve cells in a mouse model of Phelan-McDermid Syndrome (PMS). Behavioral symptoms of PMS fall under the autism spectrum disorder category. The research will be presented Friday at the International Meeting for Autism Research (IMFAR) in Philadelphia.

Previous research has shown that a gene mutation in the brain called SHANK3 can cause absent or severely delayed language abilities, intellectual disability, and autism. Mount Sinai researchers developed mice with a mutant SHANK3 gene and observed a lapse in communication between nerve cells in the brain, which can lead to learning problems. This communication breakdown indicated that the nerve cells were not maturing properly.

The researchers then injected the mice with a derivative of a compound called insulin-like growth factor-1 (IGF1), which is FDA-approved to treat growth failure in children. After two weeks of treatment, nerve cell communication was normal and adaptation of nerve cells to stimulation, a key part of learning and memory, was restored.

"The result of IGF1 treatment of these mice is an exciting development on the road to ultimate therapies for individuals with PMS," said Joseph Buxbaum, PhD, Director of the Seaver Autism Center for Research and Treatment at Mount Sinai School of Medicine. "If these data are further verified in additional preclinical studies, individuals with a SHANK3 mutation may benefit from treatments with compounds like this one."

Dr. Buxbaum and his team at the Seaver Autism Center will continue to evaluate the efficacy of IGF1 in mice. Patrick Hof, MD, Professor of Neuroscience at Mount Sinai School of Medicine, will specifically evaluate the effects of the compound on neuroanatomical changes. Additionally, Jacqueline Crawley, PhD, Senior Investigator at the National Institutes of Health, will study the effects on behavioral changes in the mice.

The study was supported by grants from the Seaver Foundation to Dr. Buxbaum, from the Simons Foundation to Drs. Buxbaum, Crawley, Hof, and Zhou, and from William G. Gibson and Paulina Rychenkova, PhD, to Dr. Buxbaum.

When Patients Don’t Fill Their Prescriptions

By PAULINE W. CHEN, M.D.

Not long ago, a doctor friend recounted the story of a patient who had recently died from complications stemming from the treatment of a chronic bleeding problem. “I felt terrible about it,” said my friend, who had cared for the patient for several years. “Something didn’t add up in this case, and I had to wonder if it was my fault, if I had done something wrong.”

Spurred on by these recurrent self-doubts, my friend went back to review the records. Nothing at first glance seemed amiss; all the recommendations, visits and discussions were consistent with what both of us knew was good, evidence-based clinical care.

But then, while reading through the pharmacy records, my friend discovered something unexpected. The patient, it turned out, hadn't been taking all of the medications my friend had prescribed. In fact, several of the prescriptions had never even been filled.

Instead of lifting the guilt, the revelation left my friend feeling worse. "It's not like my patient forgot or skipped a dose. The prescriptions were just never filled." My friend then added: "Why didn't they even tell me? And why didn't I ask?"

Like politics, religion and sex, medication nonadherence, or noncompliance, remains a topic of conversation that most of us try to avoid. While anyone who has ever tried to complete a full course of antibiotics can understand how easy it is to skip, cut down or forget one's medications altogether, bringing the topic up in the exam room feels more like a confession or inquisition than a rational discussion. Few of us want to talk about medication nonadherence, much less admit to it.

For doctors, learning that a patient has been nonadherent can sometimes breed resentment; it feels like a breach of good faith. For patients, there's something frankly discomfiting about telling your doctor you haven't taken the medications as advised. As a nondoctor friend once said, "It's embarrassing. The goal is to get the best care and make things work, but you can't get your act together enough to take your meds."

But medication nonadherence exists. And in good measure and with significant costs. In one study, as many as half of all patients did not follow their doctors' advice when it came to medications. Other studies have shown that patients who were nonadherent with medications for chronic diseases like diabetes and high blood pressure were likely to be sicker, suffer from more complications and have higher mortality rates. The overall cost of medication nonadherence? More than $170 billion annually in the United States alone.
Medication nonadherence undermines even the best cost-saving and clinical intentions of evidence-based care.

Up until more recently, research on nonadherence has focused primarily on what happens once patients have filled their prescriptions. Are they taking their pills regularly? Are they coming back for refills? Now, with the advent of better tracking systems and the more widespread use of electronic medical records, researchers have discovered that medication nonadherence often begins even before the prescription is filled.

Or not.

This past month researchers at Harvard Medical School published the largest study to date of what has been termed "primary nonadherence" and found that more than 20 percent of first-time patient prescriptions were never filled. Comparing the e-prescription data for over 75,000 patients with pharmacy insurance claims, the investigators also discovered that certain patterns of nonadherence exist. First-time prescriptions for chronic diseases like high cholesterol, high blood pressure and diabetes were more likely not to be filled, whereas those for pediatric patients 18 years of age and younger and for antibiotics were more likely to be filled.

"An awful lot of prescriptions doctors write don't end up getting filled," said Dr. Michael A. Fischer, lead author of the study and an assistant professor of medicine at Harvard Medical School. "We knew before that medication adherence was a concern, but we hadn't even studied this part of the prescription process."

While the patients in the study were also less likely to fill prescriptions written by nonprimary care specialists, women physicians, younger physicians and those doctors who were in large practices of nine or more physicians, these differences were relatively minor. According to Dr. Fischer, more important factors contributing to nonadherence are likely affordability, physician-patient communication and the cumbersome process of filling out a prescription.

That process — taking a prescription to a pharmacy or waiting for it to be faxed, getting it filled, then returning to pick it up — likely accounts for differences in prescription fill rates between Dr. Fischer's study and studies conducted in Europe or in the more integrated care systems in the United States. For example, a study published last year examining primary nonadherence among patients enrolled in Kaiser Permanente of Northern California found that only 5 percent did not fill their initial prescriptions. While there is some cost benefit to filling prescriptions at a Kaiser pharmacy, what was probably more important was the relative ease of the process. The patients in this study could retrieve their medications almost immediately and at the same location as their doctor's office. "One wonders if this difference reflects the fact that our system is so fragmented and if better integration would improve adherence rates," Dr. Fischer said.

One key to improving health care integration may be the very data gathering methods that Dr. Fischer and his co-investigators used for their study: the electronic medical records system. While many of the electronic records systems currently in use in clinics and doctors' offices are not designed to improve medication

adherence, “it should become increasingly possible for doctors to have data about whether their patients are filling prescriptions or not,” Dr. Fischer said.

And that information could serve as a means of introducing a formerly taboo topic into the patient-doctor relationship: the decision, and the challenges, of starting and continuing a medication. “We need to find constructive and therapeutic ways of continuing to work through those decisions,” Dr. Fischer noted. “We need to take this information and use it to address missed opportunities.”

“Not every unfilled prescription is a problem,” Dr. Fischer added. “But the great challenge for all of us is figuring out how to design and integrate a model of care that works best for the patients and lets the doctors do what is really important.”

Uncovering lithium's mode of action

Appearing in the May 2010 Journal of Lipid Research

Though it has been prescribed for over 50 years to treat bipolar disorder, there are still many questions regarding exactly how lithium works. However, in a study appearing in this month's Journal of Lipid Research, researchers have provided solid evidence that lithium reduces brain inflammation by adjusting the metabolism of the health-protective omega-3-fatty acid called DHA.

Inflammation in the brain, like other parts of the body, is an important process to help the brain combat infection or injury. However, excess or unwanted inflammation can damage sensitive brain cells, which can contribute to psychiatric conditions like bipolar disorder or degenerative diseases like Alzheimers.

It's believed that lithium helps treat bipolar disorder by reducing brain inflammation during the manic phase, thus alleviating some of the symptoms. Exactly how lithium operates, though, has been debated.

Mireille Basselin and colleagues at the National Institute of Aging and University of Colorado, Denver, took a detailed approach to this question by using mass spectrometry analysis to analyze the chemical composition of brain samples of both control and lithium-treated rats stressed by brain inflammation.

They found that in agreement with some other studies, rats given a six-week lithium treatment had reduced levels of arachidonic acid and its products, which can contribute to inflammation.

In addition, they also demonstrated, for the first time, that lithium treatment increased levels of a metabolite called 17-OH-DHA in response to inflammation. 17-OH-DHA is formed from the omega-3 fatty acid DHA (docosahexaenoic acid) and is the precursor to a wide range of anti-inflammatory compounds known as docosanoids. Other anti-inflammatory drugs, like aspirin, are known to also enhance docosanoids in their mode of action.

Basselin and colleagues noted that the concentration of DHA did not increase, which suggests that lithium may increase 17-OH-DHA levels by affecting the enzyme that converts DHA to 17-OH-DHA.

By reducing both pro-inflammatory AA products, and increasing anti-inflammatory DHA products, lithium exerts a double-protective effect which may explain why it works well in bipolar treatment. Now that its mechanism is a little better understood, it may lead to additional uses for this chemical.

From the article: "Lithium modifies brain arachidonic and docosahexaenoic metabolism in rat lipopolysaccharide model of neuroinflammation" by Mireille Basselin, Hyung-Wook Kim, Mei Chen, Kaizong Ma, Stanley I. Rapoport, Robert C. Murphy and Santiago E. Farias

Toothy Tree-Swinger May Be Earliest Human

The 3-foot tall Homo gautengensis had large teeth for chomping plants and spent a lot of time in trees, but likely had no language skills.

By Jennifer Viegas

Your family tree has a new and colorful member, Homo gautengensis, a toothy, plant-chomping, literal tree swinger that was just named the world's earliest recognized species of human.

The new human, described in a paper accepted for publication in HOMO-Journal of Comparative Human Biology, emerged over 2 million years ago and died out approximately 600,000 years ago. The authors believe it arose earlier than Homo habilis, aka "Handy Man." Darren Curnoe, who led the project, told Discovery News that Homo gautengensis was "small-brained" and "large-toothed."

Curnoe, an anthropologist at the University of New South Wales School of Biological, Earth and Environmental Sciences, said that it was "probably an ecological specialist, consuming more vegetable matter than Homo erectus, Homo sapiens, and probably even Homo habilis. It seems to have produced and used stone tools and may even have made fire," since there is evidence for burnt animal bones associated with this human's remains. Identification of the new human species was based on partial skulls, several jaws, teeth and other bones found at various times at South Africa's Sterkfontein Caves, near Johannesburg.

Curnoe and colleague Phillip Tobias, who is a South African paleoanthropologist, believe Homo gautengensis stood just over 3 feet tall and weighed about 110 pounds. It walked on two feet when on the

ground, "but probably spent considerable time in trees, perhaps feeding, sleeping and escaping predators," Curnoe said.

The researchers further believe that it lacked speech and language, skills that help to make humans unique among other animals today. Due to these missing abilities, its anatomy, and geological age, the researchers think that it was a close relative of us, but not necessarily our direct ancestor.

The discovery of this new human not only adds to our overall family tree, but it may also lead to a big shake-up. For decades, scientists have been searching for the species that eventually evolved into the first Homo genus member. Earlier this year, it was announced that this "missing link" human may have been unearthed -- in the form of Australopithecus sediba.

De Ruiter of Texas A&M University and his colleagues proposed that A. sediba was the transitional species between Australopithecus africanus (a non-human not in our genus) and Homo erectus -- "Upright Man."

The newly identified human, however, throws a wrench into that theory since A. sediba was "much more primitive than H. gautengensis, and lived at the same time and in the same place," according to Curnoe. As a result, "Homo gautengensis makes Australopithecus sediba. look even less likely to be the ancestor of humans."

Curnoe instead proposes that Australopithecus garhi, found in Ethiopia and dating to about 2.5 million years ago, is a better possibility for the earliest non-Homo direct ancestor in the human evolutionary line.

Curnoe still regards East Africa as being the cradle of humans, "because it has the oldest fossil record, going back to about 7 million years, but we are clearly learning now that there was much greater diversity in our evolutionary tree than we realized for a long time."

"If we compress all of human evolution into a single year, we have been alone only since the last hour on December 31, so the situation we find ourselves in today -- we are alone -- is unusual," Curnoe said. "We need to explain why this is the case. Was it climate, or are we responsible for the demise of all of our close relatives, including recently the Neanderthals and the Hobbit (Homo floresiensis)?"

It's the little things: Everyday gratitude as a booster shot for romantic relationships

Chapel Hill (University of North Carolina), NC—Our busy lives sometimes feel like they are spinning out of control, and we lose track of the little things we can do to add meaning to our lives and make our loved ones feel appreciated. A new article in Personal Relationships points the way to the methods of gratitude we can use to give a boost to our romantic relationships, and help us achieve and maintain satisfaction with our partners.

Humans are interdependent, with people doing things for each other all the time. Simply because a person does something for another does not mean that the emotion of gratitude will be felt. In addition to the possibility of not even noticing the kind gesture, one could have many different reactions to receiving a benefit from someone else, including gratitude, resentment, misunderstood, or indebtedness.

Positive thinking has been shown to have a longstanding constructive effect on our emotional life. Extending these positive emotions and gratitude to our romantic partners can increase the benefit of positive thinking tenfold, say the authors of this new study. Lead author Dr. Sara Algoe says, "Feelings of gratitude and generosity are helpful in solidifying our relationships with people we care about, and benefit to the one giving as well as the one on the receiving end." The authors propose that the emotion of gratitude is adaptive, and ultimately helps us to find, remind, and bind ourselves to people who seem to care about our welfare.

Events such as one partner planning a celebratory meal when the other partner gets a promotion, taking the children to the zoo so the other partner can have some quiet time, or stopping to pick up the other partner's favorite coffee drink are each examples of gratuitous behavior that could strengthen romantic relationships, if the recipient feels grateful in response.

The study authors chose to study over sixty-five couples who were already in ongoing, satisfying, and committed relationships. They tracked the day-to-day fluctuations in relationship satisfaction and connection for each member of the relationship. These little, everyday, ups and downs in relationship quality were reliably marked by one person's feelings of gratitude. The effects on the relationship were noticed even the day after feeling the gratitude was expressed. This research thus suggests that even everyday gratitude serves an important relationship maintenance mechanism in close relationships, acting as a booster shot to the relationship.

The authors of the study claim that this emotional response may be beneficial for relationships that are on the rocks, or in a context where people already have solid and satisfied relationships—a little gratitude may go a long way toward maintaining the connection. By temporarily changing the perspective on the relationship, everyday gratitude may work as a booster shot for ongoing romantic relationships.

However, the authors are quick to warn that the everyday emotional response of indebtedness did not facilitate relationship maintenance. Indebtedness implies a need to repay kind gestures. This may work to help to keep relationships in working order, but will not yield as many benefits or long-term growth in the

relationship as an expression of gratitude. Algoe says, "Gratitude triggers a cascade of responses within the person who feels it in that very moment, changing the way the person views the generous benefactor, as well as motivations toward the benefactor. This is especially true when a person shows that they care about the partner's needs and preferences."

This study is published in the June 2010 issue of Personal Relationships. Media wishing to receive a PDF of this article may contact scholarlynews@wiley.com. Article: "It's the Little Things: Everyday Gratitude as a Booster Shot for Romantic Relationships." Sara Algoe, et. al. Personal Relationships.

Non-expert treatment shown to be more effective than primary care in soothing widespread anxiety

By Katherine Harmon

anxiety treatment flexible cognitive behavior therapy computer-assistedNEW YORK—One-size-fits-all treatments are particularly rare in the mental health world, where each patient's ailments can seem unique.

But a team of researchers seems to have found a therapeutic model to treat anxiety disorders as wide-ranging as post-traumatic stress disorder (PTSD), social phobia and panic disorder. Lead study author Dr. Peter Roy-Byrne, of the Department of Psychiatry and Behavioral Sciences at the University of Washington School of Medicine, presented the findings May 18 at a press briefing in New York convened by JAMA, Journal of the American Medical Association.

When taken together, anxiety disorders affect about 18 percent of the population (which is more than twice the rate of depression). Some three fourths of people with mental disorders are managed in primary care (which Roy-Byrne called "the de facto mental health system"), but getting those patients—especially those with anxiety disorders—to see mental health specialists is much harder than getting them to see a radiologist, Roy-Byrne noted.

He and his team devised a flexible, collaborative care system that lightened loads for both doctors and psychiatrists (or psychologists) while making it easier for patients to get the help they needed. By enlisting the skills of nurses or masters-level clinicians with some training in anxiety management and an online patient progress tracking system, the treatment plan could adapt to patients without sending them to an expensive psychiatrist or psychologist, which has been shown to be especially difficult in anxiety patients (and could also allow specialists more time to address patients who most need their care). And a controlled trial, published May 19 in JAMA, showed promising results.

The researchers randomized 1,004 patients with at least one anxiety disorder (with and without major depression) to either their treatment model (which offered a choice of drug-based therapy as prescribed by overseeing doctors, computer-assisted cognitive behavioral therapy or a combination of both) or standard care (any treatment by their primary physician, recommended counselor or medication).

Patients receiving medication in the experimental group were advised about type and dosage as well as given additional guidance about healthy lifestyle habits, such as sleep hygiene and behavioral tips. Those getting cognitive behavioral therapy met with a nurse or masters-level clinician to work through a computer-guided program, which provided questions, examples and videos to guide the sessions as well as tailor and reinforce concepts. Primary care physicians and psychiatrists or psychologists oversaw the progress of patients and administrators via an online tracking system that charted attendance, performance and wellbeing so that they could follow-up or intervene if necessary.

The trial itself was open to patients' changing needs, so if patients entered the trial on ineffective levels of medication but didn't want to switch, the docs allowed them to stay on their preferred regimen. And if an experimental-group patient was not improving on a current path (of cognitive behavior therapy or pharmacological treatment), doctors could immediately see that and recommend alternative courses of action.

After a series of blinded follow-ups with patients (at six, 12 and 18 months after the start of the trial), the researchers found that with just six to eight sessions, patients in the treatment group were "averaging really negligible symptoms," he said. Fifty-one percent of people in the flexible, monitored treatment group were in remission at 18 months, compared to 36 percent of the usual care group.

The results "showed how we could use technology" to treat a broad range of anxiety disorders, Roy-Byrne noted on Tuesday. And because the treatment model was effective for a broad range of disorders, it could help the many people who have more than one ailment, "which is the rule rather than the exception," he added.

By using clinician-administered, evidence-based strategy, he said, "you can get a lot of people better fast." And the social implications of the model were not lost on Roy-Byrne. He noted that the days of the well-to-do and well-insured seeking in-depth psychiatric help for every minor mental health issue might be numbered. "How can you more responsibly distribute the expertise?" he asked. With an evidence-based treatment protocol, he concluded, the psychiatric and psychological big guns could be reserved for those who really needed them.