Cache of mummies unearthed at Egypt's Lahun pyramid

By Cynthia Johnston

LAHUN, Egypt (Reuters) – Archaeologists have unearthed a cache of pharaonic-era mummies in brightly painted wooden coffins near Egypt's little-known Lahun pyramid, the site head said on Sunday.

The mummies were the first to be found in the sand-covered desert rock surrounding the mud-brick Lahun pyramid, believed to be built by the 12th dynasty pharaoh Senusret II, who ruled 4,000 years ago. The team expects to announce more finds soon. The site was first excavated more than a century ago.

"The tombs were cut on the rock itself, and they vary in architectural designs," said archaeologist Abdul Rahman Al-Ayedi, head of excavations at the site. "Most of the mummies we discovered were with these bright and beautiful colors."

At the site, bare skulls from some of the mummies sit on a hillside while workers gently brush away sand from coffins below the earth that bear images of their occupants, some painted in striking hues of green, red and white.

Ayedi said the dozens of tombs dotting the site near Fayoum, 60 km (35 miles) south of Cairo, could give insight into the development of Egyptian funerary architecture and traditions from the Middle Pharaonic Kingdom all the way to the Roman era.

Some of the tombs were built on top of graves from earlier eras, and Ayedi said archaeologists had found dozens of mummies, including around 30 that were well-preserved. Some were inscribed with prayers intended to help the deceased.

An Egyptian worker brushes dust off a wooden coffin containing a linen-wrapped mummy covered in cartonnage near the Illahun Pyramid in Fayoum Reuters – An Egyptian worker brushes dust off a wooden coffin containing a linen-wrapped mummy covered in cartonnage …

Site May Date To Earlier Era

Ayedi said Egypt would soon announce an additional significant find near the Lahun pyramid, once covered by slabs of white limestone, showing the site could date back to an earlier era thousands of years before previously thought.

"The prevailing idea was that this site has been established by Senusret II, the fourth king of the 12th dynasty. But in light of our discovery, I think we are going to change this theory, and soon we will announce another discovery," he told reporters.

He said teams had made a discovery dating to before the 12th dynasty, but gave no details on what it was and said an official announcement could be made within days.

Ayedi said he had wanted to excavate at Lahun, Egypt's southernmost pyramid, because he was not satisfied with the result of the first excavation there in the 19th century, saying it did not match the significance of the site. "The size of the site is huge. So I thought that we could unearth a lot of elements in this site. At the beginning of the excavation, I thought that we may rewrite the history of the area, and I was right," he said.

Archaeologists found the main entrance to the pyramid last year in a 16-meter well, and later found storage jars and other objects inside before finding the mummies in the surrounding desert stone in recent months, Ayedi said.

Egypt, whose economy relies heavily on tourism, has made several significant discoveries this year including a rare intact mummy found in February in a sealed sarcophagus near the world's oldest standing step pyramid at Saqqara, near Cairo.

Archaeologists hope to start digging soon in search of the tomb of Cleopatra and possibly her lover Mark Antony on Egypt's north coast. Cleopatra, facing possible captivity in Rome, is alleged to have killed herself by the sting of an asp in 30 BC. *(Writing by Cynthia Johnston; Editing by Angus MacSwan)*

Smoking and high blood pressure each account for 1 in 5 deaths in US adults

Press release from PLoS Medicine

A comprehensive assessment of the risk factors for preventable deaths in the United States has found that smoking and high blood pressure are responsible for the greatest number of preventable deaths – each accounting for around 1 in 5 deaths in US adults. The study, published in the open-access journal PLoS Medicine this week, finds that other dietary, lifestyle and metabolic risk factors also cause a substantial number of deaths in the United States.

Majid Ezzati, of the Harvard School of Public Health, and colleagues estimated the number of preventable deaths caused by twelve selected risk factors. These are factors related to lifestyle, including smoking and physical inactivity, dietary factors, such as high salt intake and low intake of fruit and vegetables, and metabolic factors that often result from diet and lifestyle but may also have clinical interventions such as high blood

pressure and blood glucose. They are known as "modifiable risk factors" because although it is well established that these risk factors shorten a person's life expectancy through the increased risk of heart disease, stroke, cancers, and other chronic diseases, they can also be changed or controlled by individuals themselves or through public health as well as medical interventions.

Previous studies had indicated that some lifestyle risk factors are responsible for a huge number of premature deaths in the United States. But Ezzati and colleagues used a more comprehensive method that estimated the number of deaths across different risk factors, including dietary and metabolic factors that had been left out of previous analyses. They devised a "comparative risk assessment" – an estimate of the number of deaths that would be prevented if the distribution of the lifestyle, dietary and metabolic risk factors were at a hypothetical optimum (e.g. if nobody smoked). Gathering data on the risk factors from nationally representative surveys that had already been conducted, they obtained information on deaths from the US National Center for Health Statistics. Of the 2.5 million US deaths in 2005, the researchers estimated that almost 470,000 were associated with tobacco smoking and nearly 400,000 with high blood pressure. Being overweight or obese accounted for nearly 1 in 10 deaths of US adults, whilst high salt intake was responsible for 1 in 25 deaths of US adults - the most of any of the dietary factors analyzed.

The analysis suggests that by targeting a few risk factors there is great potential to reduce the number of preventable deaths in the United States. Importantly, the authors stress that there are interventions at an individual and a population level that are already shown to be effective at combating the two deadliest risk factors in the United States – smoking and high blood pressure. Yet despite knowledge of these interventions, the reduction of blood pressure and tobacco smoking has stagnated and even reversed in some areas.

Comparable information on lifestyle, diet and metabolic risk factors is crucial for forming health policy and priorities, and Ezzati and colleagues conclude by suggesting that "research, implementation, monitoring and evaluation related to interventions" is crucial to reduce the number of preventable deaths in the United States and elsewhere.

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http://medicine.plosjournals.org/perlserv/?request=get-document&doi=10.1371/journal.pmed.1000058

The structure of a giant virus

Press release from PLoS Biology

The mimivirus is the largest virus known to scientists, about half of a micrometre (0.0005 millimeter) in diameter. It is more than 10 times larger than the virus that causes the common cold and – unlike other viruses – is large enough to be seen with a light microscope. In this week's issue of PLoS Biology, an international team of researchers have determined key structural features of the mimivirus, findings that could help scientists study how the simplest life forms evolved and whether this unusual virus causes any human diseases.

Mimivirus infects amoebas, but it is also thought that it may act as a human pathogen, because antibodies to the virus have been discovered in people with pneumonia. However, many details about the virus remain unknown, said Michael Rossmann, Purdue University's Hanley Distinguished Professor of Biological Sciences.

Now, Rossmann and a team of researchers from Purdue, the University of California at Irvine, and the University of the Mediterranean in Marseilles, France, have determined the basic design of the virus's outer shell, or capsid, and also of the hundreds of smaller units - called capsomeres - making up this outer shell. Their findings confirmed the existence of a starfish-shaped structure that covers a 'special vertex' - an opening in the capsid where the genetic material leaves the virus to infect its host; an indentation in the virus's genetic material itself is positioned opposite this opening.

"The findings are important in terms of studying the evolution of cells, bacteria and viruses," said Siyang Sun, a postdoctoral research associate working in Rossmann's lab. "The mimivirus is like an intermediate between a cell and a virus. We usually think of cells as being alive and a virus is thought of as being non-living because it needs a host cell to complete its life cycle. The mimivirus straddles a middle ground between viruses and living cells, perhaps redefining what a virus is."

Researchers had previously been unable to determine the virus's structure because they had assumed that, like many other viruses, it's capsid had a design known as icosahedral symmetry. The paper's lead author, Chuan Xiao, discovered the true structure when he decided to try reconstructing the virus, assuming it had not the standard icosahedral symmetry but another configuration called five-fold symmetry.

"If you start out thinking the object has icosahedral symmetry, then you assume there are 60 identical pieces, and that influences how you reconstruct the virus's structure," Rossmann said.

The researchers took images of the virus using an atomic force microscope, revealing a pattern of holes regularly spaced throughout the virus's outer shell. "The capsids of most other large, pseudo-icosahedral viruses do not contain such holes, and their function is unknown," Rossmann said.

The researchers used cryo-electron microscopy reconstruction to determine the structural details. This reconstruction method enabled them to reassemble three-dimensional images from two-dimensional pictures, much as a complete architectural drawing of a house can be assembled with two-dimensional drawings of the sides, the roof and other elements. An icosahedron has a roughly spherical shape containing 20 triangular facets and 60 identical subunits. Like an icosahedron, the mimivirus capsid also has 20 facets.

However, unlike an icosohedron, five facets of the capsid are slightly different than the others and surround the special vertex. Icosohedra contain 12 similar vertices, whereas the mimivirus contains eleven such vertices, with the 12th being different than the others.

The research, which is funded by the National Institutes of Health, is ongoing, with future work intended to study additional properties of the virus, particularly the structure of the starfish-shaped feature and how it functions.

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http://biology.plosjournals.org/perlserv/?request=get-document&doi=10.1371/journal.pbio.1000092

Dietary fats trigger long-term memory formation

UCI study points to new approaches for treating obesity, eating disorders

Irvine, Calif. - Having strong memories of that rich, delicious dessert you ate last night? If so, you shouldn't feel like a glutton. It's only natural.

UC Irvine researchers have found that eating fat-rich foods triggers the formation of long-term memories of that activity. The study adds to their recent work linking dietary fats to appetite control and may herald new approaches for treating obesity and other eating disorders. Study results appear this week in the early online edition of the Proceedings of the National Academy of Sciences.

Daniele Piomelli, the Louise Turner Arnold Chair in Neurosciences, teamed with UCI's James McGaugh, one of the world's leading learning and memory researchers, to examine how dietary fats facilitate memory retention. Piomelli's previous studies identified how oleic acids from fats are transformed into a compound called oleoylethanolamide (OEA) in the upper region of the small intestine. OEA sends hunger-curbing messages to the brain to increase feelings of fullness. In elevated levels, OEA can reduce appetite, produce weight loss and lower blood cholesterol and triglyceride levels.

Piomelli and McGaugh discovered that OEA also causes memory consolidation, the process by which superficial, short-term memories are transformed into meaningful, long-term ones. It does this, Piomelli said, by activating memory-enhancing signals in the amygdala, part of the brain involved in the consolidation of memories of emotional events.

The researchers found that administering OEA to rodents improved memory retention in two different tests. When cell receptors activated by OEA were blocked, memory retention effects decreased.

"OEA is part of the molecular glue that makes memories stick," Piomelli said. "By helping mammals remember where and when they have eaten a fatty meal, OEA's memory-enhancing activity seems to have been an important evolutionary tool for early humans and other mammals."

Dietary fats are important for overall health, helping with the absorption of vitamins and the protection of vital organs. While the human diet is now rich in fats, this was not the case for early humans. In fact, fat-rich foods in nature are quite rare.

"Remembering the location and context of a fatty meal was probably an important survival mechanism for early humans," Piomelli said. "It makes sense that mammals have this capability."

Today, he noted, such memory enhancement may not be so beneficial. While OEA contributes to feelings of fullness after a meal, it could also engender long-term cravings for fatty foods that, when eaten in excess, can cause obesity.

Currently, Piomelli said, drugs that mimic OEA are in clinical trials for triglyceride control. He is interested in learning whether they could improve consolidation in people with memory problems.

Patrizia Campolongo, Jin Fu, Giuseppe Astarita and Benno Roozendaal of UCI and Viviana Trezza and Vincenzo Cuomo of the University of Rome participated in the study, which was supported by grants from the National Institutes of Health

Autism may be linked to being firstborn, breech births or moms 35 or older

Study looked at group of Utah 8-year-olds

Salt Lake City – Children who are firstborn or breech or whose mothers are 35 or older when giving birth are at significantly greater risk for developing an autism spectrum disorder, University of Utah School of Medicine researchers have reported in a new study with Utah children.

In the April 27, 2009, online issue of the journal Pediatrics, the researchers showed that women who give birth at 35 or older are 1.7 times more likely to have a child with an autism spectrum disorder (ASD), compared with women between the ages of 20-34. Children diagnosed with ASD also were nearly 1.8 times more likely to be the firstborn child, the researchers found.

Although they didn't identify a causal relationship between breech births and autism, children diagnosed with the disorder were more than twice as likely to have been a breech presentation, meaning they were not born head first.

“The results of this study give us an opportunity to look more closely at these risk factors for children across the autism spectrum, and not only those diagnosed with autism," said first author Deborah A. Bilder, M.D., assistant professor of psychiatry. "This shows that further investigation of the influence of prenatal factors is warranted."

Autism is a complex brain disorder that impairs social, communicative, and behavioral development and often is characterized by extreme behavior.

Bilder and her colleagues in the U medical school's department of psychiatry and the Utah Department of Health examined the birth records of Utah children who had been identified as having an autism spectrum disorder in a 2002 epidemiological study by the U.S. Centers for Disease Control and Prevention (CDC). That study looked at 8-year-old children in Utah's three most populous counties - Salt Lake, Davis, and Utah - and used nationally accepted criteria for an ASD classification. The researchers compared birth records for children identified with an ASD with unaffected children born in those three counties in 1994. Of that group, 196 were identified with an ASD. Birth certificates were available for 132 of those children, and the researchers examined those records for possible prenatal, perinatal, and neonatal risk factors related to ASD.

Their investigation showed that the mother's age when giving birth (older than 34), breech presentation, and being firstborn were significant risk factors for the development of an ASD. The researchers also identified a small but significant relationship between the increased duration of education among mothers of those children.

Further investigation would be needed to understand how these three risk factors may relate to ASD. But a possible explanation for the correlation of firstborn children might be that parents are reluctant to have a second child if the first is diagnosed with ASD. A possible interpretation of increased risk associated with advanced maternal age is that changes in genes occurring over time may contribute to autism spectrum disorders. The association found between breech presentation and ASD most likely indicates a shared cause, such as neuromuscular dysfunction. The vast majority of children born breech, however, are healthy.

This study follows several from the University in recent years, which found that Utah has one of the highest autism spectrum disorder rates in the country (one in 133 Utah children has the disorder), helped identify a gene that may predispose people to autism, and showed that Utah adults with autism have a better quality of life than those in other studies.

For the next step in their research, Bilder and her colleagues want to repeat this study, using a larger population of Utah 8-year-olds from subsequent birth years, to see if it replicates the results of the current study. They also may study the subset of children with breech presentation to determine whether they haven a genetic vulnerability that put them at increased risk for developing an autism spectrum disorder.

The study's other authors are Judith P. Zimmerman, Ph.D., research assistant professor of psychiatry; Judith Miller, Ph.D., associate professor of psychiatry; and William M. McMahon, M.D., chairman of the Department of Psychiatry.

War-torn countries prefer masculine leaders

* 27 April 2009 **by Linda Geddes**

THE mark of a good leader may be etched on their face but whether he or she gets elected might depend on the state of the nation.

To see whether facial characteristics influence our choice of leader, Brian Spisak and Mark Van Vugt at the University of Kent, UK, manipulated computer images of male and female faces to make them appear more masculine or feminine.

They asked 118 volunteers to choose one of them as a leader for different scenarios: during times of war; when peacekeeping between different groups was important; during periods of transition; to maintain stability after a natural disaster; and when there was a risk of civil war. The researchers also altered the male and female faces to look older or younger, and then asked 145 volunteers to pick a leader given the same scenarios.

During times of war, the volunteers preferred masculine or older faces, while they picked feminine faces when inter-group peacekeeping was the priority. Interestingly, gender was irrelevant - with masculine-looking women picked over feminine-looking males during times of war, and vice versa.

"This suggests that traditional classifications of male and female are not as relevant a cue as we might think," says Spisak, who spoke at a meeting of the European Human Behaviour and Evolution Association in St Andrews, UK, earlier this month.

Previous studies have hinted that voters prefer masculine-looking leaders during wartime, as these types of faces are associated with dominant and decisive traits, says Alexander Todorov of Princeton University. "The novelty here is that masculinity or femininity, which is naturally correlated with gender, still influences decisions even when unconfounded by gender."

Spisak and Van Vugt also found that youthful faces were preferred during times of transition and stability - with young females the leaders of choice.

Spisak believes that facial characteristics may have played a role in the recent US presidential elections, although other factors were also clearly involved. "Obama was an easier sell," he says. "He was the relatively younger candidate, and he stuck with this message of change and transition. If McCain had had a stronger and more consistent message on the war, perhaps he would have stood a better chance of winning."

New study overturns orthodoxy on how macrophages kill bacteria

Champaign, IL. - For decades, microbiologists assumed that macrophages, immune cells that can engulf and poison bacteria and other pathogens, killed microbes by damaging their DNA. A new study from the University of Illinois disproves that. The study, published in the journal PLoS ONE, shows that macrophages focus their most potent poisons, known as reactive oxygen species (ROS), on targets outside the cytoplasm.

Macrophages are voracious eaters that "swallow" cellular debris and invading organisms. They kill microbes with ROS. All aerobic cells inadvertently produce ROS that can, if left unchecked, damage DNA and other cellular components and cause cell death.

Bacteria and animal cells contain special enzymes, called superoxide dismutases, which neutralize an important ROS, called superoxide. Macrophages have harnessed these lethal compounds, dumping large quantities of superoxide onto engulfed bacteria to kill them.

Although macrophages direct ROS against invading bacteria, Salmonella typhimurium, the microbe used in the study, is adept at evading these defenses. The most virulent strains of S. typhimurium can survive and even propagate inside macrophages, eventually emerging to infect more cells.

"It's been assumed that reactive oxygen species kill the bacteria by going into the cytoplasm and causing DNA damage," said medical microbiology professor James Slauch, who led the study. "You can find this idea over and over again in review articles and many immunological textbooks, but with no real data to back it up."

To test this hypothesis, Slauch and graduate student Maureen Craig looked at the superoxide dismutases that are part of the bacterial defense against ROS. There are two such enzymes in the cytoplasm of S. typhimurium, called SodA and SodB, and another, SodC, in the periplasm, the space between the bacteria's inner and outer membranes.

One way to understand the role of an enzyme is to see what happens when it is absent, so the researchers looked at mutant S. typhimurium that had the genes for SodA, SodB, or both enzymes, deleted. Deleting the gene for SodA seemed to make no difference, but the SodB mutants were less able to survive and cause disease in a mouse. The double mutants were even more impaired. They were much, much less likely to survive in the mouse than bacteria with only the SodB gene missing. These findings "offer genetic proof" that both enzymes "are involved in the same process," Slauch said.

The fact that the bacterial mutants were less likely to survive in a mouse did not prove, however, that the missing enzymes were protecting the bacteria from ROS generated in the mouse macrophages, Slauch said.

"You get the same result if you grow these mutants in the laboratory in aerobic conditions," he said.

“Furthermore, the SodA/SodB mutant bacteria were profoundly weakened – even in a mouse that was unable to produce the potent ROS superoxide in its macrophages. These results suggest that the superoxide dismutases in the bacterial cytoplasm are most likely protecting the bacterium from its own, naturally occurring ROS, Slauch said. In contrast, deleting the gene encoding the periplasmic superoxide dismutase, SodC, conferred the same defect regardless of whether the cytoplasmic SodA/SodB were present or absent, showing that its function is independent of the cytoplasm.

Moreover, strains lacking SodC were impaired only in the presence of superoxide produced in macrophages; there was no impairment in laboratory media or in mice lacking the ability to make superoxide.

This suggests that the superoxide and other reactive oxygen species are not making it from the macrophage into the bacterial cytoplasm, Slauch said.

"We conclude from all this data that the most sensitive target of ROS in the macrophages lies outside the cytoplasm," Slauch said. "We don't know what that target is, but it's clearly not in the cytoplasm."

Bicycle helmet laws could do more harm than good

* 17:50 27 April 2009 **by Ewen Callaway**

Mandatory bicycle helmet laws could do more harm than good, a new study claims.

Helmet laws like those in effect in Australia levy a substantial cost on healthcare systems because savings from fewer head injuries pale in comparison to the costs incurred by decreases in cycling, a mathematical model concludes.

Piet de Jong, a mathematician at Macquarie University in Sydney, Australia, estimates that bicycle helmet laws would cost the US $4.8 billion per year, Netherlands $1.9 billion, and the U.K $0.4 billion.

However, one critic contends that de Jong's methods overestimate the health benefits of cycling, as well as the drop in cyclists caused by helmet laws.

"There's a lot of uncertainty around it," de Jong admits. "I try to reconcile all these various numbers or proportions that impinge on the question of whether helmet laws are very useful."

He concludes that only under extreme, theoretical circumstances do mandatory helmet laws not end up costing the healthcare system. Head injuries must be a substantial proportion of bicycling injuries, few riders must abandon their bikes due to helmet laws, and the health benefits of cycling need to be low. "Even under very favourable assumptions to the pro-helmet lobby group, it's very hard to get a benefit," de Jong says.

Numbers debate

Precise numbers on the costs and benefits of cycling and the use of helmets are hard to come by and often contentious.

One 1989 case-controlled study published in the New England Journal of Medicine concluded that bicycle helmets reduce the risk of head injury by 85 per cent. But de Jong says those results are overstated.

Writing in the BMJ in 2006, Dorothy Robinson, a statistician at the Department of Primary Industries in Armidale, Australia, claimed that helmet laws caused bike ridership decreases of 20 to 40 per cent in several Australian cities and states.

"What she has never shown to my satisfaction, or that of other critics of her work, is how long the decline persisted," says Barry Pless, an epidemiologist at Montreal Children's Hospital in Canada.

In an attempt to circumvent all of this uncertainty, de Jong created a model that can be adjusted by putting in various values for drops in cycling rates due to helmet laws, the cost of an accident due to not wearing a helmet, and the overall health benefit of cycling.

"Everybody takes one piece of the evidence and nobody is really putting in all the pieces of the puzzle," he says.

Heart benefits

Under most parameters, de Jong's model concluded helmet laws would come with a net health cost. Exactly what cost is hard to determine. To come up with a figure of $4.8 billion for the US, he assumed the health benefit of cycling was a generous $1 per kilometre. However, as long as the benefit of cycling is not zero, there will be a net cost incurred due to helmet laws, he says.

Pless, though, contends that de Jong's model overvalues the health benefits of recreational cycling. Most riders travel short distances rather slowly, blunting some of cycling's cardiovascular benefits. He points to a study of 9000 UK government employees which found that people between the ages of 45 and 64 needed to pedal 40 kilometres per week to see any reduction in heart disease rates.

Despite these issues, de Jong hopes policy makers will take a good look at his paper before supporting legislation mandating helmet use.

However de Jong, a native of bike-loving Holland, makes clear that he would not discourage people from wearing helmets. "I go to Holland and places like that, and I don't wear a helmet," he says. "I used to live in London, and I wore a helmet all the time." *Journal reference: Social Science Research Network*

Early brain activity sheds new light on the neural basis of reading

Most people are expert readers, but it is something of an enigma that our brain can achieve expertise in such a recent cultural invention, which lies at the interface between vision and language. Given that the first alphabetic scripts are thought to have been invented only around four to five thousand years it is unlikely that enough time has elapsed to allow the evolution of specialized parts of the brain for reading. While neuroimaging techniques have made some progress in understanding the neural underpinning of this essentially cultural skill, the exact unfolding of brain activity has remained elusive.

Now, a better understanding of the brain basis of reading has been reported in research published in the open-access, peer-reviewed journal PLoS ONE. The research was led by Piers Cornelissen, Morten Kringelbach, Ian Holliday and Peter Hansen from the Universities of York, Oxford, Aston, and Birmingham

UK, and was funded by the Wellcome Trust. The authors showed very early interactions between the vision and language domains during reading, with the speech motor areas of the brain (inferior frontal gyrus) being active at the same time (after a seventh of a second) as the orthographic word-form is being resolved within a brain region called the fusiform gyrus. This finding challenges the conventional view of a temporally serial processing sequence for reading in which letter forms are initially decoded, interact with their phonological and semantic representations, and only then gain access to a speech code.

This finding has a potentially important clinical application in relation to developmental dyslexia (affecting between 15-30 million people in the US alone) and those with acquired reading disabilities through injury or disease. A better understanding of normal reading processes could potentially help these individuals.

The research team used a neuroimaging method called magnetoencephalography (MEG) at Aston University, UK. This is an advanced neuroscientific tool, which offers both excellent temporal (in milliseconds) and spatial (in millimetres) resolution of whole brain activity. Because the researchers were primarily interested in the highly automatized processing of words, they used an implicit task that required participants to monitor the colour of a small red cross and to press a button as soon as the colour changed. This was interspersed with words, consonant strings and faces that were shown for 300 ms, but which were not important to solve the task.

The authors found key differences in the early brain activity of normal adults when they were reading words compared to reading consonant strings and seeing faces. Time-frequency analyses showed a left-lateralized inferior frontal gyrus (pars opercularis) response to words between 100-250 ms in the beta frequency band that was significantly stronger than the response to consonant strings or faces. The left inferior frontal gyrus response to words peaked at ~130 ms. This response was significantly later in time than the left middle occipital gyrus, which peaked at ~115 ms, but not significantly different from the peak response in the left mid fusiform gyrus, which peaked at ~140 ms, at a location coincident with the fMRI-defined visual word form area (VWFA). Significant responses were also detected to words in other parts of the reading network, including the anterior middle temporal gyrus, the left posterior middle temporal gyrus, the angular and supramarginal gyri, and the left superior temporal gyrus.

The left inferior frontal gyrus is located in the front of the brain. This is a key region of the language brain and lesions can lead to the inability to articulate words. In the context of the experiment, the inferior frontal gyrus appears to play a key role integrating the visual and language aspects of reading.

Reading problems are common. Further research could identify whether the present finding of early and specific activity in inferior frontal gyrus are affected in individuals with developmental dyslexia. The present paradigm could eventually provide opportunities for early identification of those at risk.

***Citation**: Cornelissen PL, Kringelbach ML, Ellis AW, Whitney C, Holliday IE, et al. (2009) Activation of the Left Inferior Frontal Gyrus in the First 200 ms of Reading: Evidence from Magnetoencephalography (MEG). PLoS ONE 4(4): e5359. doi:10.1371/journal.pone.0005359 http://plosone.org/doi/pone.0005359*

New doctors, teaching physicians disagree about essential medical procedures to learn

WINSTON-SALEM, N.C. – Physicians teaching at medical schools and doctors who have just completed their first year out of medical school disagree about which procedures are necessary to learn before graduating, according to a new survey done by researchers at Wake Forest University School of Medicine.

Participating physicians were asked to rate 31 basic clinical procedures – from throat culture to spinal tap – based on their importance in the first year after graduation from medical school. Faculty physicians rated 14 procedures as "must know," while new physicians agreed on only six of those 14 clinical procedures and placed five additional, completely different procedures in the "must know" category.

The results of the survey appear in the most recent issue of Medical Teacher, a peer-reviewed publication.

The authors say the results are understandable, given that the medical school curriculum often is based on experience, not structured evaluation.

"Like a lot of clinical education in most medical schools, the third and fourth years are learning by doing - taking care of real patients," said Michael T. Fitch, M.D., Ph.D., the lead author of the paper and an assistant professor of emergency medicine at the School of Medicine. "So, the procedures the patients need end up being the ones students learn."

Interestingly, Fitch said, the procedures rated as "must know" by new doctors were more invasive – spinal taps, incisions and drainage, intubation and inserting a central line, for example, than the more basic procedures identified as "must know" by the experienced, faculty physicians. The study states that many of the procedures where disagreement occurred are minimally invasive procedures such as drawing blood, which is frequently completed by non-physician staff in many institutions – a fact that may explain why new physicians felt that it was not essential to have known how to complete those procedures during internship.

The School of Medicine has used the survey results to design a new procedures curriculum implemented in April 2008 and upgraded in April 2009. The school now provides training for students in all of the 19

procedures deemed most important by both the new and faculty physicians, and requires students to track electronically whether they observed, participated in or performed the procedures.

The next task, Fitch said, is determining how to evaluate competency in the procedures. Meanwhile, he added, patients should be pleased about the survey because it is leading to better care from doctors.

"One of the good things about the outcome of this study is that we are starting to identify those core procedures that every student should learn in medical school," Fitch said. "The training that our current medical students are receiving has been enhanced by the results of this study. That is going to lead to better patient care."

The survey participants included residency and fellowship directors at Wake Forest University School of Medicine, resident physicians who had completed their internship at Wake Forest University Baptist Medical Center and graduates of the School of Medicine who completed internships elsewhere.

Associate Professor of Emergency Medicine David Manthey, M.D., and medical student Stephen Kearns, both of the School of Medicine, are co-authors on the study.

Missing planets attest to destructive power of stars' tides

During the last two decades, astronomers have found hundreds of planets orbiting stars outside our solar system. New research indicates they might have found even more except for one thing – some planets have fallen into their stars and simply no longer exist.

The idea that gravitational forces might pull a planet into its parent star has been predicted by computer models only in the last year or so, and this is the first evidence that such planet destruction has already occurred, said University of Washington astronomer Rory Barnes.

"When we look at the observed properties of extrasolar planets, we can see that this has already happened – some extrasolar planets have already fallen into their stars," he said.

Computer models can show where planets should line up in a particular star system, but direct observations show that some systems are missing planets close to the stars where models say they should be.

Barnes, a postdoctoral astronomy researcher with the Virtual Planet Laboratory at the UW, is a co-author of a paper describing the findings that was accepted this month for publication in Astrophysical Journal. Lead author Brian Jackson and co-author Richard Greenberg are with the Lunar and Planetary Laboratory at the University of Arizona.

The research involves planets that are close to their parent stars. Such planets can be detected relatively easily by changes in brightness as their orbits pass in front of the stars. But because they are so close to each other, the planet and star begin pulling on each other with increasingly strong gravitational force, misshaping the star's surface with rising tides from its gaseous surface. "Tides distort the shape of a star. The bigger the tidal distortion, the more quickly the tide will pull the planet in," Jackson said.

Most of the planets discovered outside of our solar system are gas giants like Jupiter except that they are much more massive. However, earlier this year astronomers detected an extrasolar planet called CoRoT-7 B that, while significantly larger than our planet, is more like Earth than any other extrasolar planet found so far.

However, that planet orbits only about 1.5 million miles from its star, much closer than Mercury is to our sun, a distance that puts it in the category of a planet that will fall into its star. Its surface temperature is around 2,500 degrees Fahrenheit "so it's not a pleasant environment," Barnes said, and in a short time cosmically – a billion years or so – CoRoT-7 B will be consumed. The destruction is slow but inevitable, Jackson said.

"The orbits of these tidally evolving planets change very slowly, over timescales of tens of millions of years," Jackson said. "Eventually the planet's orbit brings it close enough to the star that the star's gravity begins tearing the planet apart. “So either the planet will be torn apart before it ever reaches the surface of the star, or in the process of being torn apart its orbit eventually will intersect the star's atmosphere and the heat from the star will obliterate the planet."

The researchers hope the work leads to better understanding of how stars destroy planets and how that process might affect a planet's orbit, Jackson said. The scientists also say their research will have to be updated as more extrasolar planets are discovered. NASA, which funded the research, recently launched the Kepler telescope, which is designed specifically to look for extrasolar planets that are closer in size to Earth.

Jackson hopes new observations will provide new lines of evidence to investigate how a star's tides can destroy planets. "For example, the rotation rates of stars tend to drop, so older stars tend to spin more slowly than younger stars," he said. "However, if a star has recently consumed a planet, the addition of the planet's orbital angular momentum will cause the star to rapidly increase its spin rate. So we would like to look for stars that are spinning too fast for their age."

For more information, contact Barnes at 206-543-8979 or rory@astro.washington.edu; or Jackson at 520-626-3154 or bjackson@lpl.arizona.edu. The paper is available at http://lanl.arxiv.org/abs/0904.1170

Most distant object in the universe spotted

* Updated 18:11 29 April 2009 **by Rachel Courtland**

Astronomers have spotted the most distant object yet confirmed in the universe – a self-destructing star that exploded 13.1 billion light years from Earth. It detonated just 640 million years after the big bang, around the end of the cosmic "dark ages", when the first stars and galaxies were lighting up space.

The object is a gamma-ray burst (GRB) – the brightest type of stellar explosion. GRBs occur when massive, spinning stars collapse to form black holes and spew out jets of gas at nearly the speed of light. These jets send gamma rays our way, along with "afterglows" at other wavelengths, which are produced when the jet heats up surrounding gas. The burst, dubbed GRB 090423 for the date of its discovery last Thursday, was originally spotted by NASA's Swift satellite at 0755 GMT.

Within an hour, astronomers began training ground-based telescopes on the same patch of sky to study the burst's infrared afterglow. Some of the first observations were made on Mauna Kea in Hawaii with the United Kingdom Infrared Telescope and the Gemini North telescope.

Other telescopes later measured the spectrum of the afterglow, revealing that the burst detonated about 13.1 billion light years from Earth. "It's the most distant gamma-ray burst, but it's also the most distant object in the universe overall," says Edo Berger of the Harvard-Smithsonian Center for Astrophysics, a member of the team that observed the afterglow with Gemini North.

Stretched light

To gauge an object's distance, astronomers measure how much an object's light has been stretched, or reddened, by the expansion of space. This burst lies at a redshift of 8.2, more distant than the previous GRB record holder, which lay at a redshift of 6.7.

Other astronomers have claimed to find galaxies at even greater distances – at redshifts of 10 and 9, but those findings are still ambiguous, says Joshua Bloom of the University of California, Berkeley, who observed the afterglow using the Gemini South telescope in Chile. Until now, the record holder for the farthest galaxy had a spectroscopically confirmed redshift of 6.96.

The burst's immense distance makes the now-dead star the earliest object to be discovered from an era called 'reionisation', which occurred within the first billion years after the big bang. At that time, an obscuring fog of neutral hydrogen atoms was being burned off by radiation from the first stars and galaxies, and possibly also from the annihilation of dark matter particles.

The fading infrared afterglow of GRB 090423 appears in the centre of this false-colour image taken with the Gemini North Telescope in Hawaii. The burst is the farthest cosmic explosion yet seen **(Image: Gemini Observatory/NSF/AURA/D Fox/A Cucchiara/Penn State U/E Berger/Harvard U)**

'Watershed event'

"For astronomy, this is a watershed event," Bloom told New Scientist. “This is the beginning of the study of the universe as it was before most of the structure that we know about today came into being."

The timing of the period of reionisation is still unclear, Bloom says. If astronomers can find more gamma-ray bursts at even greater distances, they could use their spectra to determine how quickly the universe became transparent and what was responsible for the process.

"In principle, you can see very early times in the universe [with GRBs], when everything else was too faint," says Nial Tanvir of the University of Leicester in the UK, a member of a team that used the Very Large Telescope in Chile to make one of the first measurements of the distance of the burst.

Distant blasts could also help pinpoint the locations of faint GRB host galaxies that could be detected by space telescopes like the soon-to-be-refurbished Hubble Space Telescope or NASA's infrared James Webb Telescope, which is set to launch in 2013.

Sensitive and fast

But building up a picture of the early universe will require finding many more distant bursts, and progress in discovering distant bursts has been slow. Swift has found 120 bursts with measured distances, but only three – including this one – date from the first billion years of the universe's history.

That is in part because stars did not form at high rates in the very early universe, before a redshift of about 5, and so they did not explode often as GRBs.

But it is also because infrared detectors that are both sensitive and quick enough to measure very distant, short-lived GRB afterglows have only recently begun operating. As a result, astronomers may have missed out on identifying some of the most distant GRBs identified by Swift.

Berger hopes the discovery of this object will hasten the development of new telescopes that could discover such afterglows with even greater efficiency. "As a single object, [the burst] is an amazing proof of concept," says Berger. "I think we've shown that's a worthwhile investment because [distant bursts] actually do exist."

NASA is considering one such telescope, called the Joint Astrophysics Nascent Universe Satellite (JANUS), for funding this year.

Evidence of the 'Lost World' -- did dinosaurs survive the end Cretaceous extinctions?

The Lost World, Sir Arthur Conan Doyle's account of an isolated community of dinosaurs that survived the catastrophic extinction event 65 million years ago, has no less appeal now than it did when it was written a century ago. Various Hollywood versions have tried to recreate the lost world of dinosaurs, but today the fiction seems just a little closer to reality. New scientific evidence suggests that dinosaur bones from the Ojo Alamo Sandstone in the San Juan Basin, USA, date from after the extinction, and that dinosaurs may have survived in a remote area of what is now New Mexico and Colorado for up to half a million years. This controversial new research, published today in the journal Palaeontologia Electronica, is based on detailed chemical investigations of the dinosaur bones, and evidence for the age of the rocks in which they are found.

"The great difficulty with this hypothesis - that these are the remains of dinosaurs that survived - is ruling out the possibility that the bones date from before the extinction" says Jim Fassett, author of the research. "After being killed and deposited in sands and muds, it is possible for bones to be exhumed by rivers and then incorporated into younger rocks" he explains. This is not the usual way in which fossil deposits of this kind form, but it has been shown to explain some other post-extinction dinosaur bones. Fassett has amassed a range of evidence that indicates that these fossils from the Ojo Alamo Sandstone were not exhumed and redeposited and that these dinosaurs really did live after the end Cretaceous extinction event.

The first step must be to demonstrate that the rocks containing the bones are younger than the extinction event. Fassett has analysed the magnetic polarity of the rocks, and the pollen grains they contain, different approaches to finding the age of rocks which, he concludes "independently indicate that they do indeed post-date the extinction". Fassett also found that "the dinosaur bones from the Ojo Alamo Sandstone have distinctly different concentrations of rare earth metal elements to the bones in the underlying Cretaceous rocks" and this, he argues "makes it very unlikely that the post-extinction bones were exhumed from the underlying sediments." This is supported by a find of 34 hadrosaur bones together - "these are not literally an articulated skeleton, but the bones are doubtless from a single animal" - if the bones had been exhumed by a river, they would have been scattered.

So does this provide conclusive proof that dinosaurs survived the Cretaceous extinctions? According to David Polly, one of the editors of the journal in which the research is published "this is a controversial conclusion, and many palaeontologists will remain sceptical", but we already know that flying theropod dinosaurs (more generally referred to as birds) and crocodiles survived, so the possibility of pockets of survivors of other types of dinosaur is not quite as far fetched as it might sound. Finding conclusive evidence, however, is a difficult matter when the crime scene is 65 million years old. "One thing is certain" continues Polly, "if dinosaurs did survive, they were not as widespread as they were before the end of the Cretaceous and did not persist for long." The 'Lost World scenario' of humans and dinosaurs existing at the same time, still belongs firmly in the realms of pure fantasy. END

1. The paper, "New Geochronologic and Stratigraphic Evidence Confirms the Paleocene Age of the Dinosaur-Bearing Ojo Alamo Sandstone and Animas Formation in The San Juan Basin, New Mexico and Colorado" by James Fassett, is published in the April 29 issue of Palaeontologia Electronica. The paper is available on the www at: http://www.palaeo-electronica.org

Really?

The Claim: Eating Parsley Can Eliminate Bad Breath

THE FACTS People have long tried to freshen their breath with parsley. Its fresh, strong flavor would seem to make it a natural deodorizer. And its deep green color is a sign of ample chlorophyll, which is thought to have some antibacterial properties. (The sulfur compounds that give rise to bad breath are produced by various strains of bacteria that feast on food deposits and other debris in the back of the mouth.)

Leif Parsons

But researchers who have looked into this particular folk remedy have found little evidence that it works. Studies that have examined its effects in the mouth have found that while it may have some small initial effect on odor - mostly by masking it - it does little to reduce the concentration of volatile sulfur compounds.

One unlikely food that has been shown to reduce levels of sulfur compounds, however, is green tea, although the effect may be temporary, lasting no more than an hour or two.

Mouthwashes can be effective when they contain two ingredients in particular, zinc and chlorhexidine. But those that contain alcohol may make the problem worse by drying the mouth. Several studies have also identified a number of other factors that contribute to bad breath, including being overweight, drinking heavily and smoking.

THE BOTTOM LINE There is little evidence that parsley can counteract bad breath.

ANAHAD O'CONNOR scitimes@nytimes.com

Unifying the animate and the inanimate designs of nature

DURHAM, N.C. -- Living beings and inanimate phenomena may have more in common than previously thought.

At least that is the view of Duke University engineer Adrian Bejan and Penn State biologist James Marden.

What they believe connects the two worlds is a theory that flow systems – from animal locomotion to the formation of river deltas -- evolve in time to balance and minimize imperfections. Flows evolve to reduce friction or other forms of resistance, so that they flow more easily with time. This view has been termed the constructal law, which Bejan first stated 13 years ago.

With the help of Marden, Bejan believes that he has now unified both the biological and geophysical principles of nature's design through the constructal law, which can also be viewed as the physics of evolution.

"This is an exciting development for physicists, but it should also resonate with biologists," Bejan said. "The idea that organic evolution is analogous to the way form evolves in inanimate flow systems is a novel concept that has the potential to unite perspectives and approaches across disparate disciplines. We suggest that the constructal law provides a powerful tool for examining and understanding variation in both the animate and inanimate compartments of nature."

The team's findings were published online in the journal Physics of Life Reviews. It was supported by the U.S. Air Force Office of Scientific Research and the National Science Foundation.

The story began with the two scientists trying to determine if the same laws applied to two very different forms of locomotion -- the swimming of fish and the running or flying of animals. The commonly held belief among biologists was that fish locomotion was different than other animal locomotion. Since they live in water, the conventional wisdom held, fish were different because they would not be subject to gravity.

The way Bejan saw it, birds and animals could be seen as weight-lifters, since their means of locomotion required effort with an unyielding base - the ground - and a limitless top – the air. He argued that as fish swim, they too have an unyielding floor - the sea bed. Hence, water flowed over and around them like the air over runners and flyers.

So, fish too were weight-lifters, and these forms of locomotion are predicted by the constructal law, Bejan said.

"Our discovery that animal locomotion adheres to the constructal law tells us that - even though you couldn't predict exactly what animals would look like if you started evolution over on Earth, or it happened on another planet – with a given gravity and density of their tissues, the same basic patterns of their design would evolve again," Marden said.

In numerous papers over past decade, Bejan has demonstrated that the constructal law predicts the design of a wide range of flow systems seen in nature, from biology and geophysics to social dynamics and technology evolution.

"When thinking of evolution and Darwin, most people think of animals or trees," Bejan said. "That's too bad, because design features are everywhere in nature. The constructal law can be seen as a universal principle of evolution, which applies in many fields, from physics to economics."

He describes the law as an animated movie, where one screen is replaced by another screen on which the currents flow with greater ease. He sees the constructal law (www.constructal.org) as the time direction of the movie, flow configurations (designs, drawings) that flow more easily."

"The constructal law can be seen to cover 'natural design' phenomena across the board," Bejan said, "as a compact summary of common observations, the tape of evolution running in one direction, which may be expressed in physics terms simply as: time and configuration."

Depression linked with accumulation of visceral fat

Study explains association between depression and cardiovascular disease

Numerous studies have shown that depression is associated with an increased risk of heart disease, but exactly how has never been clear.

Now, researchers at Rush University Medical Center have shown that depression is linked with the accumulation of visceral fat, the kind of fat packed between internal organs at the waistline, which has long been known to increase the risk of cardiovascular disease and diabetes.

The study is posted online and will be published in the May issue of Psychosomatic Medicine.

"Our results suggest that central adiposity – which is commonly called belly fat – is an important pathway by which depression contributes to the risk for cardiovascular disease and diabetes," said Lynda Powell, PhD, chairperson of the Department of Preventive Medicine at Rush and the study's principal investigator. "In our study, depressive symptoms were clearly related to deposits of visceral fat, which is the type of fat involved in disease."

The study included 409 middle-aged women, about half African-American and half Caucasian, who were participating in the Women in the South Side Health Project (WISH) in Chicago, a longitudinal study of the menopausal transition. Depressive symptoms were assessed using a common screening test, and visceral fat measured with a CT scan. Although waist size is often used as a proxy for the amount of visceral fat, it is an inaccurate measure because it includes subcutaneous fat, or fat deposited just beneath the skin.

The researchers found a strong correlation between depression and visceral fat, particularly among overweight and obese women. The results were the same even when the analysis adjusted for other variables that might explain the accumulation of visceral fat, such as the level of physical activity. The study found no association between depressive symptoms and subcutaneous fat. The findings were the same for both black and white women.

Powell speculated that depression triggers the accumulation of visceral fat by means of certain chemical changes in the body – like the production of cortisol and inflammatory compounds – but said that more research is needed to pinpoint the exact mechanism.

Rush University Medical Center includes the 674-bed (staffed) hospital; the Johnston R. Bowman Health Center; and Rush University (Rush Medical College, College of Nursing, College of Health Sciences and the Graduate College).

Penn Medicine, CHOP Researchers Demonstrate First Common Genetic Risk Factors for Autism

Large Study Traces Root Causes of Autism to Variations in Central Nervous System Genes

PHILADELPHIA – Researchers have made an important step forward in understanding the complex genetic structure of autism spectrum disorders. A researcher collaboration, including geneticists from the University of Pennsylvania School of Medicine and The Children's Hospital of Philadelphia (CHOP), have detected variations along a genetic pathway that is responsible for neurological development, learning and memory, which appears to play a significant role in the genetic risk of autism. Their findings were published online in the journal Nature today.

Evidence suggests there is a strong genetic component increasing the likelihood of an autism diagnosis, estimated to impact 1 in 150 children in the United States. The study findings suggest that a particular genetic variation, found on a cluster between CDH10 and CDH9, is commonly found in children with autism, according to co-senior author Gerard Schellenberg, PhD, professor of pathology and laboratory medicine at the University of Pennsylvania School of Medicine.

"We studied more than 10, 000 children – of whom more than 4, 500 had been diagnosed with an autism spectrum disorder – and found a common genetic variation that increases the risk of a child developing autism, along with a rarer genetic change that contributes to some cases of autism," Schellenberg said. "This work yields important clues on what goes awry during development in children with autism and will help us focus on what is the cause of autism at a molecular level."

"It is very compelling to find evidence that mutations in genes involved in brain interconnections increase a child's risk of autism, because other autism researchers have made intriguing suggestions that autism arises from abnormal connections among brain cells during early development," said study leader Hakon Hakonarson, MD, PhD, director of the Center for Applied Genomics at The Children's Hospital of Philadelphia and associate professor of Pediatrics at the University of Pennsylvania School of Medicine.

In a second study, researchers found deleted or duplicated genes along two major central nervous system gene networks in children with autism spectrum disorders. The changes were on the ubiquitin pathway, which is responsible for regulating synaptic operations and nervous system development. One ubiquitin-related gene studied, UBE3A, was previously thought to be connected to autism, while another, PARK2, was previously found to mutate and lead to juvenile Parkinson's disease. Future research will test the effects of the missing or extra genetic copies.

The first study was supported in part by grants from the Department of Veterans Affairs, National Institutes of Health, and the Autism Genome Project Consortium funded by Autism Speaks. The Children's Hospital of Philadelphia, Autism Speaks and the National Institute of Child Health and Human Development funded the second study.

This release is available online at http://www.uphs.upenn.edu/news/News_Releases/2009/04/autism-genetics.html

We Owe It All to Comets

TAU finds comets contain key ingredients for life on earth

Comets have always fascinated us. A mysterious appearance could symbolize God's displeasure or mean a sure failure in battle, at least for one side. Now Tel Aviv University justifies our fascination - comets might have provided the elements for the emergence of life on our planet.

While investigating the chemical make-up of comets, Prof. Akiva Bar-Nun of the Department of Geophysics and Planetary Sciences at Tel Aviv University found they were the source of missing ingredients needed for life in Earth's ancient primordial soup. "When comets slammed into the Earth through the atmosphere about four billion years ago, they delivered a payload of organic materials to the young Earth, adding materials that combined with Earth's own large reservoir of organics and led to the emergence of life," says Prof. Bar-Nun.

It was the chemical composition of comets, Prof. Bar-Nun believes, that allowed them to kickstart life. He has published his theory widely in scientific journals, including the journal Icarus.

A Pinch of Argon, A Dash of Xenon

Using a one-of-a-kind machine built at Tel Aviv University, researchers were able to simulate comet ice, and found that comets contain ingredients necessary for providing the basic nutrients of life.

Specifically, Prof. Bar-Nun looked at the noble gases Argon, Krypton and Xenon, because they do not interact with any other elements and are not destroyed by Earth's oxygen. These elements have maintained stable proportions in the Earth's atmosphere throughout the lifetime of the planet, he explains.

"Now if we look at these elements in the atmosphere of the Earth and in meteorites, we see that neither is identical to the ratio in the sun's composition. Moreover, the ratios in the atmosphere are vastly different than the ratios in meteorites which make up the bulk of the Earth. So we need another source of noble gases which, when added to these meteorites or asteroid influx, could change the ratio. And this came from comets.

Solving the Otherworldly Puzzle

Comets are essentially large chunks of ice, whose temperature ranges from -200 to -250 degrees centigrade. Formed in the early days of the solar system far away from the sun, water vapor condensed directly into ice, making little grains. These grains came together to form the comets, which are less than 2/3 of a mile in diameter, explains Prof. Bar-Nun.

During the comets' formation, the porous ice trapped gases and organic chemicals that were present in outer space. "The pattern of trapping of noble gases in the ice gives a certain ratio of Argon to Krypton to Xenon, and this ratio - together with the ratio of gases that come from rocky bodies - gives us the ratio that we observe in the atmosphere of the Earth."

Thus, the arrival on Earth of comets and asteroids led to the necessary ratio of materials for organic life, "which eventually were dissolved in the ocean and started the long process leading to the emergence of life on Earth," says Prof. Bar-Nun.

Asteroid Showers and Thunderstorms

The story started between 4.6 and 3.8 billion years ago, when both the moon and the Earth were bombarded by a flux of asteroids and comets. "On the Earth, most of the craters were obliterated by continental movement and by weathering winds and water erosion. On the moon, they remained as they were," says Prof. Bar-Nun, who adds that no life could thrive during this period of bombardment.

But the Earth recovered, and three to four hundred million years later, fragile forms of life emerged after the comet-delivered elements precipitated into the ocean. "There was another chemical development of these molecules in water, which became more and more complex," says Prof. Bar-Nun, leading to the origin of life on Earth.

Cases

When Bad Advice Is the Best Advice

By PETER A. UBEL, M.D. Published: April 27, 2009

Keith Negley

Eighteen years out of training, and I still find myself struggling to understand the moral imperatives of medical practice.

Not long ago, as part of my hospital duties, I cared for a man who could no longer swallow. This dysphagia was his only medical complaint, one that had sneaked up on him over the course of a month. He simply couldn't find the muscular strength to propel food and liquid down to his stomach.

After some investigation, the medical team discovered he had metastatic lung cancer. That explained the dysphagia: cancer had stimulated his immune system to attack his swallowing muscles.

While the cancer was incurable, we hoped we could slow its progression and give him a few extra months of life - small solace for a man in his mid-50s with a loving wife and several children ready to start new families, but the best we could offer.

On rounds the morning after he received a feeding tube, I stopped by to see how he was doing - checking his abdomen for signs of infection and, more important, assessing his fragile mood. I tried to keep things upbeat, making small talk while examining his belly. But something about his response, and the look he gave his wife, was troubling.

I looked up and asked him how he was feeling, keeping purposely vague about whether I was posing a medical or a social question. It was his wife who replied - angrily. She lashed out at her husband for having sneaked off that morning for a cigarette. He glared back and told her to mind her own business.

She looked toward me for support - I was the physician, after all - and I found myself in a common medical quandary.

Was it my duty to tell this patient what to do or, instead, to give him the medical information he needed to make up his mind?

Medical decisions these days are increasingly recognized as being more than simply medical, with the right choice depending in part on the patient's preferences.

Should a middle-age woman with mildly elevated cholesterol take a statin, for example? That depends on whether she thinks the pill's benefits outweigh its burdens, burdens that only she can judge: costs, possible side effects and the inconvenience of taking medications.

Should an elderly man have knee-replacement surgery? That depends on how much he is suffering, how much he cares about the risk of surgical complications and how willing he is to undergo lengthy and painful rehabilitation.

According to this new paradigm of preference-sensitive decision-making, doctors like me shouldn't tell patients what to do (Take your pills! Stop smoking!), but rather should educate our patients about the risks and benefits of their options.

So going by the book, I should have informed my patient about the pros and cons of tobacco. But I couldn't stand by, in the role of a dispassionate educator, and let this man hurt himself. Instead, I felt compelled to give him advice that would promote his best interests.

I advised him to smoke.

"You two obviously love each other very much," I said. Then I turned to his wife.

"I know that you are trying to keep your husband from smoking because you love him and don't want him to get sicker," I continued, as I recall. "But those cigarettes aren't going to hurt him now. If anything, they'll help him relax. What matters is that you two stick together, because these next few months are going to be really difficult."

I reminded them that the cancer wasn't curable, that we were hoping to improve his quality of life, and that the best way to do that was to spend quality time with the people he loved.

Every situation is different, of course. But my duty as a physician is to improve my patients' lives. And if I can do that by sharing my perspective with them, however strange or uncomfortable it may sound, then that is what I must do.

Even if it means encouraging them to smoke.

Peter A. Ubel is director of the Center for Behavioral and Decision Sciences in Medicine at the University of Michigan.

Analysis finds strong match between molecular, fossil data in evolutionary studies

During a seminar at another institution several years ago, University of Chicago paleontologist David Jablonski fielded a hostile question: Why bother classifying organisms according to their physical appearance, let alone analyze their evolutionary dynamics, when molecular techniques had already invalidated that approach?

With more than a few heads in the audience nodding their agreement, Jablonski, the William Kenan Jr. Professor in Geophysical Sciences, saw more work to be done. The question launched him on a rigorous study that has culminated in a new approach to reconciling the conflict between fossil and molecular data in evolutionary studies.

For more than two decades, debate has waxed and waned between biologists and paleontologists about the reliability of their different methods. Until now, attention has focused on the dramatically different evolutionary history of certain lineages as determined by fossils or by genetics.

Scientists using molecular techniques assert that genetics more accurately determines evolutionary relationships than does a comparison of physical characteristics preserved in fossils. But how inaccurate, really, were the fossils? Jablonski and the University of Michigan's John A. Finarelli have published the first quantitative assessment of these assumed discrepancies in the Proceedings of the National Academy of Sciences.

They compared the molecular data to data based on the kinds of features used to distinguish fossil lineages for 228 mammal and 197 mollusk lineages at the genus level (both wolves and dogs belong to the genus Canis, for example).

No matter how they looked at it, the lineages defined by their fossil forms "showed an imperfect but very good fit to the molecular data," Jablonski said. The fits were generally far better than random. The few exceptions included freshwater clams, "a complete disaster," he said.

Jablonski and Finarelli (Ph.D.'07, University of Chicago), then decided to push their luck. They looked at the fits again, but this time focused on geographic range and body size. The result: a "spectacularly robust" match between the fossil and molecular data.

Jablonski interprets the results as good news for evolutionary studies. The work backs up a huge range of analyses among living and fossil animals, from trends in increasing body size in mammal lineages, to the dramatic ups and downs of diversity reported in the fossil record of evolutionary bursts and mass extinctions.

"Our study also points the way toward new partnerships with molecular biology, as we straighten out the mismatches that we did find," he said.

***Citation**: "Congruence of morphologically-defined genera with molecular phylogenies," by David Department of Geophysical Sciences, University of Chicago; and John A. Finarelli, Department of Geological Sciences, University of Michigan, Proceedings of the National Academy of Sciences, Online Early Edition, week of April 27-May 1, 2009.*
Funding: National Aeronautics and Space Administration and the University of Michigan Society of Fellows.
Scientists devise method to address conflict between molecular clock, fossil record of mammalian evolution (Feb. 5 , 1999): http://www-news.uchicago.edu/releases/99/990224.mammals.shtml

Google Earth aids discovery of early African mammal fossils

ANN ARBOR, Mich. - A limestone countertop, a practiced eye and Google Earth all played roles in the discovery of a trove of fossils that may shed light on the origins of African wildlife.

The circuitous and serendipitous story, featuring University of Michigan paleontologists Philip Gingerich, Gregg Gunnell and Bill Sanders, is the subject of a segment on the award-winning television series "Wild Chronicles," currently airing on public television stations (Episode 412 - Looking Back; check listings for local air dates). "Wild Chronicles" is produced by National Geographic Television and presented by WLIW21 in association with WNET.ORG.

The saga began when Gingerich, an authority on ancient whales, learned of a whale fossil from Egypt that had been discovered in a most unconventional way. At a stonecutting yard in Italy where blocks of stone from around the world are sliced up for countertops, masons had noticed what looked like cross-sections of a skeleton in slabs cut from a huge hunk of limestone imported from Egypt. Paleontologist Giovanni Bianucci of the University of Pisa recognized these as fossilized remains of a whale that lived in Egypt 40 million years ago, when the region was covered by ocean.

His curiosity piqued by the discovery, Gingerich wanted to visit the site where the limestone was quarried, but the exact location was something of a mystery. Bianucci had reported that the countertop whale came from a site near the Egyptian city of Sheikh Fadl, but a colleague in Egypt told Gingerich the quarry was probably farther east - exactly where, he wasn't sure.

Instead of setting out blindly across the desert, Gingerich sat down at his computer and clicked on Google Earth. After locating Sheikh Fadl, he scanned eastward until he found a range of limestone bluffs trailing across the desert like the backbone of some enormous serpent. Continuing his virtual expedition, Gingerich followed the bluffs, looking for roads branching off the main highway that might lead to quarries. Finally, about 75 miles east of Sheikh Fadl, he came across a road that traveled north to a deeply pocked area that just had to be a cluster of quarries.

Through associates in Egypt, Gingerich made arrangements to travel to Khasm el Raqaba, the area he had located on Google Earth. "Sure enough, when we got there, there was a huge quarry operation with trucks everywhere, blasting out blocks of limestone," said Gingerich, who is the Ermine Cowles Case Collegiate Professor of Paleontology and director of the U-M Museum of Paleontology. Within minutes of seeing the site, though, Gingerich realized any whale fossils that might be there would be impossible to locate.

Scanning the scene, however, something else caught his eye: bands of red in the white limestone walls of the quarry. He quickly realized the red bands represented layers of loose soil that were blown into ancient caves. "Suddenly it dawned on me: There should be animals preserved in that sediment, too, because caves often act as traps," Gingerich said. When he searched at the base of one rock outcrop, there were tiny bones everywhere.

Gingerich collected some of the fossils and took them back to the U-M Museum of Paleontology where Gunnell, an associate research scientist, began studying them and identified teeth and bones of fossil bats. Gunnell shared the materials with Ellen Miller of Wake Forest University, who found a few rodent jaws and some additional teeth. Recently, with funding from National Geographic Society, Gunnell, Miller, U-M

assistant research scientist William Sanders and Ahmed El-Barkooky of Cairo University visited the site to collect more of the fossils, which may have an interesting story of their own.

The bones and teeth - remains of small mammals that lived in the early Miocene Epoch, some 18 to 20 million years ago - are the first small mammal fossils of that age to be found in Egypt. They may even represent some of the first mammals to migrate from Asia to Africa when the land bridge between the two continents first formed.

"It's likely that animals moving from Asia to Africa passed through the Khasm el Raqaba area," Gunnell said. Were the tiny bats, rats and other creatures whose fossils the researchers found among those very first migrants, the progenitors of today's iconic African wildlife?

"The record isn't good enough to pin that down yet," Gunnell said. "But when these animals are studied in detail, they should lead to a better understanding of biogeography and dispersal events between Asia and Africa and between North Africa and the rest of the African continent."

Salt in Enceladus geyser points to liquid ocean

THE ice plumes that bloom above Saturn's icy moon Enceladus are almost certainly rooted in a subsurface sea of liquid water.

The Cassini spacecraft flew through a plume on 9 October 2008 and measured the molecular weight of chemicals in the ice. Frank Postberg of the Max Planck Institute for Nuclear Physics in Heidelberg, Germany, and colleagues, found traces of sodium in the form of salt and sodium bicarbonate. The chemicals would have originated in the rocky core of Enceladus, so to reach a plume they must have leached from the core via liquid water. Observations from Earth in 2007 spotted no sign of sodium, casting doubt on such a subsurface sea.

Although the salt could have been leached out by an ancient ocean which since froze solid, that freezing process would concentrate most of the salt very far from the surface of the moon's ice, says Julie Castillo of NASA's Jet Propulsion Laboratory in Pasadena, California. "It is easier to imagine that the salts are present in a liquid ocean below the surface," she says. "That's why this detection, if confirmed, is very important."

The new results were due to be presented at the European Geophysical Union meeting in Vienna this week.

Topical Cream Studied as Way to Treat Skin Cancer without the Knife

Saint Louis University Doctors Stress Screenings for Melanoma

In a case study of a type of melanoma skin cancer typically found on chronically sun-exposed skin, Saint Louis University researchers found that imiquimod, a topical cream, produced good results for patients when used together with surgery to treat the cancer, potentially helping doctors cut less.

The study, published in Dermatologic Surgery, looked at two cases of the most common type of melanoma of the head and neck, lentigo maligna (LM), a type of "melanoma-in- situ", the earliest stage of melanoma. This early form, known as LM, precedes the more invasive form, lentigo maligna melanoma (LMM), and the progression of LM to LMM typically occurs after 10 to 15 years. Though surgical removal of LM is most often used to treat the non-invasive form of the cancer, it can have high local recurrence rates.

In two patients who had both LM and LMM, investigators used imiquimod in conjunction with surgery. In both patients, surgery was first done to remove the area of known invasive disease, followed by the topical cream to the outer area of LM. This approach was chosen with patients who did not want extensive surgery due to the large size of the melanoma on their scalp and face. These cases, along with other recent studies, suggest that imiquimod may help to reduce the area needing surgery, manage the LM and hopefully minimize its recurrence.

"As we're seeing melanoma in younger and younger people, in their 30s and 40s, there is a longer window for the cancer to return and a greater desire to avoid disfiguring surgery," said Scott Fosko, M.D., chairman of the department of dermatology at Saint Louis University School of Medicine and lead study investigator.

Researchers hope that topical treatments like imiquimod may be used to lower the seriousness and the cost of treating the disease, as well as limit scars from surgery, and, most importantly, improve patient care.

"This subtype of melanoma is becoming more and more common, and can be one of the more challenging melanomas to manage," said Fosko, who is also director of the melanoma and cutaneous oncology section of the Saint Louis University Cancer Center.

"While more study is needed to understand how the drug works and which patients are likely to benefit from it, we are optimistic that the drug may prove to be a good option for some patients," said Fosko. "This may be an effective first line treatment."

Doctors stress that the best way to catch skin cancer early is through screenings. Patients seem to be hearing the message, as upcoming free cancer screenings hosted by the Saint Louis University department of dermatology and Saint Louis University Cancer Center filled up quickly.

While this year's May 2 screenings are full at both the Anheuser Busch Institute and DesPeres SLUCare locations, you may be placed on a waiting list or schedule a regular screening with a SLUCare dermatologist by calling 314-977-4440 or 1-866-977-4440.

Regular skin screenings are recommended for everyone, especially those over 40 years of age, and individuals at higher risk for skin cancer, those with a fair complexion, sunburn easily, have numerous moles, a personal or family history of skin cancer, and by occupation, recreation or use of tanning salons, get significant sun or ultraviolet rays exposure, regardless of age or race.

During a screening, a dermatologist will check moles, birth marks and other pigmentations for signs of cancer, which include abnormal size, color, shape or texture.

Skin Cancer Facts:

According to the American Cancer Society, more than 1 million new cases of skin cancer will be diagnosed in the United States this year. As many one in five Americans will develop skin cancer during their lifetime. Yet many people continue to tan both indoors and out.

Melanoma is the most deadly form of skin cancer and is the leading cancer in young adults, 25-29 years old. It is characterized by the uncontrolled growth of pigment-producing cells and may appear on the skin suddenly without warning or develop on an existing mole. There are several warning signs of melanoma.

Identifying these signs is as easy as ABCDE:

Asymmetry - one half is unlike the other half

Border - irregular, scalloped or poorly defined border

Color - varied from one area to another; shades of tan and brown, black; sometimes white, red or blue

Diameter - while melanomas are usually greater than 6 mm (the size of a pencil eraser) when diagnosed, they can be smaller

Evolving - a mole or skin lesion that looks different from the rest or is changing in size, shape or color

Established in 1836, Saint Louis University School of Medicine has the distinction of awarding the first medical degree west of the Mississippi River. The school educates physicians and biomedical scientists, conducts medical research, and provides health care on a local, national and international level. Research at the school seeks new cures and treatments in five key areas: cancer, liver disease, heart/lung disease, aging and brain disease, and infectious disease.

Native Americans Descended From a Single Ancestral Group, DNA Study Confirms

For two decades, researchers have been using a growing volume of genetic data to debate whether ancestors of Native Americans emigrated to the New World in one wave or successive waves, or from one ancestral Asian population or a number of different populations.

Now, after painstakingly comparing DNA samples from people in dozens of modern-day Native American and Eurasian groups, an international team of scientists thinks it can put the matter to rest: Virtually without exception the new evidence supports the single ancestral population theory.

"Our work provides strong evidence that, in general, Native Americans are more closely related to each other than to any other existing Asian populations, except those that live at the very edge of the Bering Strait," said Kari Britt Schroeder, a lecturer at the University of California, Davis, and the first author on the paper describing the study.

"While earlier studies have already supported this conclusion, what's different about our work is that it provides the first solid data that simply cannot be reconciled with multiple ancestral populations," said Schroeder, who was a Ph.D. student in anthropology at the university when she did the research.

The study is published in the May issue of the journal Molecular Biology and Evolution.

The team's work follows up on earlier studies by several of its members who found a unique variant (an allele) of a genetic marker in the DNA of modern-day Native American people. Dubbed the "9-repeat allele," the variant (which does not have a biological function), occurred in all of the 41 populations that they sampled from Alaska to the southern tip of Chile, as well as in Inuit from Greenland and the Chukchi and Koryak people native to the Asian (western) side of the Bering Strait. Yet this allele was absent in all 54 of the Eurasian, African and Oceanian groups the team sampled.

Overall, among the 908 people who were in the 44 groups in which the allele was found, more than one out of three had the variant.

In these earlier studies, the researchers concluded that the most straightforward explanation for the distribution of the 9-repeat allele was that all modern Native Americans, Greenlanders and western Beringians descend from a common founding population. Furthermore, the fact that the allele was absent in other Asian populations most likely meant that America's ancestral founders had been isolated from the rest of Asia for thousands of years before they moved into the New World: that is, for a period of time that was long enough to allow the allele to originate in, and spread throughout, the isolated population.

As strong as this evidence was, however, it was not foolproof. There were two other plausible explanations for the widespread distribution of the allele in the Americas.

If the 9-repeat allele had arisen as a mutation multiple times, its presence throughout the Americas would not indicate shared ancestry. Alternatively, if there had been two or more different ancestral founding groups and only one of them had carried the 9-repeat allele, certain circumstances could have prompted it to cross into the other groups and become widespread. Say that there was a second allele - one situated very close to the 9-repeat allele on the DNA strand - that conferred a strong advantage to humans who carried it. Natural selection would carry this allele into new populations and because of the mechanics of inheritance, long stretches of DNA surrounding it, including the functionless 9-repeat allele, would be carried along with the beneficial allele.

To rule out these possibilities, the research team, which was headed by Noah Rosenberg at the University of Michigan, scrutinized DNA samples of people from 31 modern-day Asian populations, 19 Native American, one Greenlandic and two western Beringian populations.

They found that in each sample that contained the 9-repeat allele, short stretches of DNA on either side of it were characterized by a distinct pattern of base pairs, a pattern they seldom observed in people without the allele. “If natural selection had promoted the spread of a neighboring advantageous allele, we would expect to see longer stretches of DNA than this with a similarly distinct pattern,” Schroeder said. “And we would also have expected to see the pattern in a high frequency even among people who do not carry the 9-repeat allele. So we can now consider the positive selection possibility unlikely.”

The results also ruled out the multiple mutations hypothesis. If that had been the case, there would have been myriad DNA patterns surrounding the allele rather than the identical characteristic signature the team discovered.

“There are a number of really strong papers based on mitochondrial DNA - which is passed from mother to daughter - and Y-chromosome DNA - which is passed from father to son - that have also supported a single ancestral population,” Schroeder said. “But this is the first definitive evidence we have that comes from DNA that is carried by both sexes.”

Other authors of the study are David G. Smith, a professor of anthropology at UC Davis; Mattias Jacobsson, University of Michigan and Uppsala University in Sweden; Michael H. Crawford, University of Kansas; Theodore Schurr, University of Pennsylvania; Simina Boca, Johns Hopkins University; Donald F. Conrad and Jonathan Pritchard, University of Chicago; Raul Tito and Ripan Malhi, University of Illinois, Urbana-Champaign; Ludmilla Osipova, Russian Academy of Sciences, Novosibirsk; Larissa Tarskaia, Russian Academy of Sciences, Moscow; Sergey Zhadanov, University of Pennsylvania and Russian Academy of Sciences, Novosibirsk; and Jeffrey D. Wall, UC San Francisco.

The work was supported by NIH grants to Rosenberg and Smith and an NSF Graduate Research Fellowship to Schroeder.

Parkinson's: Neurons destroyed by 3 simultaneous strikes

New theory of Parkinson's disease gives researchers fresh ideas for treatments

NEW YORK – In a study that reveals the clearest picture to date of neuron death in Parkinson's disease, researchers at Columbia University Medical Center have found that a trio of culprits acting in concert is responsible for killing the brain cells.

The study, published in the April 30 issue of Neuron, showed that three molecules – the neurotransmitter dopamine, a calcium channel, and a protein called alpha-synuclein – act together to kill the neurons.

The discovery gives researchers a new understanding of how to save the neurons, say the study's authors, Eugene Mosharov, Ph.D., associate research scientist, and David Sulzer, Ph.D., professor of neurology & psychiatry at Columbia University Medical Center.

"Though the interactions among the three molecules are complex, the flip side is that we now see that there are many options available to rescue the cells," says Dr. Mosharov.

The symptoms of Parkinson's – including uncontrollable tremors and difficulty in moving arms and legs – are blamed on the loss of neurons from the substantia nigra region of the brain.

Researchers had previously suspected dopamine, alpha-synuclein and calcium channels were involved in killing the neurons, but could not pin the deaths on any single molecule.

The new paper, along with previous studies with Dr. Ana Maria Cuervo at Albert Einstein College of Medicine, shows that it is the combination of all three factors that kills the neurons.

The studies found that neurons die because calcium channels lead to an increase of dopamine inside the cell; excess dopamine then reacts with alpha-synuclein to form inactive complexes; and then the complexes gum up the cell's ability to dispose of toxic waste that builds up in the cell over time. The waste eventually kills the cell.

The neurons will survive if just one of the three factors is missing, Drs. Sulzer and Mosharov also found. "It may be possible to save neurons and stop Parkinson's disease by interfering with just one of the three factors," Dr. Mosharov says.

That means that one drug already in clinical trials – which blocks the culprit calcium channel – may work to slow or stop the progression of the disease, an achievement none of the current treatments for Parkinson's disease can accomplish.

Good Dopamine; Bad Dopamine

The idea that dopamine contributes to the death of neurons may seem paradoxical, since most Parkinson's patients take L-DOPA to increase the amount of dopamine inside the cells.

The new study shows that it's the location of the dopamine inside the neurons that determines its toxicity.

Most of dopamine inside the neurons is packaged into compartments that are shipped to the edge of the cell where the dopamine is released. The motor symptoms of Parkinson's arise when the amount of dopamine released by the cells declines. L-DOPA improves symptoms by boosting the amount of dopamine released by the cells. As long as dopamine is confined inside the compartments before it is released, it is safe.

Outside the compartments in the cell's cytoplasm, however, Drs. Sulzer and Mosharov found that dopamine - in concert with calcium and alpha-synuclein – is toxic.

New Idea for Treatment

A better treatment, the researchers say, may be to push more dopamine into the compartments where it has no toxic effect on the cell. "That would be a magic treatment," Dr. Mosharov says. "Not only would it stop cells from dying and the disease from progressing, it would improve the patient's symptoms at the same time by giving their neurons more dopamine to release."

Drs. Sulzer and Mosharov are currently working on genetic therapies that could accomplish this feat, but caution that it will be years before any such treatment is ready for clinical trials, if ever.

Human brain contains neurons with a preference for whole real words

A new study provides direct experimental evidence that a brain region important for reading and word recognition contains neurons that are highly selective for individual real words. The research, published by Cell Press in the April 30th issue of the journal Neuron, provides important insight into brain mechanisms associated with reading and may lead to a better understanding of reading disabilities.

The ability to read is a complex cognitive skill that is thought to depend on neural representations built as a result of experience with written words. "Although some theories of reading as well as some neuropsychological and experimental data have argued for the existence of a neural representation for whole real words, experimental evidence for such a representation has been elusive," explains senior study author Dr. Maximilian Riesenhuber from the Department of Neuroscience at the Georgetown University Medical Center.

Previous neuroimaging studies have identified an area in the left visual cortex, called the visual word form area (VWFA), as being important for reading words. However, thus far, scientists have not demonstrated that this brain region has a preference for real words when compared with pronounceable nonsense words, known as pseudowords (i.e. "farm" versus "tarm"). Dr. Riesenhuber and colleagues performed a series of experiments using a neuroimaging technique that allowed very sensitive examination of neuronal activity. Subjects were imaged while performing reading detection tasks using real words and pseudowords.

The researchers found that neurons in the VWFA were highly selective for whole real words, supporting the idea of experience-driven tuning of neurons in the VWFA to real words but not pseudowords. Further, a whole-brain analysis revealed that the left VWFA was the only brain area that consistently exhibited this selectivity for written words during the experimental reading tasks. The findings provide evidence that experience-driven neural plasticity extends beyond lower level representations of characters and also involves whole words.

"These results are not just relevant for theories of reading and reading acquisition but also for our understanding of the mechanisms underlying experience-driven cortical plasticity in general," says Dr. Riesenhuber. "It will be interesting in future studies to investigate how the specificity of the representation in the VWFA changes during development and how it might differ in individuals with reading disorders."

The researchers include Laurie S. Glezer, Xiong Jiang, and Maximilian Riesenhuber, of the Department of Neuroscience, Georgetown University Medical Center, Washington, DC.

Why travel bans won't prevent a flu pandemic

* 11:45 29 April 2009 **by Ewen Callaway**

Restrictions on international air travel will have little effect on stemming the spread of an influenza pandemic, computer models suggest.

As the H1N1 strain of swine flu zooms around an increasingly interconnected world, the economic harm caused by border closings and mandatory travel restrictions will do more harm than good, scientists says. Sine flu has now been confirmed in Mexico, the US, Canada, Spain, Britain, Germany, Israel and New Zealand.

"There is no real sense in applying strict travel restrictions especially at this stage. It's not going to help," says Alessandro Vespignani, a computer scientist at the University of Indiana in Bloomington, whose team is also trying to predict the spread of the current outbreak.

The World Health Organization's Emergency Committee also took this position at a meeting on Monday: "WHO does not recommend closing of borders and does not recommend restriction of travel," said Keiji

Fukuda, assistant director general for health security and environment. However, Japan, which has no reported cases of swine flu thus far, has stopped issuing visas to Mexican nationals.

Drugs the key

Such measures are unlikely to be effective as the swine flu outbreak bounces around the world, potentially requiring more and more restrictions to keep infected travellers outside of the country, according to Vespignani. If things get bad in a very short time, you'll have to cut off communication with the rest of the world, he says. "Shutting down a country is impossible and, more or less, we see that it is not really effective."

In a 2007 paper, Vespignani's team modelled the spread of influenza pandemics of varying severities in 3100 urban centres in 220 countries. They also looked at the effectiveness of countermeasures including vaccination, administration of antiviral drugs such as Tamiflu, and travel restrictions.

A Draconian 10-fold reduction in airline travel would delay a pandemic by only a few weeks and have no effect on its overall health impact, Vespignani's team concluded. Other measures – particularly widespread administration of antiviral drugs – proved far more effective at limiting the spread of hypothetical pandemics.

A 2006 study led by Ben Cooper at the Health Protection Agency in London, UK, suggests that travel limitations would have to be implemented extremely early in a pandemic, when just a handful of people in a city are infected, to dramatically slow the spread. And even with a dramatic 99.9 per cent drop in airline traffic, most cities will eventually succumb to an influenza pandemic, Cooper's models indicate (PLoS Medicine, DOI: 10.1371/journal.pmed.0030212).

Economic harm

Another recent study of seasonal influenza outbreaks supports the contention that travel restrictions slow the spread of the disease, but not its ultimate toll (PLoS Medicine, DOI: 10.1371/journal.pmed.0030401).

Airline travel restrictions after the terrorist attacks on 11 September 2001 delayed the arrival of the 2001-2002 flu season in the US by about two weeks, but had little impact otherwise, says John Brownstein, an epidemiologist at Children's Hospital Boston, Massachusetts, who led that study.

"It's not likely that any amount of travel restriction is going to have a significant impact," he says of the current swine flu outbreak.

Modellers have also attempted to measure the economic cost of widespread travel bans in response to pandemic flu. In 2007, a team led by Joshua Epstein of the Brookings Institution in New York estimated that a 95 per cent reduction in air travel in the US could cost about $100 billion per year, or a little less than 1 per cent of the US gross national product (PLoS-ONE, DOI: 10.1371/journal.pone.0000401).

"In this situation, things are definitely not bad enough to warrant the economic impacts [travel limits] are going to have," Brownstein says. *Journal reference: PLoS Medicine (DOI: 10.1371/journal.pmed.0040013)*

M. D. Anderson study predicts dramatic growth in cancer rates among US elderly, minorities

Research underscores impact on health care system, importance of screenings, prevention strategies, inclusive clinical trials

HOUSTON - Over the next 20 years, the number of new cancer cases diagnosed annually in the United States will increase by 45 percent, from 1.6 million in 2010 to 2.3 million in 2030, with a dramatic spike in incidence predicted in the elderly and minority populations, according to research from The University of Texas M. D. Anderson Cancer Center.

The study, published online today in Journal of Clinical Oncology, is the first to determine such specific long-term cancer incidence projections. It predicts a 67 percent increase in the number of adults age-65-or-older diagnosed with cancer, from 1 million in 2010 to 1.6 million in 2030. In non-white individuals over the same 20-year span, the incidence is expected to increase by 100 percent, from 330,000 to 660,000.

According to Ben Smith, M.D., adjunct assistant professor in M. D. Anderson's Department of Radiation Oncology, the study underscores cancer's growing stress on the U.S. health care system.

"In 2030, 70 percent of all cancers will be diagnosed in the elderly and 28 percent in minorities, and the number of older adults diagnosed with cancer will be the same as the total number of Americans diagnosed with cancer in 2010," said Smith, the study's senior author. "Also alarming is that a number of the types of cancers that are expected to increase, such as liver, stomach and pancreas, still have tremendously high mortality rates."

Unless specific prevention and/or treatment strategies are discovered, cancer death rates also will increase dramatically, said Smith, who is currently on active military duty and is stationed at Lackland Air Force Base.

To conduct their research, Smith and his team accessed the United States Census Bureau statistics, updated in 2008 to project population growth through 2050, and the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) registry, the premier population-based cancer registry representing 26

percent of the country's population. Cancer incidence rates were calculated by multiplying the age, sex, race and origin-specific population projections by the age, sex, race and origin-specific cancer incidence rates.

The researchers found that from 2010 to 2030, the population is expected to grow by 19 percent (from 305 to 365 million). The total number of cancer cases will increase by 45 percent (from 1.6 to 2.3 million), with a 67 percent increase in cancer incidence in older Americans (1 to 1.6 million), compared to an 11 percent increase in those under the age of 65 (.63 to .67 million).

With respect to race, a 100 percent increase in cancer is expected for minorities (.33 to .66 million); in contrast, in white Americans, a 31 percent increase is anticipated (1.3 to 1.7 million). The rates of cancer in blacks, American Indian-Alaska Native, multi-racial, Asian-Pacific Islanders and Hispanics will increase by 64 percent, 76 percent, 101 percent, 132 percent and 142 percent, respectively.

Regarding disease-specific findings, Smith and his team found that the leading cancer sites are expected to remain constant - breast, prostate, colon and lung. However, cancer sites with the greatest increase in incidence expected are: stomach (67 percent); liver (59 percent); myeloma (57 percent); pancreas (55 percent); and bladder (54 percent).

Given these statistics, the role of screening and prevention strategies becomes all the more vital and should be strongly encouraged, said Smith. In the study, Smith and his team site: vaccinations for hepatitis B and HPV; the chemoprevention agents tamoxifen and raloxifene; interventions for tobacco and alcohol; and removal of pre-malignant lesions, such as colon polyps.

These findings also highlight two issues that must be addressed simultaneously: clinical trial participation and the increasing cost of cancer care. Historically, both older adults and minorities have been under-represented in such studies, and, therefore, vulnerable to sub-optimal cancer treatment. Simultaneously, over the past decade in particular, the cost of cancer care is growing at a rate that's not sustainable.

"The fact that these two groups have been under-represented in clinical research participation, yet their incidence of cancer is growing so rapidly, reflects the need for therapeutic trials to be more inclusive and address issues that are particularly relevant to both populations," said Smith. "In addition, as we design clinical trials, we need to seek not only the treatment that will prolong survival, but prolong survival at a reasonable cost to patients. These are two issues that oncologists need to be much more concerned about and attuned to."

Another issue that needs to be addressed is the shortage of health care professionals predicted. For example, according to a workforce assessment by American Society for Clinical Oncology (ASCO), the shortage of medical oncologists will impact the health care system by 2020. Smith said ASCO and other professional medical organizations beyond oncology are aware of the problem, and are actively engaged in efforts to try and grow the number of physicians, as well as encourage the careers of nurse practitioners and physician assistants who are part of the continuum of care, to best accommodate the increase in demand forecasted.

"There's no doubt the increasing incidence of cancer is a very important societal issue. There will not be one solution to this problem, but many different issues that need to be addressed to prepare for these changes," said Smith. "I'm afraid if we don't come to grips with this as a society, health care may be the next bubble to burst."

In addition to Smith, other M. D. Anderson authors on the study include: Thomas Buchholz, M.D., professor and chair of the Department of Radiation Oncology and the study's senior author; Gabriel Hortobagyi, M.D., professor and chair of the Department of Breast Medical Oncology; and Grace Smith, M.D., Ph.D., assistant professor in the Department of Radiation Oncology. Arti Hurria, M.D., post-doctoral fellow in the Department of Medical Oncology, City of Hope Cancer Center, also is a contributing author on the study.

Migraine prevention by targeting glutamate receptors?

Data to be presented at AAN suggests glutamate receptor 'mGluR5' is clinically relevant

When migraine strikes, because of severe pain, often accompanied by nausea and sensitivity to light and sound, sufferers are effectively disabled for up to 72 hours. Since they are forced to stop what they are doing until the pain and other symptoms subside, migraine causes a significant loss in productivity at work and the personal lives of those affected. Migraineurs – especially the 25% of migraineurs who experience more than three migraine attacks per month – are looking to drug developers to provide new drugs to prevent migraine attacks before they start. In the U.S. alone, approximately 30 million people suffer from migraines and the cost to employers has been estimated at $13 billion annually in lost productivity. Currently, several types of drugs, like generic beta blockers, calcium channel blockers, tricyclic antidepressants and anti-epileptic drugs, some of which are used off-label, are given to prevent migraines. However, many patients have only a partial response to these products, many of which have troubling side effects. Nevertheless, many migraine patients use existing drugs, illustrating how badly new drugs are needed.

Given the role of glutamate in the pathophysiology of migraine, the future of migraine prophylaxis, may lie in modulating one of the receptors in the glutamate system, mGluR5.

At the forthcoming annual meeting of the American Academy of Neurology in Seattle (April 25 – May 2), Addex Pharmaceuticals (SIX: ADXN) will present Phase IIa data on ADX10059, a negative mGluR5 allosteric modulator, which shows efficacy in treating acute migraine attacks and provides evidence that inhibition of this glutamate receptor subtype could play a role in stopping migraine attacks before they start.

Preclinical experiments and small scale studies in migraineurs with drugs like ketamine, which acts on glutamate signaling through NMDA receptors (functionally related to mGluR5) and the NMDA antagonist memantine, suggest that mGluR5 could play a role in the "migraine circuit," a positive feedback loop that generates the symptoms of a migraine attack. The initial step to test this hypothesis was Addex' proof of concept study in acute treatment of migraine attacks.

In the Phase IIa clinical trial of 129 migraine patients, significantly more patients taking ADX10059 than those taking placebo (16.7% vs 4.7%, respectively $p = 0.039$) were pain-free two hours after dosing. ADX10059 administration yielded better pain improvement than placebo at all time points up to two hours after treatment of a migraine attack. In addition, there were trends to superiority for ADX10059 over placebo for migraine pain improvement (mild or no pain) at all time points up to two hours post-dosing.

"Medication is available to prevent migraine but these treatments are often secondary uses of the drug and come with potentially limiting side-effects," noted Dr. Peter Goadsby of the UCSF Headache Center. "New therapies specifically developed for migraine prevention are urgently needed especially for the substantial proportion of migraine sufferers who have frequent attacks and have significant disability in their daily lives. Targeting mGluR5 signaling with ADX10059 is an interesting approach that is showing significant promise in early clinical evaluation."

"The clinical trial data for ADX10059, presented here at AAN, proved the concept that by terminating acute attacks in some patients, mGluR5 inhibition plays a role in migraine pathophysiology. Now we are looking forward to the data from our ongoing Phase IIb migraine prevention study in the first half of 2010," said Charlotte Keywood, chief medical officer.

In December 2008, Addex initiated a Phase IIb trial to study ADX10059 as a prophylactic agent in migraine. The 12-week trial will compare ADX10059 (25mg, 50mg or 100mg) versus placebo in migraine patients who suffer three or more attacks per month. Data from the migraine prevention trial are expected in the first half of 2010.

Abstract P06.006: Investigation of the Role of mGluR5 Inhibition in Migraine: A Proof of Concept Study of ADX10059 in Acute Treatment of Migraine will be presented by Peter Goadsby, Director of the UCSF Headache Center, San Francisco, and Charlotte Keywood, Chief Medical Officer, Addex Pharma during Poster Session VI: Headache III in room 6E on Wednesday, April 29, 2009 4:00 PM. The authors are available for interviews prior to and during the conference. Contact details below.

Glutamate identified as predictor of disease progression in multiple sclerosis

UCSF researchers have identified a correlation between higher levels of glutamate, which occurs naturally in the brain as a byproduct of metabolism, and greater disease burden in multiple sclerosis patients. The study is the first to measure glutamate toxicity in the brain over time and suggests an improved method for tracking the disease and predicting its course.

The research team employed a novel technique, developed by Radhika Srinivasan, PhD, study author and assistant researcher in the UCSF Department of Radiology and Biomedical Imaging, to measure glutamate levels in clinical trial patients. The technique was based on a sophisticated form of imaging known as proton MR spectroscopy, which uses simple radio-frequency pulses targeting specific brain chemicals.

Study findings were presented today (April 29, 2009) during the American Academy of Neurology annual scientific meeting in Seattle.

Glutamate, a neurotransmitter, in normal levels performs fundamental processes like memory and sensory perception. In excess, it triggers a cascade of negative reactions in the brain leading to many of the complications associated with neurologic diseases such as MS, Parkinson's disease, stroke, ALS (amyotrophic lateral sclerosis or Lou Gehrig's disease) and Alzheimer's disease by destroying nerve cells and causing seizures, injury after stroke, and the perception of pain, among other problems.

Already a target for therapeutic drug development, the identification of the glutamate pathway for MS suggests a new way for clinicians to monitor treatment of these drugs.

"This is the first time that we have had the ability to measure glutamate toxicity in the brain in real time, which gives us a marker for monitoring disease progression as well as our treatment of the disease," said Daniel Pelletier, MD, study author, associate professor of neurology and a member of the Multiple Sclerosis Research Group at the University of California, San Francisco.

"For instance, we already have anti-glutamate drugs, so now we can assess, with imaging, the impact of the therapy and the progression of the disease," he said.

Elevated levels of glutamate in the brain are understood clinically as a cause of cell injury and death. Injury to neuro-axons, which are the long fibers that extend from the cell body of a neuron cell toward other nerve cells, is partly responsible for disability progression in MS. In a previous study using proton MR spectroscopic imaging, the research team reported that MS brains have significant elevation of glutamate concentrations. For this study, researchers looked for levels of glutamate and levels of NAA (n-acteylaspartate), a marker of axonal integrity in mature brains, to see if a relationship existed.

The team scanned 265 MS patients annually and followed them for an average of 1.8 years. Accounting for disease duration and age of onset, researchers found that significant annual loss of NAA, which is a measure of neurodegeneration, was associated with concentration of glutamate. This finding indicated that the higher the level of glutamate, the greater the expected neuro-axonal loss over time.

According to the authors, the study is the largest clinical analysis to date of metabolism byproducts in the brain, and the results strongly support the link between the excess of glutamate and decline of neuro-axonal integrity in MS.

The finding, Pelletier says, goes beyond MS. "Now that we have those markers, we can quantify levels of glutamate for other neurologic diseases, which could be another way to track disease progression and therapeutic intervention."

The UCSF study, known as the EPIC MRI Study, aims to develop reliable genetic biomarkers that correlate with quantitative Magnetic Resonance Imaging (MRI) measures of disease burden and severity. Participants are involved for at least two years and receive an annual brain MRI.

Additional UCSF authors are Sarah J. Nelson, PhD, chair, Division of Bioengineering; John Kornak, PhD, assistant adjunct professor of Radiology; Darin T. Okuda, MD, assistant clinical professor in Neurology; and Bill Chu, specialist in Radiology. The study was funded in part by the National MS Society.

New pill to treat MS

A new drug for multiple sclerosis can dramatically reduce the chances of a relapse or a deterioration of the condition, according to a new study from researchers at Queen Mary, University of London.

The results of a major trial presented at the Annual Meeting of the American Academy of Neurology in Seattle show that taking a course of cladribine tablets just a few times a year can reduce the chances of a relapse by well over 50 per cent. And patients who took part in the study suffered very few side effects.

If it becomes available to patients, cladribine will be the first licensed treatment for MS which does not involve regular injections.

Multiple sclerosis is a disabling neurological condition which usually starts in young adulthood. It is the result of the body's own immune system damaging the central nervous system. This interferes with transmission of messages between the brain and other parts of the body and leads to problems with vision, muscle control, balance and memory.

For the 85,000 people in the UK who suffer from MS, the treatments which are currently available have to be given by frequent injections or intravenous infusions, and the benefits have to be weighed up against a number of side effects.

The new study involved over 1,300 MS patients who were followed up for nearly two years. Patients were given either two or four treatment courses of cladribine tablets per year, or a placebo. Each course consists of a single tablet per day for four or five days, adding up to just eight to 20 days of treatment each year. During the trial patients were monitored using MRI scans.

Compared to patients who were taking a placebo, those taking cladribine tablets were over 55 per cent less likely to suffer a relapse and 30 per cent less likely to suffer worsening in their disability due to MS.

The study's lead researcher is Professor Gavin Giovannoni of Barts and The London School of Medicine and Dentistry, part of Queen Mary, University of London. He said: "These results are really exciting. MS can be a very debilitating illness and at the moment treatment options remain limited. Having an effective oral therapy will have a major impact for people with MS."

"Our study shows that cladribine tablets prevent relapses and slow down the progression of the disease making patients feel better. Importantly, it does so without the need for constant injections that are associated with unpleasant side effects" "We will continue to follow the patients in the trial to see how they fare in the long-term."

Cladribine tablets work by suppressing the immune system, reducing the risk of further damage to a patient's nervous system.

Sun-like star's 'oddball' planet

Astronomers have discovered a strange Jupiter-sized world circling a star similar to our own Sun.

The planet has a highly unusual, elliptical orbit around its parent star.

At its furthest point, the planet is about as far from its star as the Earth is from the Sun.

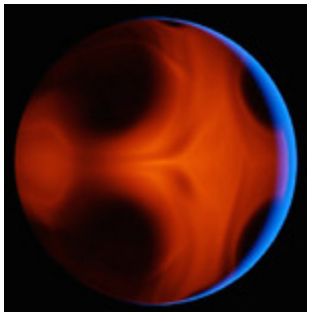
But at its nearest, it is about 10 times closer to its star than Mercury is to the Sun, the team told the JENAM 2009 conference in Hertfordshire.

The planet, HD80606b, makes its close approach every 111 days, according to the study.

If an observer were to hover above the cloud tops of this world, they would see their parent star grow to 30 times the size that the Sun appears in our own sky.

The team from University College London observed a transit, in which the strange world crossed in front of its parent star.

The data gathered from this event provided the astronomers with the most precise data yet on the planet's size and density, its tilt and the eccentricity of its orbit.



Simulation of atmosphere of HD80606b ***The Jupiter-sized planet is in an eccentric orbit***

Record breaker

For example, the transit shows that the planet has a radius about the same as Jupiter - despite being about four times more massive.

HD80606b would now appear to hold the record for both the longest orbital period and most eccentric orbit of all observed transiting planets.

At its closest approach, the planet comes within five million kilometres (three million miles) of its star. At its furthest point, the planet is about 132 million kilometres (82 million miles) away.

"The temperature on the planet is changing from about 3C - which is what you might have on Earth - to about 1,200C. So it is going through a huge change in the amount of heating," co-author David Kipping, from UCL, told BBC News.

Team leader Dr Steve Fossey commented: "Spectroscopic observations reported by a French-Swiss team, when combined with our precise measurement of the orbital tilt, indicate that the planet's unusual orbit might be explained by the parent star being a member of a binary system."

This, he said, was where "the companion star tugs on the planet's orbit over millions of years to leave it in the strange configuration we see today".

World's fastest camera relies on an entirely new type of imaging

Ultrafast, light-sensitive video cameras are needed for observing high-speed events such as shockwaves, communication between living cells, neural activity, laser surgery and elements of blood analysis. To catch such elusive moments, a camera must be able to capture millions or billions of images continuously with a very high frame rate. Conventional cameras are simply not up to the task.

Now, researchers at the UCLA Henry Samueli School of Engineering and Applied Science have developed a novel, continuously running camera that captures images roughly a thousand times faster than any existing conventional camera.

In a paper in the April 30 issue of Nature (currently available online), UCLA Engineering researchers Keisuke Goda, Kevin Tsia and team leader Bahram Jalali describe an entirely new approach to imaging that does not require a traditional CCD (charge-coupled device) or CMOS (complementary metal-oxide semiconductor) video camera. Building on more than a decade of research on photonic time stretch, a technique for capturing elusive events, the team has demonstrated a camera that captures images at some 6 million frames per second.

"The most demanding application for high-speed imaging involves fast events that are very rare, rogue events or the proverbial needle in the haystack — in other words, unusual events that carry important information," said Jalali, a professor of electrical engineering and principal investigator of the project.

One of the applications he envisions for the camera is flow cytometry, a technique used for blood analysis. Traditional blood analyzers can count cells and extract information about their size, but they cannot take pictures of every cell because no camera is fast and sensitive enough for the job. At the same time, images of cells are needed to distinguish diseased cells from healthy ones. Today, pictures are taken manually under a microscope from a very small sample of blood.

But what if you needed to detect the presence of very rare cells that, although few in number, signify the early stages of a disease? Circulating tumor cells are a perfect example. Typically, there are only a handful of them among a billion healthy cells; yet these cells are precursors to metastasis, the spread of cancer that causes about 90 percent of cancer mortalities.

"The chance that one of these cells will happen to be on the small sample of blood viewed under a microscope is negligible," Jalali said. "To find these rogue cells — needles in the haystack — you need to analyze billions of cells, the entire haystack. Ultra-high-speed imaging of cells in flow is a potential solution for detection of rare abnormal cells."

The new imager operates by capturing each picture with an ultrashort laser pulse — a flash of light only a billionth of a second long. It then converts each pulse to a serial data stream that resembles the data in a fiber optic network rather than the signal coming out of a camera. Using a technique known as amplified dispersive Fourier transform, these laser pulses, each containing an entire picture, are amplified and simultaneously stretched in time to the point that they are slow enough to be captured with an electronic digitizer.

The fundamental problem in performing high-speed imaging, Jalali says, is that the camera becomes less and less sensitive at higher and higher speeds. It is simple to see why: At high frame rates, there is less time to collect photons in each frame before the signal becomes weaker and more prone to noise. The new imager overcomes this because it is the first to feature optical image amplification.

"Our serial time-encoded amplified microscopy (STEAM) technology enables continuous real-time imaging at a frame rate of more than 6 MHz, a shutter speed of less than 450 ps and an optical image gain of more than 300 — the world's fastest continuously running camera, useful for studying rapid phenomena in physics, chemistry and biology," said research co-author Goda, a postdoctoral researcher in the group.

One such phenomenon the group has studied with the new camera is laser ablation, an important technology that is the basis of laser medicine. The camera can capture laser ablation happening in real time, providing important clues for understanding the process and optimizing its effectiveness.

"Unlike other high-speed imaging methods, our approach does not require cooling of the camera or high-intensity illumination — problems that plague conventional CCD and CMOS cameras," said Kevin Tsia, a graduate student in the group and a co-author of the research.

The study was funded by the Defense Advanced Research Project Agency (DARPA), the U.S. Department of Defense's central research and development organization.

Half a glass of wine a day may boost life expectancy by 5 years

Long-term wine consumption is related to cardiovascular mortality and life expectancy independently of moderate alcohol intake

Drinking up to half a glass of wine a day may boost life expectancy by five years - at least in men - suggests research published ahead of print in the Journal of Epidemiology and Community Health.

The Dutch authors base their findings on a total of 1,373 randomly selected men whose cardiovascular health and life expectancy at age 50 were repeatedly monitored between 1960 and 2000.

The researchers looked into how much alcohol the men drank, what type it was, and over what period, in a bid to assess whether this had any impact on the risks of their dying from cardiovascular disease, cerebrovascular disease, and from all causes. They also tracked weight and diet, whether the men smoked, and for how long, and checked for the presence of serious illness. During the 40 years of monitoring, 1,130 of the men died. Over half the deaths were caused by cardiovascular disease.

The proportion of men who drank alcohol almost doubled from 45% in 1960 to 86% in 2000, with the proportion of those drinking wine soaring from 2% to 44% during that period.

The researchers found that light long term alcohol consumption of all types - up to 20 g a day - extended life by around two extra years compared with no alcohol at all. Extended life expectancy was slightly less for those who drank more than 20 g.

And men who drank only wine, and less than half a glass of it a day, lived around 2.5 years longer than those who drank beer and spirits, and almost five years longer than those who drank no alcohol at all.
Drinking wine was strongly associated with a lower risk of dying from coronary heart disease, cerebrovascular disease, and death from all causes.

These results held true, irrespective of socioeconomic status, dietary and other lifestyle habits, factors long thought to influence the association between wine drinking and better health.

Invisibility cloak edges closer

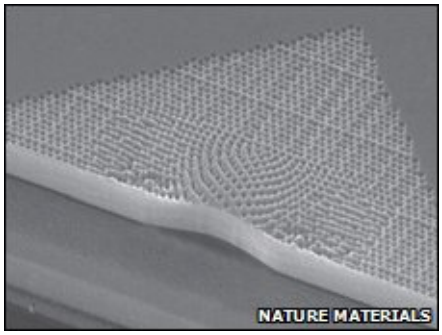
By Victoria Gill Science reporter, BBC News

Scientists have rendered objects invisible to near-infrared light. Unlike previous such "cloaks", the new work does not employ metals, which introduce losses of light and result in imperfect cloaking.

Because the approach can be scaled down further in size, researchers say this is a major step towards a cloak that would work for visible light.

One of the research teams describes its miniature "carpet cloak" in the journal Nature Materials. This "carpet" design was based on a theory first described by John Pendry, from Imperial College London, in 2008.

Michal Lipson and her team at Cornell University demonstrated a cloak based on the concept.



Invisibility cloak ***Tiny holes all over the cloak bend the light around the bump***

Xiang Zhang, professor of mechanical engineering at the University of California, Berkeley, led the other team.

"Essentially, we are transforming a straight line of light into a curved line around the cloak, so you don't perceive any change in its pathway," he explained.

This is not the first time an invisibility cloak has been made, but previous designs have used metals, whereas the carpet cloak is built using a dielectric - or insulating material - which absorbs far less light.

"Metals introduce a lot of loss, or reduce the light intensity," said Professor Zhang. This loss can leave a darkened spot in the place of the cloaked object.

So using silicon, a material that absorbs very little light, is a "big step forward," he says.

Transforming light

The cloak's design cancels out the distortion produced by the bulge of the object underneath, bending light around it - like water around a rock - and giving the illusion of a flattened surface.

Professor Zhang explained that the cloak "changes the local density" of the object it is covering.

"When light passes from air into water it will be bent, because the optical density, or refraction index, of the glass is different to air," he told BBC News. "So by manipulating the optical density of an object, you can transform the light path from a straight line to any path you want."

The new material does this via a series of minuscule holes - which are strategically "drilled" into a sheet of silicon.

Proving Professor Pendry's theory, Professor Zhang's team was able to "decide the profile" of the cloaked object - altering the optical density with the holes.

"In some areas we drill lots of very densely packed holes, and in others they are much sparser. Where the holes are more dense, there is more air than silicon, so the optical density of the object is reduced," Professor Zhang explained.

"Each hole is much smaller than the wavelength of the light. So optical light doesn't see a hole - it just sees a sort of air-silicon mixture. So as far as the light is concerned, we have adjusted the density of the object."

He pointed out that his demonstration cloak is very tiny - just a few thousandths of a millimetre across.

But there are applications even for a cloak of this size.

Such a device could be used, for example, in the electronics industry, to hide flaws on the intricate stencils or 'masks' that are used to cast processor chips. "This could save the industry millions of dollars," he said. "It would allow them to fix flaws rather than produce an entirely new mask."

Genetic variant impairs communication within the brain

Possible consequences: Schizophrenia or manic depression

For some time now it has been known that certain hereditary factors enhance the risk of schizophrenia or a manic-depressive disorder. However, just how this occurs had remained obscure. Researchers at the Zentralinstitut für Seelische Gesundheit in Mannheim, Heidelberg University and Bonn University are now able to answer this question, at least for one common genetic variant: this impairs the interoperation of certain regions of the brain. The study is to appear on 1st May in the prestigious scientific journal Science. It will also be suited to provide fresh stimuli for the search for cures.

The scientists examined test persons with whom a certain genetic trait had undergone a characteristic mutation. A year ago, a research team had demonstrated that this mutation was, amongst other things, associated with an enhanced risk of schizophrenia. In addition to this, people carrying this variant were more susceptible to a bipolar malady also known as a manic-depressive disorder. In the present case, however, our results were based on examinations of 115 healthy subjects.

"At this point, no-one had the slightest idea of what effect the genetic variant we had observed might have on the brain", declares Professor Dr. Andreas Meyer-Lindenberg. The director of the Zentralinstitut für Seelische Gesundheit was the initiator of the study. "We examined our test subjects in magnetic resonance tomographs, which reveal how the various areas of the brain interoperate".

Result: persons suffering from this high-risk genetic variant exhibited a change in the communication between their dorsolateral prefrontal cortex (DLPFC) and other regions of their brains. The DLPFC plays an active role in the working memory and diverse "higher" cerebral functions. It comprises a right-hand and a left-hand fraction, and it was the communication between these two halves which had become impaired. In contrast to this, the link between the DLPFC and the hippocampus, a further region of the brain of importance for the memory, was improved. Both these noteworthy phenomena had already been shown to exist in patients suffering from schizophrenia.

Moreover, carriers of this high-risk gene also displayed an enhanced linkage between the amygdala and a number of other cerebral regions. The amygdala, also known as the "almond", plays an active role in the

manner in which we cope with our emotions. "Which is why we have related this phenomenon to the bipolar impairment, which is, as we know, characterised by erratic mood swings", Professor Dr. Dr. Henrik Walter of Bonn University explains.

Over 100 years ago, the German psychiatrist Carl Wernicke had already suspected that schizophrenia might be attributable to impaired interoperation between different regions of the brain. The new study, employing an innovative combination of modern genetics and cerebral imaging, has confirmed this suspicion.

The mutated gene contains the building plan for a protein whose precise function is still not clear. Diverse study groups worldwide are currently engaged in finding answer to this question – amongst other reasons, because this could provide approaches to novel treatments. "It is impressive that using modern methods we are able to trace such subtle genetic effects in the living brain", says Professor Dr. Peter Kirsch, head of the Study Group for Cerebral Imaging in Mannheim. Carriers of this variant, incidentally, must not be worried that they are destined to suffer from schizophrenia or bipolar impairment. "This genetic variant plays only a minor role in these disorders", says Dr. Christine Esslinger from the Zentralinstitut für Seelische Gesundheit reassuringly. Other factors must at all events become involved before a disorder such as this breaks out.

In Mannheim, apart from Professor Meyer-Lindenberg, Dr. Christine Esslinger and Professor Kirsch, Professor Dr. Marcella Rietschel has also played a critical part in this study. In Bonn, the participation of Privatdozent Dr. Sven Cichon must be emphasised. The study has been supported by the Federal Ministry for Education and Research within the framework of the National Genome Research Network. The German Research Foundation (DFG) has also supported its work.

Neural Mechanisms of a Genomewide Important Psychosis Variant. Christine Esslinger, Henrik Walter, Peter Kirsch, Susanne Erk, Knut Schnell, Claudia Arnold, Leila Haddad, Daniela Mier, Carola Opitz von Boberfeld, Kyeon Raab, StephanieH.Witt, Marcella Rietschel, Sven Cichon, Andreas Meyer-Lindenberg. Science, 1.5.2009 (doi:

Eden? Maybe. But Where's the Apple Tree?

By NICHOLAS WADE

Locations for the Garden of Eden have been offered many times before, but seldom in the somewhat inhospitable borderland where Angola and Namibia meet.

A new genetic survey of people in Africa, the largest of its kind, suggests, however, that the region in southwest Africa seems, on the present evidence, to be the origin of modern humans. The authors have also identified some 14 ancestral populations.

The new data goes far toward equalizing the genetic picture of the world, given that most genetic information has come from European and Asian populations. But because it comes from Africa, the continent on which the human lineage evolved, it also sheds light on the origins of human life.

"I think this is an enormously impressive piece of work," said Alison Brooks, a specialist on African anthropology at George Washington University.

The origin of a species is generally taken to be the place where its individuals show the greatest genetic diversity. For humans, when the new African data is combined with DNA information from the rest of the world, this spot lies on the coast of southwest Africa near the Kalahari Desert, the research team, led by Sarah A. Tishkoff of the University of Pennsylvania, said in this week's issue of Science.

Dr. Brooks, who spent many years in the area, said that it had some trees but that it also had deep sand and was not particularly garden-like. The area is a homeland of the Bushmen or San people, whose language is distinguished by its many click sounds.

But the San in the past might not have been restricted to where they are now, she said. The San are thought to have once occupied a much larger area, one that probably stretched from southern Africa up the east coast to as far as present-day Ethiopia.

Since the geneticists' calculations refer to people, not geography, the San - and therefore the site of greatest human diversity - might have been located elsewhere in the past.

Christopher Ehret, an expert on African languages at the University of California, Los Angeles, and a member of Dr. Tishkoff's team, has detected traces of words borrowed from click languages in East African languages. This suggests that proto-Khoisan, the inferred ancestral language of all click-speakers, may have originated in East Africa, Dr. Brooks said.

The language of the first modern humans may have undergone a very early branching, Dr. Ehret said, with the Khoisan click languages on one branch and the other three language groups of Africa - Nilo-Saharan, Niger-Kordofanian and Afroasiatic — on the other branch. Clicks are difficult to pronounce fluently and with a single exception no click languages are known outside Africa.

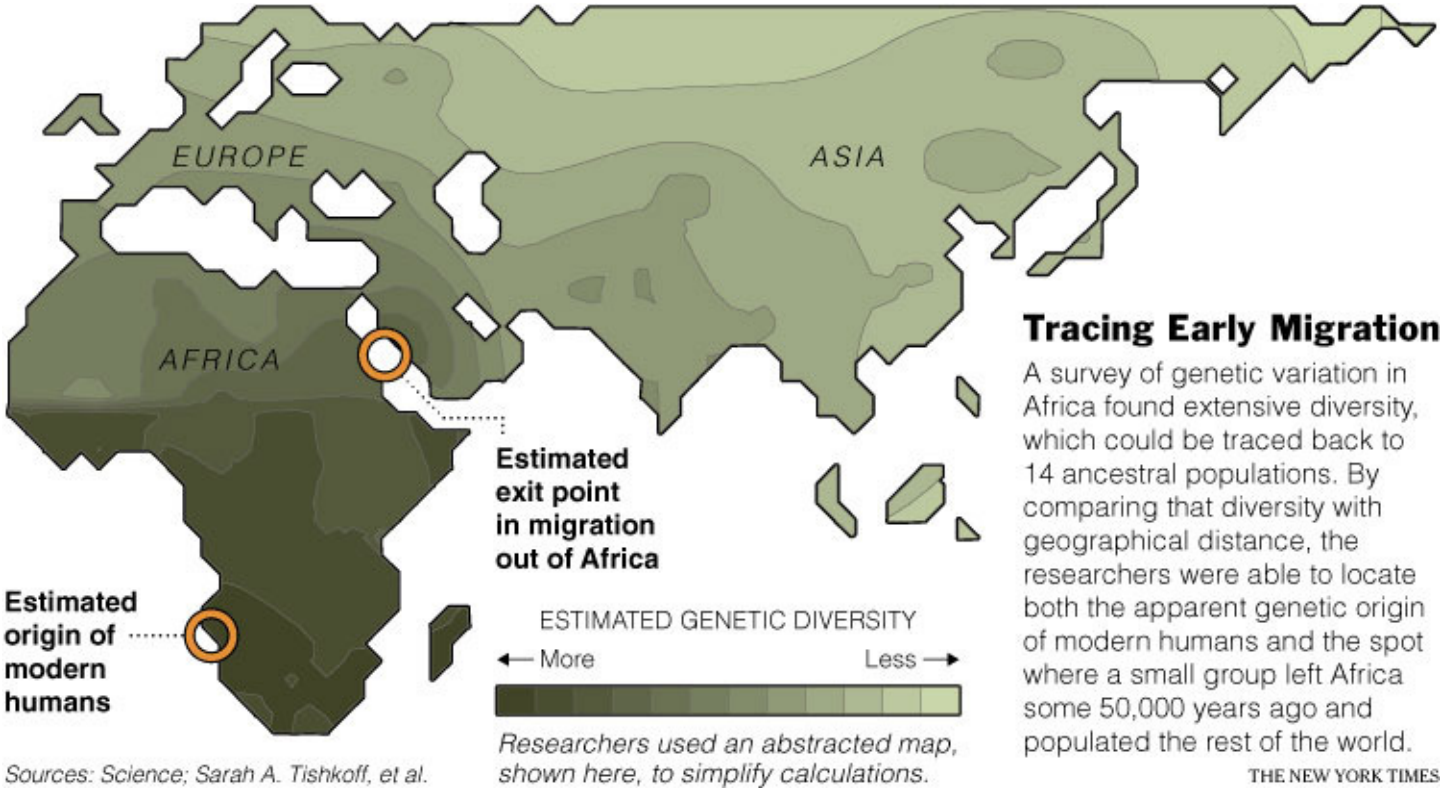
Another finding of the Tishkoff-Ehret team is that African languages tend to be highly correlated with the genetics of their speakers, a finding that helps indicate cases of language replacement. The various Pygmy

groups in Africa, the team has found, show distant genetic relationships to the San and other click-speakers, suggesting the pygmies, too, once spoke Khoisan languages but have now adopted those of their neighbors.

Another instance of a mismatch between language and genetics concerns the Luo, an ethnic group in Kenya to which President Obama's father belonged. The Luo speak a Nilo-Saharan language and are thought of as a people of Sudanese origin, but genetically they have a heavy mixture of Bantu speakers' genes, Dr. Tishkoff said.

Dr. Tishkoff's team has also calculated the exit point from which a small human group — maybe a single tribal band of 150 people — left Africa some 50,000 years ago and populated the rest of the world. The region is near the midpoint of the African coast of the Red Sea.

Dr. Tishkoff and her colleagues found that the 14 ancestral African populations they detected are now highly mixed, with the exception of the Bantu speakers.



Huge gene study shines new light on African history

* 19:00 30 April 2009 **by Peter Aldhous**

The history of Africa, the cradle of humanity, is written in its genes. And now we have our best-ever view of African genetic diversity, with the publication of a huge study of the genomes of people from across the continent.

For the past 10 years, an international team led by Sarah Tishkoff of the University of Pennsylvania in Philadelphia has toured the African continent, collecting blood samples from thousands of individuals. The results confirm Africa as the centre of human genetic diversity and, together with linguistic data, reveal a rich pattern of human migrations within the continent.

"Now we have a spectacular insight into the history of African populations," says Muntaser Ibrahim of the University of Khartoum in Sudan, a member of the team.

The findings should also pave the way for studies into genetic variants that influence the susceptibility of people with African heritage to common diseases, or affect their responses to commonly used drugs.

Collection challenges

Anthropologists and geneticists know that populations throughout the world migrated from Africa more than 60,000 years ago (see diagram), and that the human genome is at its most diverse in our continent of origin, but previous studies have only scratched the surface of African genetic diversity.

In part, that is because collecting DNA from people across the continent poses formidable logistical challenges. To secure their samples, Tishkoff and her colleagues had to negotiate permits with authorities in many countries, and travelled to remote villages accessible only by four-wheel drive.

In the field, the researchers often had to use their vehicle batteries to power the centrifuges used to separate out white blood cells from their samples, and then add buffering chemicals to stabilise the DNA so it would not degrade under the African sun. "It worked amazingly well," Tishkoff says.

With the samples in hand, the researchers analysed the DNA from some 2400 individuals from more than 100 modern populations for a panel of 1327 "markers" - known sites of genetic variation – across the entire genome. Then they analysed the results using statistical techniques that can assign individuals into different groups on the basis of their genetic similarity and reveal the relationships between the different groups.

Genetic map

The analysis suggested that modern Africans are descended from 14 ancestral populations, which generally correlate with known language and cultural groups. But most African populations show high levels of mixed ancestry, reflecting historic migrations across the continent – such as the movement of Bantu speakers from the highlands of Nigeria and Cameroon across much of eastern and southern Africa in the past 5000 years.

The researchers had expected to find a close relationship between language and genetics. "The spread of a language into a new area normally involves the spread of at least some speakers," says Christopher Ehret, a specialist in African history and linguistics at the University of California, Los Angeles, and a member of Tishkoff's team. "Gene flow is simply the normal accompaniment."

But migrations can also cause genes and language to diverge. For example, the researchers found that pygmy populations from central Africa cluster genetically with eastern and southern African speakers of languages that rely heavily on clicking of the tongue. Despite retaining their distinct genetic heritage, pygmies seem to have lost their ancestral languages as Bantu speakers moved in.

The results suggest that all modern humans can trace their origin to a population that lived near the border between South Africa and Namibia – although Tishkoff stresses that these people may have moved into the area from elsewhere. As expected, the study also places the exit point for humanity's great "out of Africa" migration near to the Red Sea.

Medical boost

As well as revealing Africa's history, the study should facilitate future biomedical research, both into genes that determine susceptibility to common diseases, and into variations in people's responses to drugs – which can cause fatal reactions.

When looking for the rare genetic variants involved, geneticists can be thrown off track by the existence of subgroups within the populations they are studying. This is a particular problem for African or African American populations, which are more genetically diverse than other groups. The new study should help by identifying distinct populations in which to look for medically important gene variants.

"By knowing the population structure, we can use this information to facilitate our search for rare variants," says Scott Williams of Vanderbilt University in Nashville, Tennessee, who worked on the new study and is investigating the genetics of hypertension in a population in Ghana.

"When we use labels like ‘black' or ‘African', they are gross approximations," agrees Charles Rotimi of the National Human Genome Research Institute in Bethesda, Maryland, who studies the influence of culture, lifestyle and genetics on patterns of obesity, hypertension and diabetes in African Americans.

Journal reference: Science (DOI: 101126/science.1172257)

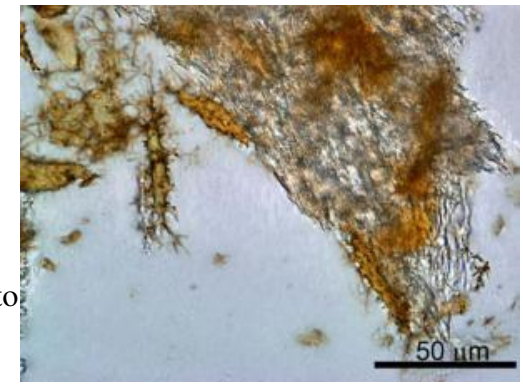
First dino 'blood' extracted from ancient bone

* 19:00 30 April 2009 **by Jeff Hecht**

A dinosaur bone buried for 80 million years has yielded a mix of proteins and microstructures resembling cells. The finding is important because it should resolve doubts about a previous report that also claimed to have extracted dino tissue from fossils.

Proteins such as collagen are far more durable than DNA, but they had not been expected to last the 65 million years since the dinosaurs died out. So palaeontologist Mary Schweitzer of North Carolina State University attracted wide attention when she reported finding first soft tissue and later collagen from a Tyrannosaurus rex leg bone that was intact until it was broken during excavation.

Yet critics said the extraordinary claim required extraordinary evidence, and asked for protein sequences, better handling of samples to prevent contamination, and confirmation analyses from other laboratories.



Multiple hadrosaur red blood "cells" surrounded by white, fibrous matrix **(Image: Mary H. Schweitzer)**

So Schweitzer took a look at the pristine leg bone of a plant-eating hadrosaur that had been encased in sandstone for 80 million years. She and colleagues exhaustively tested the sample, sequencing the proteins they found with a new and better mass spectrometer and sending samples to two other labs for verification.

Now they report recovering not just collagen – which conveys little evolutionary information because it is the same in almost all animals – but also haemoglobin, elastin and laminin, as well as cell-like structures

resembling blood and bone cells. The proteins should reveal more about dinosaur evolution because they vary much more between species. *Journal reference: Science (DOI: 10.1126/science.1165069)*

Using a small stockpile of a secondary antiviral drug in a flu pandemic

Press release from PLoS Medicine

In a global influenza pandemic, small stockpiles of a secondary flu medication – if used early in local outbreaks – could extend the effectiveness of primary drug stockpiles, according to research made available today ahead of publication in PLoS Medicine.

Many countries are investing in large stockpiles of a single drug, oseltamivir (Tamiflu). But influenza viruses can become resistant to antiviral drugs, and the widespread use of a single drug is likely to increase the risk that a resistant strain will emerge. If such a strain were to spread widely, the effectiveness of antiviral drugs in treating infected patients, as well as their ability to slow the spread of a pandemic, would be greatly reduced.

Using a mathematical model to represent the global spread of pandemic influenza, an international team of researchers led by Joseph Wu of the University of Hong Kong, and including collaborators in the UK and the US, found that treating as few as only the first 1% of the population in a local epidemic with a secondary drug rather than with oseltamivir, could substantially delay the development of resistance to oseltamivir. This reduction in resistance was predicted to benefit not only local populations, but also those in distant parts of the world where the pandemic would subsequently spread through air travel.

In the context of the currently emerging swine flu, the secondary drug could be zanamivir (Relenza), the only other approved drug to which the new H1N1 strain has been found to be susceptible.

This strategy is predicted to be effective because it delays use of the primary stockpiled drug until a certain proportion of the local population (about 1.5% according to the model) has been infected with virus that remains susceptible to the primary drug. With drug-sensitive virus in the majority as people recover from infection and develop immunity, only a minority of further infections are likely to be resistant to the primary drug.

Technically, such a delay could be achieved by postponing the launch of any antiviral intervention. However, because even a short delay would mean denying antiviral drugs to people who would benefit from them, the researchers instead propose the deployment of a small stockpile of a secondary antiviral during the early phase of the local epidemic.

The model, prepared before the current swine flu crisis, considered two possible strategies, "early combination chemotherapy" (treatment with two drugs together while both are available, assuming that clinical trials show such a combination to be safe for patients) and "sequential multi-drug chemotherapy" (treatment with the secondary drug until its stockpile is exhausted, then treatment with the primary drug). While either strategy could be effective in principle, only the sequential strategy would be practical in responding to the currently emerging H1N1 swine flu, because the safety of combining zanamivir with oseltamivir (for combination therapy) is not established.

After simulating the impact of these strategies in a single population, the researchers then introduced international travel data into their model to investigate whether these two strategies could limit the development of antiviral resistance at a global scale. This analysis predicted that, provided the population that was the main source of resistant strains used one of the strategies, both strategies in distant, subsequently affected populations would be able to reduce the consequences of resistance, even if some intermediate populations failed to control resistance. ***Author-Approved Version Of The Copy-Edited Manuscript:*** *http://www.plos.org/press/plme-06-05-wu.pdf*

Chlamydia May Play Role In a Type of Arthritis

Spondylarthritis (SpA) represents a group of arthritidies that share clinical features such as inflammatory back pain and inflammation at sites where tendons attach to bone. It includes ankylosing spondylitis (AS), psoriatic arthritis, inflammatory bowel-disease-related arthritis, reactive arthritis (ReA) and undifferentiated spondylarthritides (uSpA). Since Chlamydia trachomatis or Chlamydia pneumoniae (which are often asymptomatic) frequently cause ReA, a new study examined whether there was a connection between these two

infections and uSpA. The study was published in the May issue of Arthritis & Rheumatism (http://www3.interscience.wiley.com/journal/76509746/home).

Led by John D. Carter of the University of South Florida, the study involved blood and synovial tissue analysis from 26 patients who had chronic uSpA or Chlamydia-induced ReA. Synovial tissue samples from 167 osteoarthritis patients were used as controls. Samples were analyzed to assess chlamydial DNA and the 26 subjects were asked if they had any known exposure to Chlamydia trachomatis or Chlamydia pneumoniae and if so, the infection was documented in relation to the onset of their uSpA. They also underwent a physical exam that included evaluation of swollen and tender joints and other symptoms of SpA. The results showed that the rate of Chlamydia infection was 62 percent in uSpA patients, significantly higher than the 12 percent seen in control subjects.

It is believed that as many as 150,000 cases of Chlamydia trachomatis-induced ReA may appear in the U.S. each year compared to about 125,000 new cases of rheumatoid arthritis. This is a low estimate since it does not include cases resulting from Chlamydia pneumoniae. “Thus, Chlamydia-induced ReA represents a considerable burden on the health care systems of the U.S. and other nations, and its impact on those systems may well be significantly underrecognized,” the authors state.

Most women with genital Chlamydia trachomatis infection have no symptoms at the time of the initial infection; this was also true of the patients in the study who had DNA evidence of Chlamydia. For Chlamydia pneumoniae, as many as 70 percent of acute infections are asymptomatic and, even when there are symptoms, definitive identification of the organism is rare. The authors point out that relying on identification of a symptomatic infection may therefore result in routine underdiagnosis or misdiagnosis of Chlamydia-induced ReA.

They add that because ReA is a type of SpA and patients with ReA do not present with the classic combination of symptoms of arthritis, conjunctivitis/iritis and urethritis, it is reasonable to believe that Chlamydia trachomatis plays a role in causing uSpA, which may in fact be ReA. They conclude that although there is no diagnostic test for Chlamydia-induced ReA, testing for chlamydial DNA in the synovial tissue of patients thought to have ReA may be the most accurate way of diagnosing the condition.

Article: “Chlamydiae as Etiologic Agents in Chronic Undifferentiated Spondylarthritis,” John D. Carter, Hervé C. Gérard, Luis R. Espinoza, Louis R. Ricca, Joanne Valeriano, Jessica Snelgrove, Cynthia Oszust, Frank B. Vasey, Alan P. Hudson, Arthritis & Rheumatism, May 2009.

Popular diabetes treatment could trigger pancreatitis, pancreatic cancer

Drug's adverse effects negated when combined with older diabetes drug

A drug widely used to treat Type 2 diabetes may have unintended effects on the pancreas that could lead to a form of low-grade pancreatitis in some patients and a greater risk of pancreatic cancer in long-term users, UCLA researchers have found.

In a study published in the online edition of the journal Diabetes, researchers from the Larry L. Hillblom Islet Research Center at UCLA found that sitagliptin, sold in pill form as Januvia, caused abnormalities in the pancreas that are recognized as risk factors for pancreatitis and, with time, pancreatic cancer in humans. Januvia is marketed by Merck & Co. Inc. Sitagliptin is a member of a new class of drugs that enhance the actions of the gut hormone known as glucagon-like peptide 1 (GLP-1), which has been shown to be effective in lowering blood sugar in people with Type 2 diabetes. The study is available at http://diabetes.diabetesjournals.org/cgi/content/abstract/db09-0058v1.

"Type 2 diabetes is a lifelong disease — people often take the same drugs for many years, so any adverse effect that could over time increase the risk for pancreatic cancer would be a concern," said Dr. Peter Butler, director of the Hillblom Center and the study's lead investigator. "A concern here is that the unwanted effects of this drug on the pancreas would likely not be detected in humans unless the pancreas was removed and examined."

An observed connection between Byetta, a drug used to treat Type 2 diabetes that is related to Januvia in its intended actions, and pancreatitis has already been reported, prompting a Food and Drug Administration warning. Amylin Corp., which markets Byetta, has suggested that since there is no known mechanism linking the cases of pancreatitis with Byetta, the association might be chance. The UCLA study suggests that there may indeed be a link between drugs that enhance the actions of GLP-1 and pancreatitis − by increasing the rate of formation of cells that line the pancreatic ducts.

In the study, researchers used human IAPP transgenic (HIP) rats to test both sitagliptin and metformin; metformin, a member of an older, different class of diabetes drugs in use since the 1950s, has recently been found to have anti-tumor properties. The researchers sought to determine how the drugs, both singly and in combination, affected islet disease progression in the pancreas — particularly how they affected beta cells in

the pancreas's Islets of Langerhans. Beta cells are responsible for releasing insulin in people with normal metabolism, but they don't produce insulin in sufficient amounts in diabetes patients. HIP rats approximate both the islets and metabolism of people with Type 2 diabetes. The drugs were tested in 40 rats for 12 weeks.

The researchers found that the two drugs in combination had a synergistic effect that helped preserve beta cells, improved their function and enhanced insulin sensitivity in the test rats. With the sitagliptin alone, however, the rats had abnormally high rates of cell production in their pancreatic ducts; a few developed an abnormality known as ductal metaplasia, and one developed pancreatitis.

But the metformin, trade name Glucophage, seems to counteract sitagliptin's adverse effect.

"The apparent protection against the unwanted actions of sitagliptin in the exocrine pancreas are intriguing and may offer a potential way of using the GLP-1 class of drugs safely," Butler said. "The protective effect may have been either by the actions of metformin to decrease blood glucose values or its recently appreciated properties as a tumor suppressive agent."

Butler noted that the present study was undertaken in rats and that it is possible the adverse effects observed would not occur in humans.

"Given these findings, it is probably sensible to use the GLP-1 class of drugs only with metformin until other data is forthcoming," he said.

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