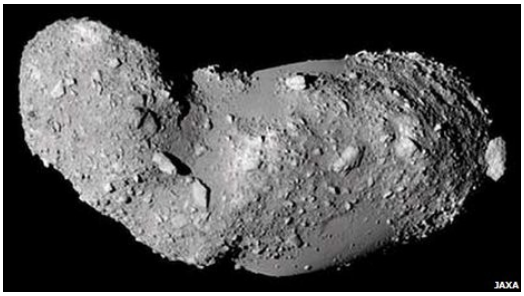
Asteroid probe 'on home straight'

By Paul Rincon Science reporter, BBC News Asteroid

An unmanned Japanese spacecraft designed to return samples from an asteroid has completed an important step on its journey back to Earth.



Itokawa (Jaxa) Hayabusa returned astonishing images from its encounter with Itokawa

Hayabusa achieved the second and largest of four engine firings designed to guide the probe back home.

The probe visited the asteroid Itokawa in 2005, making close approaches designed to capture soil samples.

But the mission has been plagued by technical glitches affecting the engines and communications with Earth.

It remains unclear whether the probe managed to grab any material from Itokawa; scientists will have to open the capsule to find out.

At the weekend, the Japanese Space Agency (Jaxa) announced that Hayabusa had successfully completed its second Trajectory Correction Manoeuvre (TCM), guiding the spacecraft to Earth's "outer rim".

The craft is now roughly 7,600,000km from our planet, according to Jaxa.

The spacecraft is scheduled to return to Earth on 13 June.

At a distance of 40,000km from Earth, the Hayabusa "mothership" will release its sample return capsule.

Shielding should protect the capsule from the high temperatures it will experience during re-entry. Parachutes will then deploy to slow the capsule's speed for its touchdown in the Australian outback.

It is due to land at the Woomera Test Facility in South Australia at around 1400 GMT.

Scientists will be on tenterhooks as they wait for the capsule to be opened.

Even if Hayabusa failed to grab large samples at Itokawa, the capsule may still contain some residues from the asteroid which could be analysed in laboratories. Researchers have already been able to study remote sensing data sent back to Earth by the spacecraft during its encounter with the asteroid.

Hayabusa - which means "Falcon" in Japanese - was launched from the Kagoshima Space Center in Japan on 9 May 2003. It arrived at Itokawa in September 2005, returning astonishing images of the potato-shaped asteroid's jagged terrain. Hayabusa made two "touchdowns" designed to collect rocks and soil for return to Earth. But it apparently failed to fire a metal bullet designed to gather the samples.

Asteroids contain primordial material left over from the formation of the Solar System billions of years ago.

A fuel leak in 2005 left Hayabusa's chemical propellant tanks empty, so engineers had to use the spacecraft's ion engines to guide the spacecraft home.

Ion thrusters are highly efficient but have a low acceleration. This means that each trajectory correction takes much longer to complete than it would with chemical engines.

Sugary band-aid may help heal post-operative tissue

Gel developed from same compound found in spray tanning lotion

NEW YORK - A compound found in sunless tanning spray may help to heal wounds following surgery, according to new results published by plastic surgeons from NewYork-Presbyterian Hospital/Weill Cornell Medical Center in New York City and biomedical engineers at Cornell University in Ithaca, N.Y., where the novel compound was developed.

Results published today in the Proceedings of the National Academy of Sciences show that a sticky gel composed of polyethylene glycol and a polycarbonate of dihydroxyacetone (MPEG-pDHA) may help to seal wounds created by surgery.

Procedures to remove cancerous breast tissue, for example, often leave a hollow space that fills with seroma fluid that must typically be drained by a temporary implanted drain. "This is an unpleasant side effect of surgery that is often unavoidable," explains Dr. Jason Spector, co-author of the study and plastic surgeon at NewYork-Presbyterian Hospital/Weill Cornell Medical Center.

The gel could potentially be used in all different reconstructive surgeries to prevent seroma formation. "The new substance would act to glue together the hole left behind to prevent seroma buildup," says Dr. Spector.

DHA is a compound that sticks to compounds in biological tissues, called amines. The sticky properties of DHA are what allows sunless tanner to adhere to the skin without being wiped off. However, it is biodegradable and water soluble as well, which means that the compound does not stay tacked onto the body's tissues forever. Currently used "bio-glues" are made from animal products and take a long time to degrade in the body - both factors that raise the risk of infection.

"DHA is a compound that is naturally produced in the body," explains Dr. David Putnam, the study's senior author and a biomedical engineer from Cornell University's Department of Biomedical Engineering and School

of Chemical and Biomolecular Engineering. "The glue is broken down, or metabolized, and then safely removed by the body."

Dr. Putnam's lab and his collaborators work to create safe, synthetic compounds from chemicals found in nature. DHA is an intermediary compound produced during the metabolism of glucose, a sugar used by the body for fuel.

To create the new compound, MPEG-pDHA, Dr. Putnam and his lab first bound the single molecule monomer of DHA, which is highly reactive, to a protecting group molecule, making it stable enough to manipulate. This allowed the engineers to bind the monomers together to form a polymer, or chain of molecules, along with MPEG. Doing so allows the polymer gel to be injected through a syringe.

"Making a polymer from DHA has eluded chemical engineers for about 20 years," says Dr. Putnam.

Now in gel form, the compound has the ability to stick tissues together, preventing the pocket from filling with seroma fluid, like an internal Band-Aid, explains Dr. Putnam. The researchers found that the gel prevented or significantly lowered seroma formation or fluid buildup in rats that had breast tissue removed.

"The next step would be to test the gel on larger animals and then in clinical trials in human surgical cases," says Dr. Spector. Previous results, published by Drs. Putnam and Spector, in the August 2009 issue of the Journal of Biomedical Materials Research, showed that the gel also prevented bleeding in a rat liver.

"This is another aspect of the compound that would be greatly beneficial if proven to be applicable in humans," says Dr. Spector. "The gel could speed the healing and decrease bleeding within the body."

This research was supported in part from a National Science Foundation CAREER Award, a grant from the Morgan Tissue Engineering Fund, an Early Career Award from the Wallace H. Coulter Foundation, and the New York State Center for Advanced Technology.

Co-authors of the study include Dr. Peter Zawaneh from Cornell University, Dr. Sunil Singh and Dr. Peter Henderson from Weill Cornell, and Dr. Robert Padera from the Department of Pathology at Brigham and Women's Hospital.

'Oldest' stone artifacts may be younger

The Asahi Shimbun

Fragments of stone tools found at the Sunabara remains in Izumo, Shimane Prefecture, may not be as old as originally thought, according to archaeologists.

At a meeting of the Japanese Archaeological Association in Tokyo on Sunday, the fragments were estimated to date from 70,000 to 127,000 years ago.

In September, a team led by Kazuto Matsufuji at Kyoto's Doshisha University announced that 20 stone tool fragments were found in a 120,000-year-old stratum. But further research revealed a 70,000-year-old stratum of volcanic ash right above the find.

Before the discovery in September, the oldest stone artifacts in Japan were believed to be 90,000-year-old tools found at the Kanedori site in Iwate Prefecture, among other locations.

13,000-year-old clay figure found

The Asahi Shimbun

OTSU - A clay figure believed to be 13,000 years old and one of the oldest in the country, was found in an archaeological site in Higashiomi, Shiga Prefecture, the Shiga Prefectural Association for Cultural Heritage said.

The tiny figure, 3.1 centimeters in height and 14.6 grams in weight, depicts a female torso with breasts and a waistline.

The figure, which was discovered at the Aidanikumahara archaeological site, is from an incipient era of the Jomon Pottery Culture, according to the association.

***A clay figure found in Higashiomi, Shiga Prefecture** (The Asahi Shimbun)*

Another female clay figure from approximately the same era was found in Matsusaka, Mie Prefecture, in 1996.

Powerful genome barcoding system reveals large-scale variation in human DNA

MADISON - Genetic abnormalities are most often discussed in terms of differences so miniscule they are actually called "snips" - changes in a single unit along the 3 billion that make up the entire string of human DNA.

"There's a whole world beyond SNPs - single nucleotide polymorphisms - and we've stepped into that world," says Brian Teague, a doctoral student in genetics at the University of Wisconsin-Madison. "There are much bigger changes in there."

Variation on the order of thousands to hundreds of thousands of DNA's smallest pieces - large swaths varying in length or location or even showing up in reverse order - appeared 4,205 times in a comparison of DNA from just four people, according to a study published May 31 in the Proceedings of the National Academy of Sciences.

Those structural differences popped into clear view through computer analysis of more than 500 linear feet of DNA molecules analyzed by the powerful genome mapping system developed over nearly two decades by David C. Schwartz, professor of chemistry and genetics at UW-Madison.

"We probably have the most comprehensive view of the human genome ever," Schwartz says. "And the variation we're seeing in the human genome is something we've known was there and important for many years, but we haven't been able to fully study it."

To get a better picture of those structural variations, Schwartz and his team developed the Optical Mapping System, a wholly new type of genome analysis that directly examines millions of individual DNA molecules.

Common systems for analyzing genomes typically chop long DNA molecules into fragments less than a couple thousand base pairs long and multiply them en masse, like a copy machine, to develop a chemical profile of each piece.

Reading such small sections without seeing their place in the larger picture of DNA leaves out critical understanding. To make matters worse, interesting parts of the human genome are often found within DNA's trickiest stretches.

"Short pieces could really come from so many different locations," Teague says. "An enormous part of the genome is composed of repeating DNA, and important differences are often associated with areas that have a lot of repeated sections."

It's a problem inherent to the method that has irked Schwartz for a long time.

"Our new technology quickly analyzes huge DNA molecules one at a time, which eliminates the copy machine step, reduces the number of DNA jig-saw pieces and increases the unique qualities of each piece," Schwartz says. "These advantages allow us to discover novel genetic patterns that are otherwise invisible."

The genome mapping system in Schwartz' lab takes in much larger pieces, at least millions of base pairs at a time. Sub-millimeter sections of single DNA molecules - thread-like and, in full, 4 to 5 inches long in humans - are coaxed onto treated glass surfaces.

The long strands of DNA straighten out on the glass, and are clipped into sections by enzymes and scanned by automated microscopes. The pattern of these cuts along each molecule thread produces a unique barcode, identifying the DNA molecule and revealing genetic changes it harbors.

The scan results are passed along to databases for storage and retrieval, and handled by software that stitches collections of bar-coded molecules together with others to reconstitute the entire strand of DNA and quickly pinpoint genetic changes.

"What we have here is a genetic version of Google Earth," Schwartz says. "I could sit down with you and start at chromosome 1, and we could pan and zoom through each one and actually see the genetic changes across an individual's genome."

To Teague, the Optical Mapping System provides access to a new frame of reference on human genetic variation. "I've got a whole folder of papers on diseases that are ascribable to these structural differences," he says. "If you can see the genetic basis for those diseases, you can figure out the molecular differences in their development and pick drug targets to treat or cure or avoid them altogether. We fit into that storyline right up at the front."

It's been a long story.

"We've been thinking about these large structural variations for decades," says Schwartz, whose work is funded by the National Institutes for Health and the National Science Foundation. "The problem was that the system for discerning large structural variants was not available. So we had to build it."

The integrative building process included studying the behavior of fluids at microscopic scale, manipulating large DNA molecules and placing barcodes on them, automating high-powered microscopes to analyze single molecules, organizing the computing infrastructure to handle the data and algorithms to analyze whole human genome, and more.

And after notable turns analyzing the DNA of corn, parasites, bacteria and even the mold that caused the 19th-century potato famine in Ireland, Schwartz has arrived at the human genome, his original target.

"It's like you spend years making a telescope, and then one day you point it at the sky and you discover things that no one else could see," he says. "We've integrated so many scientific problems together in a holistic way, which lets us solve very hard problems."

The result is a 30-day turnaround for one graduate student to analyze one human genome, but that's just a waypoint. Schwartz's team isn't just pointing at the sky. They are aiming for the stars by building new systems for personal genomics.

"This will go even further," says Konstantinos Potamousis, the lab's instrumentation innovator and a co-author on the study, which included researchers from UW-Madison, Mississippi State University, the University of Pittsburgh, the University of Southern California and the University of Washington.

"Our systems scale nicely into the future because we've pioneered single molecule technologies. The newer systems we are building will provide more genetic information in far less time."

With development complete on new molecular devices, software and analysis, a large piece of the system is already in place. And the speed of innovation will synergize the pace of genome analysis.

"Our newer genome analysis systems, if commercialized, promise genome analysis in one hour, at under $1,000," Schwartz says. "And we require that high speed and low cost to power the new field of personal genomics."

The Claim: Rosemary Helps Reduce Toxins in Grilled Meat

By ANAHAD O'CONNOR

THE FACTS Cooking meat at high temperatures is known to create toxins called heterocyclic amines, which have been linked to some cancers. Marinating lowers the risk by preventing the formation of the toxins. But one ingredient that makes a big difference is rosemary. Studies show that adding it to ground beef and other types of muscle meat before grilling, frying, broiling or barbecuing significantly reduces heterocyclic amines.

In a study published in The Journal of Food Science in March, scientists tested extracts of rosemary on ground beef patties that were cooked at temperatures from 375 degrees to 400 degrees Fahrenheit. The extract was added to both sides of the meat before cooking. The higher the concentration, the greater the reduction in heterocyclic amines (in some cases by over 90 percent.

Scientists attribute this to specific antioxidants in rosemary: rosmarinic acid, carnosol and carnosic acid. Another study two years ago compared several marinades and found that the one that was most protective was a Caribbean mixture, which, they wrote, “contained considerable amounts” of the same three antioxidants.

If rosemary is not your thing, or you have an allergy, try marinades with garlic, onion and lemon juice. They have also been shown in studies to be effective (garlic and onion much more so than lemon juice).

THE BOTTOM LINE Studies show that marinades with rosemary help eliminate some carcinogens in grilled meat.

Tecnalia presents electric vehicle that reaches 140 km/hour in 10 seconds

The Tecnalia Technological Corporation has presented its experimental vehicle -‘Dynacar’-, a totally electric car that can reach a speed of 140 kilometres per hour in 10 seconds. The presentation took place at the International Eco Friendly Vehicle & Sustainable Mobility Show in Madrid, held between the 20th and 23rd of May.

Although it is a totally electric vehicle, ‘Dynacar’ takes on board the possibility of integrating range extension concepts, i.e. a battery or small internal combustion engine that will enable the car battery to be supplied with energy in a supplementary mode. The car is a two-seater and has a complete instrument panel to validate systems relative to longitudinal and lateral dynamics. It uses a single-shell, high-rigidity lightweight chassis of steel and aluminium alloy, with an adjustable deformable parallelogram suspension system for the four wheels.

The vehicle has a peak power of 100 kW provided by a permanent magnet synchronous electric motor, a total weight of 700 kg and an energy storage capacity of 15 kWh.

Acceleration from 0 to 100 km/h is estimated to be under 5.7 seconds, the optimum management of traction control being critical. The peak speed is approximately 140 km/h, reaching this figure in 10 seconds. Autonomy in an urban cycle is some 70 kilometres; “an appropriate distance for the purpose of the experimental vehicle”, according to those responsible at Tecnalia.

The vehicle will be adapted to run on the open road, but its main application is to act as a research platform for new concepts in high-powered electric traction, as well as active systems that enable maximum advantage to be taken of new propulsion systems, such as boost vectorisation or the concepts of distributed traction by means of incorporating in-wheel motors, regenerative braking, etc.

The researchers who have devised ‘Dynacar’ state that “the electrification of road transport is one of the priorities of the research, given that the dependence on fossil fuels and the greenhouse effect has focused everyone’s attention on the traditional concept of transport based on vehicles with conventional motor drive”.

Over the past five years the Tecnalia Corporation has been undertaking research into advanced configuration tools and the virtual evaluation of vehicles, in order to develop new solutions for electric and hybrid vehicles. ‘Dynacar’ will be used to check the hypotheses used with high performance electric and hybrid vehicles and to develop new concepts for vehicles of the future. *For more updated information about ‘Dynacar’: www.dynacar.es.*

Drug could get into the autistic mind

* 01 June 2010 **by Celeste Biever**

CAN people with autism take a pill to improve their social skills? For the first time, drugs are being tested that could address the social difficulties associated with autism and other learning disorders by tackling some of the brain chemistry thought to underlie them.

The only drugs currently prescribed to people with autism seek to dampen aggression and anxiety. The new drugs, now in the very early stages of clinical testing, address some of the classic symptoms of autism.

"People may learn more, learn to speak better, learn social skills and to be more communicative," says Randall Carpenter of Seaside Therapeutics in Cambridge, Massachusetts, which is testing one of the drugs.

Geraldine Dawson, chief science officer at the charity Autism Speaks and a psychiatrist at the University of North Carolina at Chapel Hill, is equally enthusiastic about the prospect of a new class of drugs. "For the first time we are seeing drugs that could tackle core autism symptoms," she says.

For the first time we are seeing drugs that could tackle the core symptoms of autism

The Seaside trial is aimed at a learning disorder called fragile X, which is associated with autism. People with fragile X carry a mutation in a gene involved in strengthening brain connections associated with salient experiences. Stronger brain connections allow people to distinguish these events from background noise, making this a key process in learning.

Carpenter and his colleagues are testing a drug called arbaclofen, which seems to reverse the effect of the mutation. At the International Meeting for Autism Research in Philadelphia, Pennsylvania, on 23 May, they presented initial results suggesting that the drug may improve the social skills of people with fragile X and autism, including improved communication and general sociability, and fewer outbursts.

Seaside's trial is not the only attempt to alter the brain chemistry of people with autism. The hormone oxytocin, also known as the cuddle chemical, helps us connect social contact with feelings of pleasure, and some people with autism produce less of it. Several teams are looking into boosting oxytocin to relieve symptoms of autism.

At the Philadelphia meeting, a team led by Evdokia Anagnostou, a child neurologist at Bloorview Research Institute in Toronto, Canada, reported that people given the hormone twice daily for six weeks were more likely to be better at recognising emotions and at social functioning, and had a better quality of life than others given a placebo.

Trying to alter the brain chemistry thought to underlie autistic behaviour has never been done before in this way, says Uta Frith of University College London. "If they succeed it would be marvellous." But she cautions that the drugs have not yet been shown to work better than behavioural interventions and that most causes of autism are still deeply mysterious.

Carpenter points out that behavioural interventions don't work for everyone, and both approaches could be useful. "If we come up with an effective treatment, parents are going to embrace that."

Next-gen blood glucose monitor: High-tech tattoos

by Elizabeth Armstrong Moore

Chemical engineers at MIT are designing carbon nanotubes that can be injected beneath the skin to reveal continuous blood glucose levels in real time. If it works, people with Type I diabetes may not have to prick their fingers multiple times a day to monitor their glucose levels.

Dubbed a "tattoo" that's designed to detect glucose, the nanotubes are wrapped in a polymer that is sensitive to glucose concentrations. A wearable device roughly the size of a wristwatch shines infrared light through the skin and onto the nanotubes, which fluoresce when in contact with glucose. So it's really a tattoo in hiding. And at this point the sensor is estimated to have a shelf (or is it skin?) life of roughly six months.

But the team, which plans to start testing on animals soon, says that if the readings are accurate enough to pass the Clarke Error Grid analysis for glucose sensor accuracy, the system could revolutionize continuous glucose monitoring.

"The most problematic consequences of diabetes result from relatively short excursions of a person's blood sugar outside of the normal physiological range, following meals, for example," said Michael Strano, a professor at MIT's Department of Chemical Engineering. "If we can detect and prevent these excursions, we can go a long way toward reducing the devastating impact of this disease."

While the MIT sensor appears to be the first of its kind, it is by no means the only continuous glucose sensor. Strano says that most work by injecting the enzyme glucose oxidase, which breaks down glucose and indirectly measures glucose levels based on interactions with a byproduct of the breakdown, hydrogen peroxide. Because of the risk of easy infection, this method is only approved to last for up to a week at a time.

The MIT sensor, on the other hand, takes more direct measurements with a passive device that simply absorbs and re-emits light - a process Strano tells me should be quite safe.

"The device really only has to absorb and emit. It doesn't have to be self-powered, and doesn't have to contain anything else except fluorophore," he said. "We're very excited about this; we have a series of patents on it, and we're very committed to getting this to work."

The engineers first described their sensor in the journal ACS Nano in November 2009, and are now working on the "ink" the nanotubes would be suspended in when injected beneath the skin.

Antidepressants linked to cataract risk - Parkinson's drug may cause corneal damage

Highlights of June 2010 Ophthalmology

This month's Ophthalmology, the journal of the American Academy of Ophthalmology, includes new studies on links between eye diseases and two widely-prescribed drugs: SSRI (selective serotonin reuptake inhibitor) antidepressants, and amantadine, a Parkinson's disease treatment.

Some Antidepressants May Bump Up Cataract Risk

Seniors who take SSRI antidepressants may be more likely to develop cataracts, says the first major study to examine this interaction. The risk appears to increase by about 15 percent, which in the United States would translate to 22,000 cataract cases attributable to antidepressant use. The study, led by Mahyar Etminan, PharmD, of Vancouver Coastal Health Research Institute, Canada, assessed data for nearly 19,000 people age 65 or older, all of whom also had cardiovascular disease. Their records were compared to about 190,000 controls.

The effect was strongest for three SSRIs: Luvox (fluvoxamine) increased risk by 39 percent, Effexor (venlafaxine) by 33 percent and Paxil (paroxetine) by 23 percent. The apparent increased risk was associated only with current, not past, drug use. Some antidepressants did not appear to be associated with cataract risk, but this could have been because the numbers of study participants using these drug types were too small to show effects, or because only specific agents in certain medications are related to cataract formation. These questions need further study.

"The eye's lens has serotonin receptors, and animal studies have shown that excess serotonin can make the lens opaque and lead to cataract formation," Dr. Etminan said. "If our findings are confirmed in future studies, doctors and patients should consider cataract risk when prescribing some SSRIs for seniors," he added.

Earlier research linked beta blocker medications and oral and inhaled steroids to higher cataract risk, and a recent Swedish study suggests that women's hormone replacement therapy may also raise risk.

Long-term Use of Parkinson's Drug May Impact Vision

Parkinson's disease, the second most common neurodegenerative disease after Alzheimer's, is often treated with amantadine. The drug helps alleviate patients' motor problems and may be taken for years. Doctors have long known that amantadine treatment causes abnormal changes in the cornea in some Parkinson's patients. The cornea is the eye's clear outer surface that provides most of the visual power. Usually corneal reactions occur soon after starting the drug and disappear a few weeks after it is withdrawn. But sometimes corneal disorders appear only after years of treatment, and the corneas of these patients often do not recover when amantadine is stopped. Won Ryang Wee, MD, PhD, and his colleagues at Seoul National University College of Medicine, South Korea, studied whether the effect of amantadine on corneal endothelial cells is dependent on the cumulative dose received.

The researchers compared 169 eyes of amantadine-treated patients with an equal number of matched controls; the average age of all subjects was 59. They found that the patient group with the highest cumulative amantadine intake and/or longest duration of treatment (up to 8 years) had the most significant reductions in endothelial cell density (ECD). Endothelial cells work to keep excess water out of the main body of the cornea. When there are too few endothelial cells, corneal edema (swelling) results and vision is impaired. This study noted two early indicators of abnormal corneal changes in response to amantadine, before ECD reduction occurred: deformation of the normal hexagonal cell shape, and increase in cell size variation. The findings also show that ECD reduction in response to amantadine treatment does not occur quickly.

"Assuming other studies confirm these results, ophthalmologists and neurologists should consider evaluating a patient's corneal endothelium at the beginning of treatment with amantadine and reassess at regular intervals if the drug is used long term," Dr. Wee said, "and additional monitoring would be needed for patients with other conditions that reduce ECD–such as recent cataract surgery or ongoing glaucoma, uveitis or Fuch's dystrophy–because corneal edema could develop during treatment."

Eds: Full texts of the studies are available from the Academy's media relations department.

Calcium consumption may cause prostate cancer in Chinese

PHILADELPHIA - Among Chinese men, calcium consumption - even at relatively low levels and from non-dairy food sources such as soy, grains and green vegetables - may increase prostate cancer risk, according to results published in Cancer Research, a journal of the American Association for Cancer Research.

"Our results support the notion that calcium plays a risk in enhancing the role of prostate cancer development," said lead researcher Lesley M. Butler, Ph.D., assistant professor of epidemiology at Colorado State University, Fort Collins, Colo. "This study is the first to report an association at such low levels and among primarily non-dairy foods."

Some studies conducted in North American and European populations have linked high consumption of dairy products to an increased risk of prostate cancer. A few studies have suggested that calcium in milk is the causative factor, however the evidence is not clear.

In an Asian diet, non-dairy foods like tofu, grains and vegetables such as broccoli, kale and bok choy are the major contributors of calcium intake. Therefore, Butler and colleagues speculated that people who are exposed to those calcium-rich food sources in an Asian diet may also be at increased risk for prostate cancer.

Using data from the Singapore Chinese Health Study, the researchers evaluated whether dietary calcium increased prostate cancer risk in a population of 27,293 Chinese men aged 45 to 74 years, with low dairy consumption. The study was restricted to men who belonged to two major dialect groups of Chinese people living in Singapore: the Hokkiens and the Cantonese.

The Singapore Chinese Health Study, funded by the U.S. National Institutes of Health, National Cancer Institute, is a population-based prospective study initiated between 1993 and 1998.

Participants completed a food frequency questionnaire to assess their diet over the past year. Of these men, 298 were diagnosed with incident prostate cancer.

Butler and colleagues at Colorado State University, the National University of Singapore and the University of Minnesota assessed the participant's diet at baseline. Since it is suggested that calcium is absorbed more so in smaller individuals, the researchers accounted for body mass index (BMI) in this Chinese population.

Results showed a 25 percent increased risk of prostate cancer when comparing those who consumed, on average, 659 mg vs. 211 mg of total calcium a day, according to the study.

Major food sources of calcium in this population consisted of: vegetables (19.3 percent), dairy (17.3 percent), grain products (14.7 percent), soyfoods (11.8 percent), fruit (7.3 percent) and fish (6.2 percent). However, the researchers stress that there was no positive association with prostate cancer risk and any one particular food source. Among men with less than average BMI (median BMI was 22.9 kg/m2), the researchers found a twofold increased risk of prostate cancer.

"It was somewhat surprising that our finding was consistent with previous studies because nearly all of them were conducted among Western populations with diets relatively high in calcium and primarily from dairy food sources," Butler said.

Edward Giovannucci, M.D., Sc.D., professor of epidemiology and nutrition at Harvard School of Public Health, who is not associated with this study, said these results add more evidence that calcium is a causative factor of prostate cancer.

"However, there are some aspects that require further study," he said. "First, they found an association with relatively low intakes of calcium, whereas most previous studies suggested an association with high intake of calcium. Also, they found an association mostly in lean men, and whether this is true or is a chance finding requires further study."

Additional studies are needed to explore the possible roles of calcium, as opposed to other dairy product components, in prostate cancer progression, Butler stressed.

Calcium supplements: too much of a good thing?

Over-the-counter supplements can cause hypertension and kidney failure

Negative health effects linked to taking too much supplemental calcium are on the rise, according to a commentary appearing in an upcoming issue of the Journal of the American Society Nephrology (JASN). The incidence of the so-called milk-alkali or calcium-alkali syndrome is growing in large part because of widespread use of over-the-counter calcium and vitamin D supplements.

The milk-alkali syndrome arose in the early 1900s when patients ingested abundant amounts of milk and antacids to control their ulcers. This practice increased individuals' risk of developing dangerously high levels of calcium in the blood, which could cause high blood pressure and even kidney failure. The incidence of the milk-alkali syndrome declined when newer ulcer medications became available, but it appears to be on the rise again thanks to increased use of over-the-counter calcium and vitamin D supplements used mainly as

preventive and treatment measures for osteoporosis. In many cases, patients with the syndrome require hospitalization.

Stanley Goldfarb, MD and Ami Patel, MD (University of Pennsylvania School of Medicine) recommend changing the name of the milk-alkali syndrome to the calcium-alkali syndrome because the condition is now associated with a large intake of calcium, not milk. Postmenopausal women, pregnant women, transplant recipients, patients with bulimia, and individuals who are on dialysis have the highest risks of developing the calcium-alkali syndrome due to various physiological reasons.

According to the authors, the obvious preventive strategy against the calcium-alkali syndrome is to limit the intake of calcium to no more than 1.2 to 1.5 grams per day. "Calcium supplements taken in the recommended amounts are not only safe but are quite beneficial. Taken to excess is the problem," said Dr. Goldfarb. "Even at the recommended dose, careful monitoring of any medication is wise and yearly determinations of blood calcium levels for those patients taking calcium supplements or vitamin D is a wise approach," he added.

The authors reported no financial disclosures.

The commentary, entitled "Got Calcium? Welcome to the Calcium-Alkali Syndrome," (doi 10.1681/ASN.2010030255) is available online at http://jasn.asnjournals.org. A detailed article on this commentary will also be included within the June issue of ASN Kidney News.

So Big!

BY C. CLAIBORNE RAY

Q. What was going on in the Jurassic and Cretaceous periods that allowed the largest known land animals, like the Brontosaurus, to thrive and survive?

A. The Brontosaurus, now properly named the Apatosaurus, and the other great sauropod species benefited from a complex interaction of resource availability and evolved physical traits, according to a multi-author review article that appeared online in April in Biological Reviews, published on behalf of the Cambridge Philosophical Society.

Victoria Roberts

The dinosaurs' genetic heritage and evolutionary innovations "triggered a remarkable evolutionary cascade," the article said. The most important innovation, the study suggested, was probably the very long neck, which made "food accessible that was out of the reach of other herbivores." The long neck could only evolve because of the creatures' small head, lightening the load on the neck, and the small head was possible because food was ingested without being chewed but retained for long periods of digestion.

The large dinosaurs also seem to have retained an avian-style, highly dispersed respiratory system, which required less energy for breathing and in addition may have helped with cooling such large creatures. Size itself was an advantage in survival, protecting against predators, for example. Another advantage was an oviparous reproduction system, with many small offspring being born, but only a few surviving to reach giant adulthood.

Treating heart attack past recommended time may significantly increase risk of death

An examination of the treatment received by patients with myocardial infarction (heart attack) at 80 hospitals in Quebec indicates that those who received either primary percutaneous coronary intervention (PPCI; such as angioplasty) or fibrinolysis (administration of medication to dissolve blood clots) beyond the times recommended in international guidelines had a significantly increased risk of death within 30 days, along with an increased risk of the combined outcome of death or readmission for heart attack or heart failure at one year, according to a study in the June 2 issue of JAMA.

"Both primary percutaneous coronary intervention and fibrinolysis are well-recognized treatments for STEMI in international guidelines, and benefits are maximized when treatment occurs early," according to background information in the article. STEMI (ST-segment elevation myocardial infarction) is a certain pattern on an electrocardiogram following a heart attack. "However, randomized trials and selective registries are limited in their ability to assess the effect of timeliness of reperfusion on outcomes in real-world STEMI patients."

Laurie Lambert, Ph.D., of the Quebec Healthcare Assessment Agency, Montreal, Canada, and colleagues conducted a province-wide evaluation of STEMI care in Quebec (population, 7.8 million) to determine the use of reperfusion treatments (such as PPCI or fibrinolysis) and their delays and whether STEMI reperfusion treatment outside of the guideline-recommended delays was associated with poorer outcomes than treatment within recommended delays. The researchers analyzed data of STEMI care for 6 months during 2006-2007 in 80 hospitals in Quebec. Maximum delays recommended in international guidelines for PPCI are 90 minutes; 30 minutes for fibrinolysis.

Of the patients treated with acute reperfusion (n = 1,832), 78.6 percent (1,440) underwent PPCI and 21.4 percent (392) received fibrinolytic therapy. Among patients who underwent PPCI, the median (midpoint) door-to-balloon time was 110 minutes. PPCI was untimely (greater than 90 minutes) in 68 percent of patients. For patients who received fibrinolysis, the median delay was 33 minutes, and untimely (greater than 30 minutes) in 54 percent of patients. Incidence of the combined outcome (death or readmission for heart failure or heart attack) at 1 year was 13.5 percent for fibrinolysis patients and 13.6 percent for PPCI patients.

"When the 2 treatment groups were combined, patients treated outside of recommended delays had an adjusted higher risk of death at 30 days (6.6 percent vs. 3.3 percent) and a statistically nonsignificant increase in risk of death at 1 year (9.3 percent vs. 5.2 percent) compared with patients who received timely treatment. Patients treated outside of recommended delays also had an adjusted higher risk for the combined outcome of death or hospital readmission for congestive heart failure or acute myocardial infarction [heart attack] at 1 year (15.0 percent vs. 9.2 percent). At the regional level, after adjustment, each 10 percent increase in patients treated within the recommended time was associated with a decrease in the region-level odds of overall 30-day mortality," the authors write.

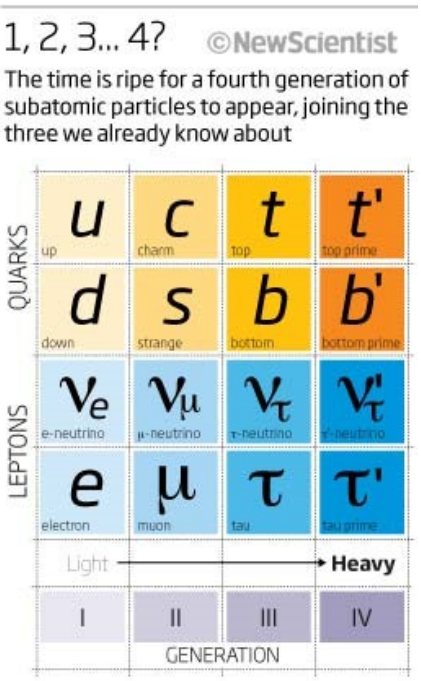
"Our study, while consistent with registry and clinical data associating longer treatment delays with poorer outcomes, is novel and robust in several ways. Above all, it represents not a sampling but more than 95 percent of all STEMI patients within a large and complex system of care and provides very recent information that transcends the relative selectivity of randomized clinical trials and most registries."

" … we believe this evaluation represents a needed contribution to the evidence base for deriving clinical practice guidelines and an important advance in knowledge of the outcomes associated with contemporary processes of STEMI care. This 'real-world' information is relevant both clinically and from a perspective of evidence-based health care policy and planning, pointing to the lifesaving potential for approaches that focus on offering the most timely reperfusion treatment to patients with STEMI," the researchers write.

They add that time, rather than mode of reperfusion, emerges as a critical determinant of outcome in this systematic evaluation of STEMI care. "Regardless of reperfusion strategy, patients treated beyond maximum recommended delays had increased mortality."*JAMA. 2010;303[21]:2148-2155.*

Matter: The next generation

* 01 June 2010 **by David Shiga**



TWO teams working at the Tevatron particle smasher in Batavia, Illinois, have found hints of a new generation of fundamental particles - to add to the three generations we already know about. What's so special about these new particles?

If they really do exist, they might explain a long-standing puzzle - how the universe avoided self-destruction in its earliest moments after the big bang.

First a rundown on what we know already. Each of the three known generations of matter contains two types of fundamental particle - quarks and leptons. First generation leptons include the familiar electron and neutrino (see images, right).

The first generation of matter can explain everything we encounter in everyday life. Atomic nuclei are composed of protons and neutrons, which are in turn composed solely of "up" and "down" quarks.

The second and third generations were introduced to explain the dozens of varieties of short-lived, subatomic particles spotted in the debris of particle smashers. Each of these two generations contains a pair of quarks - much heavier than those of the first generation - as well as muons and taus, heavy versions of the electron. They also each have their own version of the neutrino.

New generations of matter have tended to show up every 30 or 40 years - the last time was in 1975, when the tau was discovered. "We've seen three generations, why not four?" says Amarjit Soni of Brookhaven National Laboratory in Upton, New York. A fourth generation would be "a very simple continuation of the trend we've seen", he says.

Now hints of this fourth generation have turned up in data from the Tevatron accelerator, which smashes together protons and antiprotons.

In March, researchers at the CDF detector at the Tevatron finished combing through the collision debris created there between March 2002 and March 2009. They were looking for hints of a fourth-generation quark, which would be heavier than those in the other three generations. That would explain why it hadn't been seen in

past experiments - the heavier a particle is, the more energy is needed to forge it, and collisions in previous experiments involved too little energy to produce such a massive beast.

A heavy fourth-generation quark would unleash a lot of energy as it decayed, producing very energetic muons, among other things. The other three generations of matter also produce these decay products, and calculations suggest these three generations should account for two decay events at the highest energy measured in the experiment. But the CDF team saw eight - a surplus that hints at a fourth-generation quark.

The excess is small enough to be a statistical fluke, so the team is not claiming to have seen signs of a fourth generation. "Extraordinary claims require extraordinary evidence, and we definitely don't have that," admits John Conway of the University of California at Davis, one of the study's authors.

No fluke

Not everyone is ready to dismiss the excess, however. Stephen Martin of Northern Illinois University in DeKalb, who was not involved in the study, says, "It's interesting enough that we'll be paying attention to future analyses and hoping. It would be very exciting if there was a [fourth-generation] quark."

Though the significance of the CDF excess is debated, fresh evidence from Tevatron's other main detector, DZero, shows another possible hint of a fourth generation that is harder to dismiss.

A new analysis of proton-antiproton collisions in DZero found the decay products were unexpectedly skewed - slightly more muons were created than antimuons, their antimatter counterparts (arxiv.org/abs/1005.2757).

"If it is confirmed, it's an extremely important discovery," says Soni. "It has very important repercussions for all of particle physics."

This result is at odds with the standard model of particle physics, the best theory we have so far to describe the subatomic world. The model predicts a much smaller difference between the number of matter and antimatter particles produced in collisions, about 1/40th of what DZero actually saw. A new and unknown influence seems to be at work.

Some physicists have previously pointed out that a fourth generation of particles could skew the matter-antimatter balance in the sort of process observed at DZero.

How might this happen? The weird rules of quantum mechanics permit virtual particles to briefly pop into existence, and if fourth-generation quarks were to arise this way in DZero, they could interfere with the normal sequence of events by which particles in the experiment decay. For example, pairs of quarks that include third-generation "bottoms" normally go through a series of reactions that produce muons and anti-muons. A fourth-generation quark could interfere with this process, upsetting the normal balance between matter and antimatter production and skewing the results in favour of matter.

If the anomaly at DZero is the result of fourth-generation particles, the implications would be profound. For decades, physicists have puzzled over the fact that the universe as we know it exists at all.

According to the standard model, matter and antimatter should have condensed in nearly equal amounts from the energy available in the early universe. Since matter and antimatter annihilate each other on contact, most of both "species" would have been quickly destroyed, leaving a barren sea of radiation almost completely devoid of the matter needed to make stars, galaxies and planets. Clearly that didn't happen, so something must have boosted production rates for matter, leaving an excess to survive the orgy of annihilation and give rise to the universe.

If fourth-generation quarks are responsible for upsetting this balance, then we would not exist without them. "To me, this is the single most important motivation for the existence of [the fourth generation]," says George Hou of the National Taiwan University in Taipei. By a mere extension from three to four generations, he adds, we may have enough asymmetry to explain how matter survived annihilation in the early universe.

Though the DZero asymmetry fits with the existence of a fourth generation, it does not prove it. It is also possible to generate matter-antimatter asymmetry in theories that attempt to explain particle physics by introducing hidden extra dimensions, as well as in supersymmetry - a theory in which each particle in the three known generations of matter, as well as those that carry forces, has a heavier partner.

Fourth-generation particles could also help explain the origin of the dark matter that seems to make up most of the universe's mass. Key to this idea is a heavy neutrino. Like the neutrinos in all the other generations of particles, this one does not interact with the electromagnetic force, making it transparent to light and hence invisible.

While the other three known neutrinos are too lightweight to account for a significant fraction of dark matter, heavier fourth-generation neutrinos might be able to clump together and form the seeds of galaxies.

Exciting as the idea is, it is not watertight. For one, a heavy neutrino would ordinarily decay in a fraction of a second into a lighter version from another generation, so no heavy neutrinos from the early universe should

have survived to form the dark matter we think exists today. Physicists would have to come up with a way to explain how a heavy neutrino stayed stable for billions of years since the big bang.

Luckily the Large Hadron Collider at CERN should be able to clarify things. It is now colliding particles with a combined energy of 7 teraelectronvolts, dwarfing the Tevatron's 2 TeV collisions. Given the extra power, it should not take long for the LHC to spot a fourth-generation quark with a mass of around 450 GeV. "The LHC is going to be able to definitively test this," says Martin.

An important milestone along the way will be spotting the heaviest particle that is already known – a third-generation quark called the top, which has a mass of 170 GeV. The LHC looks on track to spot the top within a few months, Conway says, and then it should not take much longer to see if the CDF excess is more than a fluke.

A positive discovery would be a win for the fourth-generation theory, says Hou. "It would truly turn the world upside down."

Synthetic peptide may regenerate brain tissue in stroke victims

DETROIT – A synthetic version of a naturally occurring peptide promoted the creation of new blood vessels and repaired damaged nerve cells in lab animals, according to researchers at Henry Ford Hospital in Detroit.

"This successful experiment holds promise for treating clot-induced strokes in humans," says study lead author Daniel C. Morris, M.D., senior staff physician in the Department of Emergency Medicine at Henry Ford Hospital. "Neurorestorative therapy is the next frontier in the treatment of stroke."

He will present the findings June 3 at the Annual Meeting of the Society for Academic Emergency Medicine in Phoenix.

Dr. Morris explains that the researchers added the synthetic peptide Thymosin beta 4 to a group of drug treatments – including statins – used for neurorestorative therapy to activate repair mechanisms which mimic cellular changes that occur in the early stages of brain development.

This research follows an earlier study, reported by the same team in March, which found that Thymosin beta 4 improved neurological function after stroke in adult rats by increasing the formation of protective myelin around nerve fibers in brain cells.

These experiments conclude that the peptide repairs and regenerates stroke-injured brain tissue.

The results of the first study also were similar to other research using the peptide to regenerate damaged heart, corneal tissue and wound repair.

In the latest study, adult rats were dosed with Thymosin beta 4 one day after they were subjected to a blockage in the cerebral artery, then given four more doses, once every three days. Rats treated only with saline were used as a control group.

After eight weeks, the Thymosin beta 4 group showed significant overall improvement compared to the control group.

The researchers concluded that the peptide improved blood vessel density as well as promoted a certain type of immature brain cells called oligodendrocyte progenitor cells to differentiate into mature oligodendrocytes, which produces myelin to protect axons in nerve cells.

In addition to Dr. Morris, the Henry Ford research team included Michael Chopp, Ph.D.; Li Zhang, M.D.; and Zheng Gang Zhang.

Thymosin beta 4 is produced by RegeneRx Biopharmaceuticals, Inc. The study was funded by the National Institutes of Health.

Genome of bacteria responsible for tuberculosis of olive tree sequenced

Olive tree branch affected by Pseudomonas savastanoi **Nafarroako Unibertsitate Publikoa**

Researchers at the Public University of Navarra, the Polytechnic University of Madrid (CBGP), the University of Malaga, the University of Wisconsin and the Valencian Institute of Agricultural Research have managed to sequence the genome of the bacteria responsible for tuberculosis in the olive tree. The study, included in the June issue of Environmental Microbiology, represents the first sequencing of the genome of a pathogenic bacteria undertaken in Spain, being the first genome known worldwide of a pathogenic Pseudomonas in woody plants.

The sequencing of the genome of this pathogen opens the doors to the identification of the genes responsible for the virulence of this bacteria and its survival on the philosphere (leaf surface), thus facilitating the design of specific strategies in the fight against the disease and enabling drawing up programmes for the genetic improvement of olive groves.

Pseudomonas savastanoi is the agent that gives rise to tuberculosis in the olive tree, a disease that causes important losses in the olive crops in Spain. Trees affected present tumours (known as verrucas) that can grow to several centimetres diameter in trunks, branches, stalks and buds. Diseased trees are less robust and have less

growth, to the point of being non-productive if the attack is very intense. To date, due to the absence of effective methods of control, preventive strategies have been carried out, reducing populations of bacteria with phytosanitary treatment.

New strategies

Plant diseases produced by pathogenic microorganisms not only reduce production but can also alter the quality of the food and drastically diminish the commercial value of the crops. The new strategies for disease control today involve the analysis of information contained in the genome of pathogenic organisms. Similar to what has happened with the human genome, this technology is generating a great amount of valuable information for the development of innovative technologies, that will enable identifying and controlling the pathogen as well as obtaining new varieties of the host plant that have greater resistance to the disease.

Olive tree with tumours (warts) produced by tuberculosis deskargatu **Nafarroako Unibertsitate Publikoa**

Body's own proteins may lead the way in global fight against tuberculosis

New research published in the Journal of Leukocyte Biology suggests that CCL5 protects against Mycobacterium tuberculosis by attracting protective immune cells, which help control bacterial growth

Ohio scientists hope to counter the re-emerging threat of tuberculosis (TB) with help from proteins from our bodies. In a research report published in the June 2010 print issue of the Journal of Leukocyte Biology (http://www.jleukbio.org), scientists show how the protein CCL5 plays a protective role in helping the body ward off this contagious, airborne disease in the early stages of infection. CCL5 is a member of a large family of proteins responsible for immune cell migration toward infection sites. The work on this molecule suggests that CCL5 and/or related proteins may lead to new therapies that help the immune system resist TB.

"We hope this study will spark interest in understanding the mechanisms which control cell migration to sites of infection, help define the protective immune response to Mycobacterium tuberculosis, and ultimately improve our capacity to predict and/or treat patients with TB," said Gillian Beamer, V.M.D, Dipl. ACVP, Ph.D., a researcher from the Center for Microbial Interface Biology at Ohio State University in Columbus, Ohio who was involved in the work.

Scientists discovered the role and potential benefits of CCL5 by studying mice lacking the gene to make the CCL5 protein and mice with the CCL5 gene. When both groups of mice were infected with Mycobacterium tuberculosis, those lacking CCL5 accumulated fewer protective cells and had more bacteria in the lungs over three to five weeks of infection when compared to the normal mice. After five weeks, differences between the groups were not apparent, leading researchers to conclude that CCL5 did not play a role in long-term infection, but rather in the onset and early protection against infection. Additionally, in humans, altered CCL5 expression may be a predisposing factor leading to TB disease progression.

"Tuberculosis may not be top of mind for most people in the developed world, but TB is a leading cause of global disease and drug resistant forms of TB are an ever increasing problem," said John Wherry, Ph.D., Deputy Editor of the Journal of Leukocyte Biology. "Studies such as these this give us hope that as organisms evolve resistance to current therapies, we can develop promising new approaches to treat infectious disease."

Details: Bridget Vesosky, Erin K. Rottinghaus, Paul Stromberg, Joanne Turner, and Gillian Beamer. CCL5 participates in early protection against Mycobacterium tuberculosis. J Leukoc Biol 2010 87: 1153. doi:10.1189/jlb.1109742 ; http://www.jleukbio.org/cgi/content/abstract/87/6/1153

Only five percent of cancer research funds are spent on metastases, yet it kills 90 percent of all cancer patients

On average, about five percent of total cancer research funding is spent on investigating metastases (the spread of cancer cells around the body) in Europe, yet metastatic disease is the direct or indirect cause of 90 percent of all cancer deaths, according to an editorial in the European Journal of Cancer (EJC). [1]

The authors of the editorial, which introduces a special EJC issue on metastasis ("Stopping cancer in its tracks: metastasis as a therapeutic target"), highlight this discrepancy in funding and they believe that, although it is difficult to obtain accurate figures, the situation is probably similar in other countries such as the USA and Japan.

It has been known for some time that metastasis is the key problem in cancer and the main reason why people die from the disease. Until recently, the reasons why some people developed metastases and other did not had been unclear, but, as this special issue of the EJC shows, at last there are models and scientific hypotheses that have begun to unravel this process and the EJC reviews the state of the art in this respect.

However, research into metastasis has not necessarily attracted the recognition it deserves from funding organisations.

Professor Jonathan Sleeman, one of the two guest editors of the EJC special issue and head of microvascular pathobiology research at the University of Heidelberg (Germany), said: "Metastasis is a process in cancer that is very poorly understood; it kills patients and therefore we believe that it should be funded better. Yet at the European level and, indeed, worldwide, comparatively little emphasis is placed on tackling metastases and in providing appropriate levels of funding for research."

He continued: "Given the clinical importance of metastasis for cancer patients, the limited treatment options for metastatic disease and the open question of how metastasis works, we need to know how much research funding is being directed at the problem and what proportion of funding for cancer research ends up focused on metastases? I have found it hard to obtain reliable figures, but although there is considerable variation between European countries, I estimate that the average spent on metastasis research is around 5% of total cancer research funding. Given that metastasis is of central importance to the prognosis and outcome of cancer patients, we could argue that in many countries more funding should be directed toward metastasis research."

Metastasis is the process by which cancer cells split off from the original, primary tumour and travel to other parts of the body via the blood or lymph systems. This leads to the growth of secondary tumours in places such as the bones, brain, lungs and liver, and it is usually these that end up killing the patient.

"Metastatic disease, therefore, represents a major public health problem, affecting cancer patients and their families, as well as health care systems and the broader economy. Despite this, progress in developing treatments for metastatic disease remains slow," write Prof Sleeman and the second guest editor, Professor Patricia Steeg (chief of the Women's Cancers Section, Laboratory of Molecular Pharmacology at the National Cancer Institute, Bethesda, USA) in their editorial.

In addition to adequate funding, they call for:

* effective translational research for metastatic disease, which will take discoveries made in the laboratory quickly into new and better treatments for cancer patients;

* clinical trials to be designed so that they include information on metastases;

* clinicians and scientists to work more closely together to design clinical trials that assess the development of new metastases.

"In summary, combating metastasis formation and growth is the key to successfully treating cancer," they conclude. "Traditional growth control approaches are inadequate and can even be detrimental in the long term: new therapies built upon a solid understanding of the process of metastatic disease are urgently required. In turn, this demands an increased pre-clinical knowledge base that capitalises on major conceptual advances made in recent years, as well as a rational approach to the design of clinical trials with the inclusion of metastasis as an end-point. Together these observations speak for the necessity of increasingly close interactions between basic and clinical scientists, as well as the enhanced levels of research funding required to alleviate this major clinical problem."

The EJC special issue on metastasis consists of a number of articles looking at the state of current knowledge about the disease and outlining promising areas of research. Prof Steeg said: "We hope that this special issue will highlight the fact that metastasis should be an important consideration during drug development. If more attention was paid to it, we could really improve treatments for cancer patients."

[1] "Cancer metastasis as a therapeutic target" by Jonathan Sleeman and Patricia S. Steeg. European Journal of Cancer. Volume 46, issue 7, pages 1177-1180 (May 2010).

Study finds cancer information on Wikipedia is accurate, but not very readable

PHILADELPHIA - It is a commonly held that information on Wikipedia should not be trusted, since it is written and edited by non-experts without professional oversight. But researchers from the Kimmel Cancer Center at Jefferson have found differently, according to data being presented at the 2010 ASCO Annual Meeting in Chicago. (Abstract #6058)

Reassuringly, they found that cancer information found on a wiki was actually similar in accuracy and depth to the information on a peer-reviewed, patient-oriented cancer web site. There is one caveat, however: they found that the information on the peer-reviewed site was written in plainer English.

Researchers lead by Yaacov Lawrence M.D., assistant professor of Radiation Oncology at Jefferson Medical College of Thomas Jefferson University, compared the cancer information found on Wikipedia with the information found on the patient-oriented section of the National Cancer Institute's Physician Data Query (PDQ), a comprehensive peer-reviewed cancer database.

"There are a vast number of web sites where patients can obtain cancer information," Dr. Lawrence said. "The purpose of this study was to answer one question: Is the cancer information on Wikipedia correct?

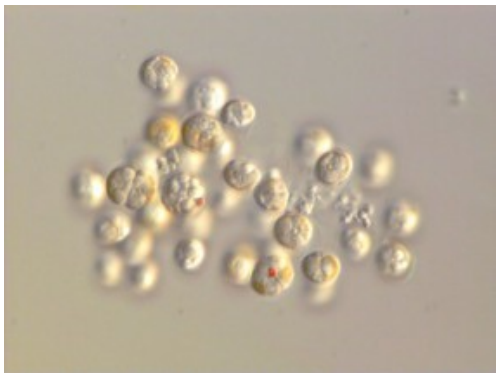
Reassuringly, we found that errors were extremely rare on Wikipedia. But the way information was presented on PDQ is more patient-friendly."

Dr. Lawrence and his colleague Malolan Rajagopalan, a medical student from the University of Pittsburgh, started by choosing ten cancer types and selecting key factual statements for each cancer from standard oncology textbooks. The material covered epidemiology, etiology, symptoms, diagnosis, treatment and controversial topics in cancer care.

Medical student volunteers examined the PDQ and Wikipedia articles against the prepared statements. The web pages were printed out to ensure that each individual looked at the same version of the articles. Standard algorithms were used to calculate readability based upon word and sentence length.

For both web sites, inaccuracies were extremely rare: less than two percent of the information on either site was discordant with that presented in the textbooks. There was no difference between the sites in depth of coverage. Both sites poorly discussed controversial aspects of cancer care. But the PDQ site was notably more readable: whereas PDQ was written at a level suitable for a 9th grader, Wikipedia was written at a level suitable for a college student. This difference was highly statistically significant.

"PDQ's readability is doubtless due to the site's professional editing, whereas Wikipedia's lack of readability may reflect its varied origins and haphazard editing," Dr. Lawrence said. "Overall our results are reassuring: on the one hand Wikipedia appears to be extremely accurate, on the other, the resources invested in the creation and upkeep of the PDQ are clearly justified."



The next step is to repeat the study with cancer patients to truly determine how this difference in readability impacts upon patients' understanding and retention of information, Dr. Lawrence said.

Thymoquinone induced oxidative stress targets highly aggressive prostate cancers

Researchers at the Tulane University School of Medicine, in New Orleans, LA, have demonstrated that thymoquinone (TQ) a major component of black seed oil (Nigella sativa) can suppress the growth of several aggressive prostate cancer (PCa) cell lines, in vitro. Although previous studies have shown the anti-proliferative effects of TQ in different types of cancers, the molecular mechanism of this effect of TQ had not been delineated. Since TQ has a structure similar to ubiquinone, a component of the mitochondrial coenzyme-Q (co-Q) complex, the effect of TQ on free oxygen radical production was investigated. These scientists showed exposure to TQ (20 – 100 □M) caused a rapid induction of reactive oxygen species (ROS) generation in both LNCaP and C4-2B cells. A precipitous decrease in the level of glutathione (GSH) an intracellular small molecule antioxidant was also found to be responsible for the potent anti-cancer effects of TQ which could be inhibited by exogenous addition of N-acetyl cysteine (NAC) a GSH analog. Free oxygen radicals are often used as second messengers for mitogenic signaling in tumor cells where a critical balance in ROS generation and its rapid inactivation by antioxidants, can dictate cell growth or apoptosis. These investigators showed significant increases in several cell death (apoptosis) inducing factors, e.g. GAD45□ and AIF-1, in TQ exposed PCa cells. This study appears in the June 2010 issue of Experimental Biology and Medicine.

Dr. Mondal stated that, "Complementary and alternative medicine (CAM) is becoming very important as an adjunct therapy in cancer patients, both to ameliorate the side effects of chemotherapy as well as to enhance their anti-tumor effects. The low side effect profiles of natural compounds is also an important aspect in their therapeutic utility as an adjunct to anti-tumor therapy. Indeed, in a previous publication (Exp Biol Med; (2009) Apr; 234(4) :442-53) we had shown that at lower concentrations (<5.0 □M) TQ decreases ROS production and increases GSH levels in pancreatic beta-cells, which restored nelfinavir (an anti-HIV agent) induced deleterious effects on these cells. Our current findings suggest that the ROS generating effects of high concentrations of TQ (>20 □M) may be of great advantage towards the development of novel anti-cancer therapeutics, especially against hormone-refractory prostate cancers which are much harder to treat."

The research team led by Dr. Krishna C. Agrawal (posthumously) included Dr. Sandeep Koka, previously a graduate student under Dr. Agrawal, and two other faculty members from Tulane University, Dr. Asim B. Abdel-Mageed and Dr. Debasis Mondal. These investigators successfully tested the hypothesis that TQ induced oxidative stress is responsible for its anti-proliferative effects in prostate cancer cells. Since black seed oil have been used in the middle eastern countries for hundreds of years, the investigators postulated that the active component TQ and possibly the oil itself, can be used effectively, either alone or as an adjunct to chemotherapy, to target highly aggressive prostate cancers.

Dr. Steven R. Goodman, Editor-in-Chief of Experimental Biology and Medicine said "Koka et al have demonstrated that Thymoquinone efficiently killed hormone-dependent and hormone-independent prostate cancer cells. The mechanism appears to be that Thymoquinone induces oxidative stress and suppresses GSH levels. This suggests that oxidative stress may lead to decreased tumor growth and increased cell death in highly aggressive forms of prostate cancer."

"Little brown balls" tie malaria and algae to common ancestor: UBC research

Inconspicuous "little brown balls" in the ocean have helped settle a long-standing debate about the origin of malaria and the algae responsible for toxic red tides, according to a new study by University of British Columbia researchers.

In an article published this week in the Proceedings of the National Academy of Sciences Early Edition, UBC Botany Prof. Patrick Keeling describes the genome of Chromera and its role in definitively linking the evolutionary histories of malaria and dinoflalgellate algae.

Under the microscope, Chromera looks like inconspicuous "little brown balls." **Credit: Patrick Keeling**

"Under the microscope, Chromera looks like boring little brown balls," says Keeling. "In fact, the ocean is full of little brown and green balls and they're often overlooked in favour of more glamorous organisms, but this one has proved to be more interesting than its flashier cousins."

First described in the journal Nature in 2008, Chromera is found as a symbiont inside corals. Although it has a compartment – called a plastid – that carries out photosynthesis like other algae and plants, Chromera is closely related to apicomplexan parasites – including malaria. This discovery raised the possibility that Chromera may be a "missing link" between the two.

Now Keeling, along with PhD candidate Jan Janouskovec, postdoctoral fellow Ales Horak and collaborators from the Czech Republic, has sequenced the plastid genome of Chromera and found features that were passed down to both apicomplexan and dinoflagellate plastids, linking the two lineages.

"These tiny organisms have a huge impact on humanity in very different ways," says Keeling. "The tool used by dinoflagellates and Chromera to do good – symbiosis with corals – at some point became an infection mechanism for apicomplexans like malaria to infect healthy cells.

"Resolving their evolutionary origins not only settles a long-standing scientific debate but could ultimately provide crucial information for tackling diseases and environmental concerns."

A third of young girls get HPV vaccine to prevent cervical cancer

By Jim Dryden

The HPV vaccine prevents four strains of the sexually transmitted human papillomavirus (HPV) that are linked to cervical cancer. Only about one in three young women has received the human papillomavirus (HPV) vaccine to help prevent cervical cancer, according to a new report from researchers at Washington University School of Medicine in St. Louis.

The findings are published in the May issue of the American Journal of Preventive Medicine.

The HPV vaccine prevents four strains of the sexually transmitted human papillomavirus, two of which are found in about 70 percent of all women with cervical cancer. Both the American Cancer Society and the Advisory Committee on Immunization Practices recommend that women and girls receive the vaccine, but the new data shows that only 34 percent of girls ages 13 to 17 were vaccinated in the six states surveyed.

"The good news is that the vaccination rate is increasing," says first author Sandi L. Pruitt, PhD. "The bad news is this is just the first dose of a three-dose vaccine."

Pruitt, a postdoctoral research associate in Washington University's Division of Health Behavior Research, tracked rates of HPV vaccination in Delaware, New York, Oklahoma, Pennsylvania, Texas and West Virginia. She and senior investigator Mario Schootman, PhD, analyzed data from 1,709 girls in 274 counties of the six states in this study. The information came from a national telephone survey called the Behavioral Risk Factor Surveillance System (BRFSS).

"This was the first year the survey asked about HPV vaccination," Pruitt says. "That portion of the survey was optional, and only six states opted to use it. Ideally, we'd like to know what's happening in more states, but these six states represent a good cross-section of urban and rural, rich and poor, and they do include girls from racial and ethnic groups that closely mirror the rest of the country."

More than 70 percent of the girls in this study were white, and almost 75 percent had health insurance. Girls living in states with more poverty were less likely to get the HPV vaccine, but higher poverty rates in the individual counties within those states and lower family income levels actually made it more likely a girl would be vaccinated. Pruitt says those seemingly contradictory findings may be explained in part by the way in which funding for vaccines is allocated.

“For the neediest children, the United States has a publicly funded vaccination system, but each state sets its own guidelines for who is eligible to receive free vaccines,” she says. “Individual states set different guidelines for providing vaccines to those with no insurance versus those who may be underinsured. So girls from poorer counties may be more likely to qualify for a free vaccine, whereas those states with more poverty may not have adequate funding to provide it or may be less likely to fill in gaps for those who may not have enough private insurance coverage to pay for it."

Pruitt says it’s important that poorer, less-educated African-American and Hispanic girls and women have access to the HPV vaccine because women from those groups have higher rates of cervical cancer. This study found women from those racial and ethnic backgrounds are just as likely as white girls to receive the initial dose of the vaccine.

“We didn’t find a racial disparity in terms of vaccination,” she says. “That’s very important because the highest burden of cervical cancer is among women of color, especially Hispanic women and those who live along the U.S.-Mexico border. There’s a huge epidemic of cervical cancer among those women, so the fact that we didn’t find racial and ethnic disparities is a good thing.”

Last year, an estimated 11,000 cases of cervical cancer were diagnosed in the United States, and more than 4,000 of those women will eventually die from the disease.

Girls whose parents had more education also were more likely to get the vaccine, but surprisingly, rates of vaccination declined slightly as family income levels rose. Pruitt says that may be due to the rising number of wealthier parents choosing not to vaccinate their children for anything, but it’s unclear from the data what motivated people to choose either to vaccinate or not.

The HPV vaccine, known as Gardasil, was controversial when it was approved by the U.S. Food and Drug Administration in 2006 because some feared that vaccinating girls as young as age 11 against a sexually transmitted virus may encourage them to become sexually active or engage in riskier behaviors. But no evidence to date suggests receiving the HPV vaccine encourages earlier sexual initiation or riskier sexual behaviors.

The vaccine is now approved for both boys and girls, beginning at age 11 to 12. The HPV vaccine also can be given to adolescents and young adults as old as 26. Pruitt says as more states report on the HPV vaccine, it will be possible to learn whether to anticipate future reductions in the incidence of cervical cancer.

Pruitt SL, Schootman M, Geographic disparity, area poverty and human papillomavirus vaccination. American Journal of Preventive Medicine, vol. 30 (5), pp. 525-533. May 2010.

The study was funded in part by Pruitt’s postdoctoral fellowship through the Alvin J. Siteman Cancer Center’s Prevention and Control Program.

Scripps research scientists determine structure of immune molecule that counteracts HIV strains

The findings advance the effort to develop an AIDS vaccine

LA JOLLA, CA – In findings that contribute to efforts to design an AIDS vaccine, a team led by Scripps Research Institute scientists has determined the structure of an immune system antibody molecule that effectively acts against most strains of human immunodeficiency virus (HIV), the virus that causes AIDS. The study, which is being published in an advance, online issue of the journal Proceedings of the National Academy of Sciences (PNAS) during the week of June 1, 2010, illuminates an unusual human antibody called PG16.

"This study advances the overall goal of how to design an HIV vaccine," said Scripps Research Professor Ian Wilson, who led the team with Dennis Burton, Scripps Research professor and scientific director of the International AIDS Vaccine Initiative (IAVI) Neutralizing Antibody Center at Scripps Research. "This antibody is highly effective in neutralizing HIV-1 and has evolved novel features to combat the virus."

The Problem with HIV

According to the World Health Organization's latest statistics, around 33 million people are living with HIV worldwide. During 2008 alone, more than 2 million men, women, and children succumbed to the disease and an estimated 2.7 million were infected with HIV. One of the most compelling medical challenges today is to develop a vaccine that will provide complete protection to someone who is later exposed to this virus.

HIV causes AIDS by binding to, entering, and ultimately leading to the death of T helper cells, which are immune cells that are necessary to fight off infections by common bacteria and other pathogens. As HIV depletes the body of T helper cells, common pathogens can become potentially lethal.

An effective HIV vaccine would induce antibodies (specialized immune system molecules) against the virus prior to exposure to the virus. Also called immunoglobulins, these antibodies would circulate through the blood, and track down and kill the virus.

Most of the antibodies that the body produces to fight HIV, however, are ineffective. The surface of the virus is cloaked with sugar molecules that prevent antibodies from slipping in and blocking the proteins the virus uses to latch onto a cell and infect it. To make matters more complicated, HIV is constantly mutating, so there are multiple HIV strains that antibodies elicited in any vaccine must be able to sense and destroy.

Nonetheless, while rare, broadly neutralizing antibodies against HIV do exist. Last year, a team of scientists from IAVI, Scripps Research, Theraclone Sciences, and Monogram Biosciences published research from a systematic search for such antibodies among 2,000 volunteers. The study revealed two powerful new broadly neutralizing antibodies against HIV-PG9 and PG16, isolated from a volunteer in Africa.

"Hammerhead" Structure

Once the broadly neutralizing antibodies were discovered, the next challenge was to figure out how they worked. To shed light on this question, in the current study members of the Wilson lab turned to x-ray crystallography, a technique that can solve structures to exquisitely high resolution.

In x-ray crystallography, scientists manipulate a protein or some other molecule so that a crystal forms. This crystal is then placed in front of a beam of x-rays, which diffract when they strike the atoms in the crystal. Based on the pattern of diffraction, scientists can reconstruct the shape of the original molecule. The scientists succeeded in forming crystals of the active part of the PG16 antibody, and in reconstructing the structure from the data - with some surprising results.

"The antibody has a novel and really interesting subdomain that hasn't been seen before," said Research Associate Rob Pejchal, who is first author of the paper. "This subdomain, which we found plays a major role in the recognition and neutralization of HIV, has a different kind of antibody architecture. We like to call it the 'hammerhead' because it resembles the head of a hammerhead shark. It reaches out from the main part of the antibody and it has two flat ends on top."

Co-author Laura Walker, a graduate student in the Scripps Research Kellogg School of Science and Technology, added, "This hypervariable loop (CDR3) that forms the novel subdomain is also unusually long for an antibody. Almost all of the antibodies we know to be broadly neutralizing against HIV have one unusual feature or another."

Pejchal notes that the study also revealed that PG16 was sulfated, suggesting possible mechanisms of action not usually seen in antibodies this effective against HIV.

While the scientists were unsuccessful so far in crystallizing PG16's sister molecule PG9, they were able to glean insight into its action from biochemical studies using both molecules. By switching a small (seven-amino acid) segment of the CDR3 subdomain of PG9 for a similar segment from PG16, the team changed the subset of HIV isolates neutralized by the antibody. This confirmed the loop in question was the "business end" of the antibody and suggested that it might be possible to create other interesting variants of the antibody by manipulating this region.

Seth Berkley, president and CEO of IAVI, which funded the study with the National Institute of Allergy and Infectious Diseases (NIAID) of the National Institute of Health (NIH), noted, "These studies of PG16 have taught us a lot about how these neutralizing antibodies work. I am particularly excited by the possibilities these findings open up for AIDS vaccine development, since the breadth and potency of HIV neutralization achieved by PG16 is what we'd like to see in the antibodies elicited by a vaccine. IAVI and its researchers will continue to support the application of these findings to the design of novel immunogens against HIV. We hope that we will be able to translate the insights gleaned from this study into the design of a promising AIDS vaccine candidate."

In addition to Wilson, Burton, Pejchal, and Walker, authors of the paper, "Crystal structure and functional studies of broadly reactive antibody PG16 reveal a novel H3 subdomain that mediates potent neutralization of HIV-1," are Robyn Stanfield and Pascal Poignard of Scripps Research and IAVI, Wayne Koff and Sanjay Phogat of IAVI New York. This study was supported by IAVI, NIAID, the Skaggs Institute of the Scripps Research Institute, and the Ragon Institute.

Green machine: Cars could run on sunlight and CO2

* 14:46 02 June 2010 **by Helen Knight**

Greenhouse-gas-pumping cars are, let's face it, never going to be green. But innovative sunlight-powered fuel production techniques could inch motor vehicles towards carbon neutrality.

Experimental solar-powered reactors have shown they can create the building blocks for synthetic liquid fuels. They've got a way to go, but these projects could take a big chunk out of net carbon dioxide emissions without the need for major changes to either vehicles or refuelling infrastructure.

A team at Sandia National Laboratories in Albuquerque, New Mexico, is developing a technique to create some of the ingredients for synthetic fuels from carbon-containing gases. Their cerium-oxide-based system can convert CO2 into carbon monoxide, and can also turn water into hydrogen.

Heliocentric orbits

The machine, called the Counter Rotating Ring Receiver Reactor Recuperator (CR5) consists of two chambers separated by rotating rings of cerium oxide. As the rings spin, a large parabolic mirror concentrates solar energy onto one side, heating it to 1500 °C and causing the cerium oxide there to release oxygen gas into one of the chambers, whence it is pumped away.

As the ring rotates further it takes the deoxygenated ring off the heat and allows it to cool before it swings round to the other chamber. CO2 is pumped into the second chamber, causing the cooled cerium to steal back an oxygen molecule, producing carbon monoxide and cerium oxide.

The process also works with water instead of CO2, with the reaction this time producing hydrogen.

Experiments late last year with a 14-ring reactor have demonstrated that the process can produce carbon monoxide, although the failure of certain parts meant the device did not operate continuously for more than a few seconds at a time.

Bigger and better

The team is now working to improve reliability while building a bigger reactor with 28 rotating rings. That will enable it to process more CO2 and water, says James Miller, a combustion chemist at Sandia.

Once the reactor is producing a steady stream of hydrogen and carbon monoxide, the gases can be converted into a synthetic liquid fuel using a technique such as the Fischer-Tropsch process developed in Germany in the 1920s. In this process the two gases are heated in the presence of an iron-based catalyst to produce hydrocarbon fuels.

Initially, the team plan to use CO2 captured from power-plant exhaust flues to produce their synthetic fuel.

Ultimately, however, they hope to use CO2 extracted directly from the air, although they are not developing their own carbon-capture technique to do so. "That is a huge challenge in itself, and we opted to focus on one hard problem at a time," says Miller.

Cunning with calcium

Such challenges haven't deterred Aldo Steinfeld and his team at the Swiss Federal Institute of Technology, Zurich. They have a system which is already sucking CO2 out of the atmosphere to feed a synthetic fuel process.

The team's reactor again uses a large parabolic mirror to concentrate solar heat onto a chamber – this time containing calcium oxide. Once it reaches 400 °C, air is pumped into the chamber, and the heat causes the calcium oxide to react with CO2 to form calcium carbonate.

Next, the calcium carbonate is then heated again, this time to 800 °C, at which point it releases a pure stream of CO2 and reverts back to calcium oxide.

This stream of CO2 is piped into a second reactor. Here, a solar concentrator is used to heat zinc oxide to 1700 °C, causing it to release oxygen molecules, leaving metallic zinc. The temperature is then lowered and CO2 and steam are pumped in, which react with the pure zinc to form syngas, a mixture of hydrogen and carbon monoxide, – and zinc oxide once again. The team has previously experimented with a 10-kilowatt prototype, and is planning to test a 100-kilowatt version early next year.

Finding ways to use the sun's energy to create fuel should be one of the highest-priority areas for clean-energy technology research, says Ken Caldeira of the Carnegie Institution of Washington at Stanford University in California. "This area holds out the promise for technologies that can produce large amounts of carbon-neutral power at affordable prices, which can be used where and when that power is needed," he says.

"It is one of the few technology areas that could truly revolutionise our energy future."

Retirees in Mexico cut off, study says

They live in enclaves with little contact with home or with the Mexican mainstream

Montreal, Quebec – Baby boomers retiring in Mexico may find it's cheaper to live there than in Canada or the U.S., however, a study suggests retirees are often isolated both from their families back home – and from the mainstream of Mexican life. The study, by Jesse O'Brien of the University of Calgary, will be presented at the 2010 Congress for the Humanities and Social Sciences taking place at Montreal's Concordia University. O'Brien's study looked at how Canadian and American retirees in a small, unnamed town in Mexico's Yucatan Peninsula have adapted to life as expatriates.

"It's an extremely important topic as baby boomers come of retirement age," says O'Brien, adding that many people will want to retire somewhere warm and cheap. He adds that living abroad will become especially attractive if the value of people's pension plans drops. "Moving to a cheaper place like Mexico is going to become a viable option for some people," he says.

But moving to a new country – even if it's an inexpensive tropical paradise – is never easy, and O'Brien says people go through several phases as they adapt to their new life. They start out, he says, by thinking they're going to be living like kings in paradise; eventuality, reality sets in.

For most expatriates, reality is that they end up living in a pleasant but isolated enclave.

O'Brien says the expats in the community he studied had essentially recreated a North American lifestyle in one small corner of the Yucatan. "They are living exactly the same life they'd live at home, but in a different location," he says. Most "absolutely love" the life, but his study showed some problems.

The first, he says, is that the expat community is negatively affecting the local population "even though they don't notice it themselves." For example, he said the expats often make no attempt to learn Spanish, and expect to be dealt with in English. And their relationships with the locals are based on service, not friendship. As a result, says O'Brien, the expats' relationship to the locals is often condescending.

He also explains that expats have surprisingly little contact with their families back home. "It's kind of shocking," he says, adding that most people he talked to report that missing family members is the most difficult part of living abroad. Part of that may be due the fact that the community he studied was not on the tourist circuit, and therefore not as easy to get to as some of the cities or resorts.

On the plus side, O'Brien says the fact of living in an enclave and being cut off from family results in the creation of unusually strong community ties. People who wouldn't normally meet back home are thrown together, and because of the circumstances, friendships develop.

O'Brien notes the case, for example, of a burly former biker who became best of friends with an elderly gay man who had moved to Mexico to start a bed and breakfast. The fact of being North Americans together in Mexico often trumps other differences, he says.

New medics in death spike

Study suggests inexperienced medical staff make fatal medication errors

Are new medical residents a threat to patients? According to Dr. David Phillips and Gwendolyn Barker from the University of California, San Diego in the US, fatal medication errors peak in July in teaching hospitals in particular, which coincides with the yearly influx of new medical residents who are given increased responsibility for patient care. Their findings1 are published in the Journal of General Internal Medicine², published by Springer.

Phillips and Barker looked at the relationship between inexperience and medical error by focusing on changes in the number of medication mistakes (involving accidental overdose of a drug, wrong drug given or taken in error, drug taken inadvertently, and accidents in the use of drugs in medical and surgical procedures) in July, when thousands begin medical residencies. They tested the hypothesis that the arrival of new medical residents in July is associated with increased fatal medication errors.

They examined 244,388 US death certificates focusing on fatal medication errors as the recorded primary cause of death, issued between 1979 and 2006. They compared the observed number of deaths in July with the number of expected events in a given month for a given year. They also looked at whether there were any differences between deaths in and out of hospital in July as well as between counties with and without teaching hospitals.

The authors found that inside medical institutions, fatal medication errors spiked in July and in no other month. This July peak was visible only in counties with teaching hospitals. In these counties, the number of July deaths from medication errors was 10 percent above the expected level. No similar link was observed for other causes of death or for deaths outside hospitals.

The authors highlight several implications for medical policy. “Our findings provide fresh evidence for 1) re-evaluating responsibilities assigned to new residents; 2) increasing supervision of new residents; 3) increasing education concerned with medication safety. Incorporating these changes might reduce both fatal and non-fatal medication errors and thereby reduce the substantial costs associated with these errors.”

1. Phillips DP & Barker GEC (2010). A July spike in fatal medication errors: a possible effect of new medical residents. Journal of General Internal Medicine; DOI 10.1007/s11606-010-1356-3

Prompt gallbladder removal in elderly associated with increased survival, lower costs

New research findings in Journal of the American College of Surgeons show patients not treated during initial hospitalization required re-admission within 2 years

CHICAGO – New research findings published in the May issue of the Journal of the American College of Surgeons indicate that delaying cholecystectomy, the surgical removal of the gallbladder, in elderly patients with sudden inflammation of the organ often results in increased costs, morbidity and mortality.

Gallstone disease is the most costly digestive disease in the United States, with approximately 20 million people having the disorder. Annually, gallstone disease leads to more than one million hospitalizations, 700,000

operative procedures, and a cost of $5 billion. Furthermore, the prevalence of gallstones increases with age: 15 percent of men and 24 percent of women will have gallstones by age 70. As well, complications related to gallstones are more common in elderly patients, with the most common being acute cholecystitis, a sudden inflammation of the gallbladder, which can cause abdominal pain, nausea, vomiting, and fever.

"This is the first systematic study on how adherence to the recommendations for management of acute cholecystitis affects long-term outcomes and resource use," said Taylor S. Riall, MD, PhD, FACS, associate professor of surgery at the University of Texas Medical Branch in Galveston. "Our study helped identify both patients who are at high risk for not receiving definitive surgical treatment with cholecystectomy and those that are at high risk for being readmitted if they do not have cholecystectomy."

Researchers used a five percent sample of national Medicare claims data from 1996 to 2005 to identify a cohort of patients admitted to an acute care hospital with acute cholecystitis. By choosing patients from this period, researchers were able to evaluate comorbidities in the year before initial hospitalization and then follow all patients two years after their initial hospitalization for gallstone complications.

Between 1996 and 2005, 29,818 Medicare beneficiaries were admitted to acute care facilities for a first episode of acute cholecystitis. Of these patients, 75 percent (n=22,367) underwent cholecystectomy. The inpatient mortality rate was 2.7 percent in patients who did not undergo cholecystectomy, and 2.1 percent in patients who did ($p = 0.001$).

For the 25 percent of patients (n=7,451) who did not undergo cholecystectomy upon first hospitalization, 38 percent required gallstone related re-admission over the subsequent two years, compared to only four percent in patients who did undergo the surgery ($P< 0.0001$). Twenty-seven percent of patients who did not undergo definitive therapy (gallbladder removal) required subsequent cholecystectomy, often not performed electively, but associated with acute care re-admission. The gallstone-related readmissions were expensive for Medicare, leading to approximately $14,000 in total charges and greater than $7,000 in Medicare payments per readmission.

Additionally, patients who did not undergo cholecystectomy during initial hospitalization were 56 percent more likely to die two years after hospitalization discharge versus those who received immediate treatment (HR 1.56, 95 percent CI 1.47 to 1.65), even after controlling for patient demographics and comorbidities.

Eyes of cattle may become new windows to detect mad cow disease

The eyes may or may not be windows to the soul, as the old adage goes, but scientists are reporting evidence that a peek into the eyes of cattle may become the basis for a long-sought test to detect infection with the agent that causes Mad Cow Disease. That test could help prevent the disease from spreading in the food supply. A study on using the tell-tale glow given off by eyes infected with the Mad Cow agent appears in ACS' semi-monthly journal Analytical Chemistry.

Jacob Petrich and colleagues note that the human form of Mad Cow Disease is linked to eating beef from animals infected with abnormal proteins called prions implicated in a range of brain diseases. Scientists are trying to develop tests to detect infected cattle before they enter the food supply. Past studies suggest that chemical changes in an animal's retina, the light sensitive nerve tissue in the back of the eye, may provide a basis for detecting prion diseases.

The scientists showed that retinas of sheep infected with scrapie, a disease similar to Mad Cow Disease, emit a characteristic glow when examined with a beam of light from a special instrument. They suggest that eye tests based on the finding could become important in the future for fast, inexpensive diagnosis of prion diseases and other neurological diseases.

DOWNLOAD FULL TEXT ARTICLE "Fluorescence Spectroscopy of the Retina for Diagnosis of Transmissible Spongiform Encephalopathies"

Apologies may fuel settlement of legal disputes, study says

CHAMPAIGN, Ill. – Apologies may be good for more than just the soul, according to research by a University of Illinois professor of law and of psychology.

Jennifer Robbennolt says her studies show that apologies can potentially help resolve legal disputes ranging from injury cases to wrongful firings, giving wounded parties a sense of justice and satisfaction that promotes settlements and trims demands for damages. “Conventional wisdom has been to avoid apologies because they amount to an admission of guilt that can be damaging to defendants in court,” she said. “But the studies suggest apologies can actually play a positive role in settling legal cases.”

Robbennolt surveyed more than 550 people, gauging their reaction to apologies offered during settlement negotiations in a hypothetical injury case. She says apologies generally reduced financial demands, increasing prospects for an agreement.

But the nature of the apology matters, according to a summary of her findings that will appear in Court Review, a publication of the American Judges Association. Apologies that accept fault have more impact than apologies that merely express sympathy, but take no responsibility

Robbennolt says apologies that accept blame can be powerful psychologically, giving plaintiffs a sense of closure and accountability that makes them less angry and more willing to forgive.

"The apology fulfills some of the goals that triggered the suit, such as a need for respect, to assign responsibility and to get a sense that what happened won't happen again," she said. "So receiving an apology can reduce financial aspirations and make it possible for parties to enter into discussions about settlement."

For defendants, apologies can reduce legal costs as well as damages because cases may settle more quickly, said Robbennolt, who has studied the legal implications of apologies for a decade.

While plaintiffs respond favorably to apologies, another study by Robbennolt shows that lawyers react more in line with traditional thinking – that apologies are an admission of guilt that can be used to leverage bigger settlements.

She says lawyers may view apologies differently because of their third-party view of the dispute, or because their training provides a perspective on the legal value of apologies that lay people fail to appreciate.

"Another possibility is the way in which the financial incentives of attorneys and clients can diverge," Robbennolt said. "Settling cases quickly can mean lower fees for attorneys paid on an hourly basis. Or if the attorney is taking a contingency fee, that fee is smaller if cases are settled for less. As some lawyers say, you can't take one-third of an apology."

How those diverging views of apologies play out when lawyers and clients mull settlements is unknown, she said, but could ensure a broad analysis of pros and cons that benefits clients.

"The findings tell lawyers that clients seem to value apologies in ways that lawyers don't, so they need to be sensitive to those differences," Robbennolt said. "At the same time, clients can benefit from getting advice from someone who can help them fully understand all of the legal implications so they can decide exactly how to respond to an apology." She says courts are increasingly recognizing the potential for apologies. Statutes that make at least some apologetic statements inadmissible at trial are now on the books in 35 states, most enacted in the last decade.

Because laws are relatively new, Robbennolt says, more research is needed to gauge the impact of apologies, such as how they sway jury awards, how those jury awards influence the offering of apologies and whether early apologies can ward off lawsuits entirely. "There's still a lot to learn, but based on the data we do have, it appears apologies can be a viable strategy," she said.

Robbennolt says apologies could prove useful in a host of cases, from medical malpractice and personal injury cases to employment, divorce and custody disputes.

Whether apologies are a good defense strategy depends on the case, she said. Cases where fault is clear-cut may offer the most potential, but even then defendants need to weigh the possible benefits against the risk that apologies could backfire and increase liability.

"It seems relatively clear that plaintiffs want apologies and it also seems that defendants often want to apologize," Robbennolt said. "But there's always a chance that an apology could make things worse. One of the reasons this is such an interesting problem is because that looms so large in the background."

First paper 'dipstick' test for determining blood type

Scientists are reporting development of the first "dipstick" test for instantly determining a person's blood type at a cost of just a few pennies. Their study on the test, which involves placing a drop of blood on a specially treated paper strip, appears in ACS' semi-monthly journal Analytical Chemistry, where the authors say it could be a boon to health care in developing countries. The test also could be useful in veterinary medicine, for typing animals' blood in the field, they note.

Gil Garnier and colleagues explain that determining a patient's blood type is critical for successful blood transfusions, which save millions of lives each year worldwide. There are four main blood types: A, B, AB, and O. Use of the wrong blood type in a patient can be fatal. Current methods for determining blood type require the use of sophisticated instruments that are not available in many poor parts of the world. An inexpensive portable test could solve that problem.

The scientists describe development of prototype paper test strips impregnated with antibodies to the antigens on red blood cells that determine blood type. In lab tests using blood samples from human volunteers, the scientists showed that a drop of blood placed on the strip caused a color change that indicated blood type. The results were as accurate as conventional blood typing. "The paper diagnostics manufacturing cost is a few pennies per test and can promote health in developing countries," the report notes.

DOWNLOAD FULL TEXT ARTICLE "Paper Diagnostic for Instantaneous Blood Typing"

Out of the shadows: our unknown immune system

* 02 June 2010 **by Linda Geddes**, Baltimore

DELIBERATE infection with a blood-sucking worm seems an odd way to treat multiple sclerosis (MS). Yet more surprising is what this experiment may tell us about a "shadow" branch of our immune system. Completely unknown until recently, this is pointing to new ways of treating a host of complex diseases.

A couple of recent studies suggest that parasitic infection dampens inflammation and reduces relapse rates in people with MS, in which the body's own cells are attacked by the immune system as if they were "foreign". So Cris Constantinescu at the University of Nottingham, UK, and his colleagues plan to place tiny hookworm larvae on the skin of 32 people with MS, allowing the worms to burrow down and infect the volunteers.

The team won't just be looking for a reduction in volunteers' symptoms though. They will also be watching to see if the parasites boost numbers of a set of newly discovered immune cells, known as regulatory B cells (B regs).

B regs are sending shockwaves through the immunology community. Until recently it was assumed that B cells' main role was to make antibodies at the behest of T-cells. These master regulators enhance or suppress an immune attack depending on the situation, as well as carrying out immune attacks in their own right (See diagram). It was therefore thought that T-cells are at fault when the body attacks itself in autoimmune diseases, such as MS, asthma, diabetes and rheumatoid arthritis - and when it fails to root out disease agents, such as cancer cells.

Now it seems that T-cells are not the immune system's only regulators. Experiments suggest that under some circumstances, B regs regulate T-cells, providing a shadow role for B cells.

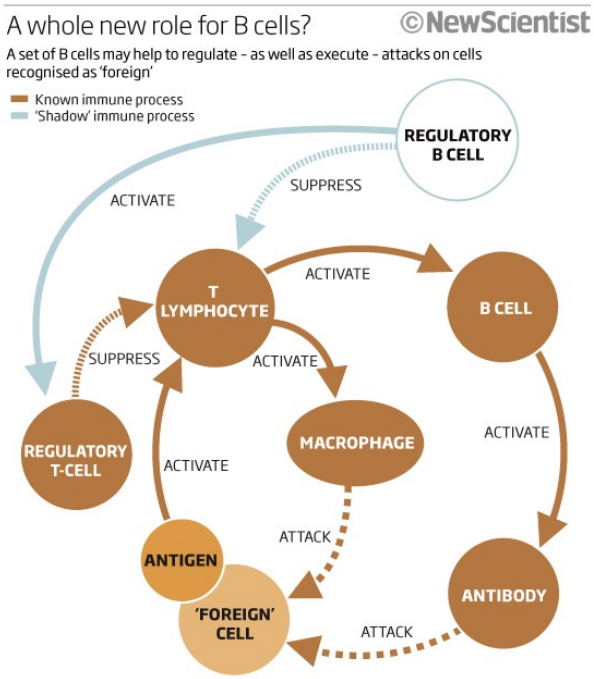
"Diseases we've traditionally thought to be mediated by T-cells might actually be regulated by B cells," says Kevan Herold of Columbia University in New York. Boosting B regs might therefore provide new opportunities for treating autoimmune diseases, while inhibiting B regs it could be a new way to treat cancer.

Animal studies are already suggesting that the approach might work in one type of asthma. In a study published in May, Padraic Fallon of Trinity College, Dublin, and his colleagues isolated B regs from the spleens of mice infected with the parasite Schistosoma mansoni. When they transferred the B cells into mice primed to develop asthma, this either reduced their symptoms or stopped them developing asthma in the first place (The Journal of Allergy and Clinical Immunology, DOI: 10.1016/j.jaci.2010.01.018).

"These are major regulators of the immune system in allergic disease," Fallon concludes. B regs seemed to work by releasing a chemical called IL-10 into the lungs, drawing in regulatory T- cells (T regs), which in turn inhibited immune attacks.

IL-10 played a similar role in a subset of B regs, which Thomas Tedder at Duke University School of Medicine in Durham, North Carolina, calls B10 cells. His team found that transferring these cells into mice with a disease similar to multiple sclerosis reduced the severity of disease.

Tedder has also identified similar cells in humans. "We can stimulate them and we can isolate them, but they're fairly rare," he says. He presented both findings in May at the annual American Association of Immunologists meeting in Baltimore, Maryland.



The race is now on to identify drugs that might boost B regs in people with autoimmune diseases or suppress them in people who have cancer.

One clue that such an approach might work comes from studies of rituximab, which kills B cells. First prescribed for the treatment of B cell lymphoma, a type of cancer, the drug has also reduced symptoms in people with diabetes, MS and rheumatoid arthritis. Rituximab most likely knocked out all the cells to start with, and then, for some reason only the B regs grew back, which helped suppress autoimmunity, suggests Frances Lund of the University of Rochester Medical Center in New York (Nature Reviews Immunology, DOI: 10.1038/nri2729).

In individuals with cancer, however, it might be desirable to suppress B regs. Preliminary evidence suggests that as well as keeping autoimmunity in check, B regs also help dampen the immune system's natural ability to recognise and destroy tumours.

Tedder's team has already created antibodies that can deplete B10 cells - but not other B cells - in mice, and says he has similar antibodies that may selectively deplete human B10 cells - although he hasn't yet tested them in people.

Arya Biragyn of the US National Institute of Aging, and his colleagues, also announced at the Baltimore meeting that they have identified a separate set of B regs that cancer seems to recruit in order to avoid detection by the immune system. Destroying these cells might make cancer immunotherapies work better.

"Even if you transiently wipe out B cells during immunotherapy, this should give you very potent anti-tumour responses against hidden tumour cells," Biragyn says.

Working out how parasitic worms trigger B reg activity might suggest additional ways to do this - and to boost B regs. Indeed, Fallon has identified several molecules released by parasitic worms that seem to trigger B regs.

Until such drugs are developed, parasites might be the best way to boost B regs. Severe hookworm infection can cause malnutrition, internal bleeding and anaemia, but in a mild and controlled infection, the dangers are minimal, says Constantinescu, though there may be some itchiness as the worms go through the skin.

Watch the 'clock' in our immune cells

THE discovery of a "shadow" set of immune processes suggests new ways to fight disease. So does evidence that immune cells have circadian clocks, making them more active at certain times of the day.

The majority of asthma attacks occur at night or in the early morning, while people with rheumatoid arthritis, an inflammatory disease, report more joint pain and stiffness in the early morning. To see whether this is because immune cells are governed by circadian rhythms, Xiaojia Wang at the Brody School of Medicine in Greenville, North Carolina, and her colleagues turned to mast cells, which help drive allergies, asthma and anaphylaxis, a potentially fatal allergic response, by releasing chemicals that boost inflammation.

They found that five "clock genes", known to control the rhythmic switching of genes in non-immune cells, were also expressed in a rhythmic pattern in mast cells taken from mice, as was the receptor for a molecule key to activating mast cells in response to allergens. The results were presented in May at a meeting of the American Association of Immunologists in Baltimore, Maryland.

A circadian clock also seems to operate in macrophages - immune cells that engulf pathogens and drive inflammation. Achim Kramer at the Institute for Immunoimaging in Berlin, Germany, and his colleagues have shown that around 8 per cent of mouse macrophage genes are under the control of this clock (Proceedings of the National Academy of Sciences, DOI: 10.1073/pnas.0906361106).

If human immune cells have similar clocks, drugs against immune disorders could be given at the times when their target is most available, a strategy known as chronotherapy.

Shape-shifting islands defy sea-level rise

* 02 June 2010 **by Wendy Zukerman**

AGAINST all the odds, a number of shape-shifting islands in the middle of the Pacific Ocean are standing up to the effects of climate change.

For years, people have warned that the smallest nations on the planet - island states that barely rise out of the ocean - face being wiped off the map by rising sea levels. Now the first analysis of the data broadly suggests the opposite: most have remained stable over the last 60 years, while some have even grown.

Paul Kench at the University of Auckland in New Zealand and Arthur Webb at the South Pacific Applied Geoscience Commission in Fiji used historical aerial photos and high-resolution satellite images to study changes in the land surface of 27 Pacific islands over the last 60 years. During that time, local sea levels have risen by 120 millimetres, or 2 millimetres per year on average.

Despite this, Kench and Webb found that just four islands have diminished in size since the 1950s. The area of the remaining 23 has either stayed the same or grown (Global and Planetary Change, DOI: 10.1016/j.gloplacha.2010.05.003).

Webb says the trend is explained by the islands' composition. Unlike the sandbars of the eastern US coast, low-lying Pacific islands are made of coral debris. This is eroded from the reefs that typically circle the islands and pushed up onto the islands by winds, waves and currents. Because the corals are alive, they provide a continuous supply of material. "Atolls are composed of once-living material," says Webb, "so you have a continual growth." Causeways and other structures linking islands can boost growth by trapping sediment that would otherwise get lost to the ocean.

All this means the islands respond to changing weather and climate. For instance, when hurricane Bebe hit Tuvalu in 1972 it deposited 140 hectares of sedimentary debris onto the eastern reef, increasing the area of the main island by 10 per cent.

Kench says that while the 27 islands in his study are just a small portion of the thousands of low-lying Pacific islands, it shows that they are naturally resilient to rising sea levels. "It has been thought that as the sea

level goes up, islands will sit there and drown," he says. "But they won't. The sea level will go up and the island will start responding."

John Hunter, an oceanographer at the University of Tasmania in Australia, says the study is solid, and good news for those preparing evacuations. The shifting shape of the islands presents a challenge, however. Even on islands where the total land mass is stable or grows, one area may be eroded while another is being added to. It's not possible to simply move people living in highly urbanised areas to new land, says Naomi Biribo of the University of Wollongong in New South Wales, Australia.

Webb and Kench warn that while the islands are coping for now, any acceleration in the rate of sea-level rise could overtake the sediment build up. Calculating how fast sea levels will rise over the coming decades is uncertain science, and no one knows how fast the islands can grow.

Barry Brook, a climate scientist at the University of Adelaide in Australia and a supporter of the 350 campaign - which calls for the most stringent global emissions targets in the hope of saving low-lying states from sea-level rise - points out that sea-level rise is already accelerating. But, while he was initially surprised by the findings, he agrees with Webb and Kench's analysis. "It does suggest that islands have been able to adapt to sea-level rises," he says. And Biribo, who lives on the Pacific island of Kiribati, says: "It gives me that sense that we can still live on this island."

Good news, but the warnings stand

At its highest point, Tuvalu stands just 4.5 metres out of the Pacific. It is widely predicted to be one of the first islands to drown in the rising seas caused by global warming. Yet Arthur Webb and Paul Kench found that seven islands in one of its nine atolls have spread by more than 3 per cent on average since the 1950s. One island, Funamanu, gained 0.44 hectares, or nearly 30 per cent of its previous area.

Similar trends were observed in the neighbouring Republic of Kiribati. The three major urbanised islands in the republic - Betio, Bairiki and Nanikai - increased by 30 per cent (36 hectares), 16.3 per cent (5.8 hectares) and 12.5 per cent (0.8 hectares), respectively.

Yet warnings about rising sea levels must still be taken seriously. Earlier this year, people living on the low-lying Carteret Islands, part of Papua New Guinea, had to relocate. Kench says anecdotal reports that the islands have been submerged are "incorrect", saying that instead erosion has changed the shape of the islands, forcing people to move.

Dogs can potentially sniff out prostate cancer, French researchers say

Man's best friend may cement his position if early results from French researchers can be replicated. A team of researchers from Tenon Hospital in Paris reported Tuesday at a San Francisco meeting of the American Urological Association that dogs can be trained to detect the characteristic odor of unique chemicals released into urine by prostate tumors, setting the stage for a new way to identify men who are most at risk from the cancer.

If developed, the test might be more effective than the PSA test now used because it would have fewer false positives.

As surprising as the idea might sound, other researchers have already been studying the use of dogs to detect cancers of the breast, lung and bladder. Many tumors release characteristic chemicals that can be identified by the exquisitely sensitive canine nose. Lung cancer cells, for example, can release such chemicals into the air of the lungs, and they can then be detected on the victim's breath.

Dr. Jean-Nicolas Cornu of Tenon and his colleagues trained a Belgian Malinois -- a shepherd breed that has already been used for detecting bombs and in other cancer tests -- to identify urine from patients with confirmed prostate cancer, then to differentiate those samples from urine from healthy subjects.

Finally, they used one urine sample from a prostate cancer victim and four samples from healthy people, asking the dog to choose the correct one. In 66 tests, the dog was correct 63 times. There were three false positives and no false negatives. That is, the dog correctly identified all the specimens from prostate cancer patients, but misidentified three from healthy men.

The whole training process took about a year, Cornu said, and the team is already training other dogs. The researchers are now attempting to identify what specific chemicals the dog is reacting to in hopes of developing an "electronic nose" that wouldn't require treats and potty breaks.

Autism finding could lead to simple urine test for the condition

Children with autism have a different chemical fingerprint in their urine than non-autistic children, according to new research published tomorrow in the print edition of the Journal of Proteome Research.

The researchers behind the study, from Imperial College London and the University of South Australia, suggest that their findings could ultimately lead to a simple urine test to determine whether or not a young child has autism.

Autism affects an estimated one in every 100 people in the UK. People with autism have a range of different symptoms, but they commonly experience problems with communication and social skills, such as understanding other people's emotions and making conversation and eye contact.

People with autism are also known to suffer from gastrointestinal disorders and they have a different makeup of bacteria in their guts from non-autistic people.

Today's research shows that it is possible to distinguish between autistic and non-autistic children by looking at the by-products of gut bacteria and the body's metabolic processes in the children's urine. The exact biological significance of gastrointestinal disorders in the development of autism is unknown.

The distinctive urinary metabolic fingerprint for autism identified in today's study could form the basis of a non-invasive test that might help diagnose autism earlier. This would enable autistic children to receive assistance, such as advanced behavioural therapy, earlier in their development than is currently possible.

At present, children are assessed for autism through a lengthy process involving a range of tests that explore the child's social interaction, communication and imaginative skills.

Early intervention can greatly improve the progress of children with autism but it is currently difficult to establish a firm diagnosis when children are under 18 months of age, although it is likely that changes may occur much earlier than this.

The researchers suggest that their new understanding of the makeup of bacteria in autistic children's guts could also help scientists to develop treatments to tackle autistic people's gastrointestinal problems.

Professor Jeremy Nicholson, the corresponding author of the study, who is the Head of the Department of Surgery and Cancer at Imperial College London, said: "Autism is a condition that affects a person's social skills, so at first it might seem strange that there's a relationship between autism and what's happening in someone's gut. However, your metabolism and the makeup of your gut bacteria reflect all sorts of things, including your lifestyle and your genes. Autism affects many different parts of a person's system and our study shows that you can see how it disrupts their system by looking at their metabolism and their gut bacteria.

"We hope our findings might be the first step towards creating a simple urine test to diagnose autism at a really young age, although this is a long way off - such a test could take many years to develop and we're just beginning to explore the possibilities. We know that giving therapy to children with autism when they are very young can make a huge difference to their progress. A urine test might enable professionals to quickly identify children with autism and help them early on," he added.

The researchers are now keen to investigate whether metabolic differences in people with autism are related to the causes of the condition or are a consequence of its progression.

The researchers reached their conclusions by using H NMR Spectroscopy to analyse the urine of three groups of children aged between 3 and 9: 39 children who had previously been diagnosed with autism, 28 non-autistic siblings of children with autism, and 34 children who did not have autism who did not have an autistic sibling.

They found that each of the three groups had a distinct chemical fingerprint. Non-autistic children with autistic siblings had a different chemical fingerprint than those without any autistic siblings, and autistic children had a different chemical fingerprint than the other two groups.

ASU instrument on NASA rover helps identify outcrop of long-sought rare rock on Mars

TEMPE, Ariz. – It's amazing what cleaning your glasses can reveal. A mineral-scouting instrument developed at Arizona State University has found an outcrop of rock rich in carbonates in the Columbia Hills of Gusev Crater on Mars, according to a report published online June 3 in the journal Science. The instrument is onboard NASA's Mars Exploration Rover Spirit.

What makes the discovery unusual is that Spirit visited the outcrop, dubbed Comanche, back in December 2005. Yet the data pointing to the discovery languished since then because one of the instruments that detected the carbonate minerals was partly blinded by dust.

Dust in your eye

The instrument is the Miniature Thermal Emission Spectrometer, or Mini-TES, developed at Arizona State University. Each of the two Mars rovers carries a Mini-TES to identify minerals in rocks nearby. The instrument was designed by its Principal Investigator, Philip Christensen, an ASU Regents' Professor in the School of Earth and Space Exploration, part of the College of Liberal Arts and Sciences.

"Mini-TES got dusted months before Spirit reached Comanche, and we didn't have a good way to correct for the dust effects at the time," says Steve Ruff, research scientist at ASU's Mars Space Flight Facility. Ruff is one of a team of scientists on the paper, whose lead author is Richard V. Morris of NASA's Johnson Space Center in Houston. "We knew there was something weird about the outcrop's spectrum as seen by Mini-TES, but couldn't say what caused it."

Ruff adds, "Spirit's Mössbauer spectrometer indicated that carbonate was possible, but I didn't believe it."

What finally did the trick was developing a calibration to remove the spectral effects of the dust on the instrument. Combined with the Mössbauer data and chemical data from a third spectrometer, "the Mini-TES spectra put the discovery over the edge," says Ruff

Warmer, wetter Mars?

Scientists have been searching for Martian carbonate rocks for decades because such minerals are crucial to understanding the early climate history of Mars and the related question of whether the planet might once have held life. "Small amounts of carbonate minerals have been detected on Mars before," says Ruff.

The difference this time, he says, "is that we're seeing a couple of large outcrops of rock poking through the soil of the Columbia Hills. The rocks are about 25 percent carbonate by weight, by far the highest abundance we've seen on Mars."

Born of water

Comanche and a neighboring small outcrop dubbed Comanche Spur have the same granular texture and Mini-TES spectral nature. Ruff says they are part of a stack of volcanic sedimentary rocks, draped over the underlying terrain.

"They're definitely a puzzle to understand," says Ruff. "The outcrops are very rich in olivine, a volcanic mineral, but they appear to have been soaked in water." He explains that it's as if the granular material settled over a preexisting landscape, then the entire stack was flooded with carbonate-rich water, probably from a hydrothermal source.

NASA's other Mars rover, Opportunity, has discovered ample evidence for alteration of rocks by water in Meridiani Planum, on the other side of Mars from Spirit's Gusev Crater. But the water at Meridiani was strongly acidic. While life can evolve to survive in acidic conditions - such as in some of Yellowstone National Park's geysers and hot springs - few scientists think it can start under those conditions.

Moreover, acidic water quickly destroys carbonate minerals, as for example vinegar dissolves hard water deposits. Thus finding outcrops of carbonate rock shows that the hydrothermal water at Comanche was liquid, chemically neutral, and abundant.

While there's no evidence for life, Ruff says, the conditions would have been more favorable for it.

In plain view

Ironically, Ruff notes, the new finding complicates the story of the Columbia Hills. "This makes the geology harder to understand. It adds another environment to incorporate into the picture of how the Hills formed," he says.

Looking at the big picture, Ruff notes, "the Comanche data have been available to scientists and the public for about four years now. The new finding shows that this data set still harbors potentially major discoveries.

"Do other surprises await us? Who knows? But I'll make a strong prediction: More discoveries will be made with old data."

Mystery seafaring ancestor found in the Philippines

* 17:55 03 June 2010 **by Jeff Hecht**

The discovery of a single foot bone is forcing anthropologists to rethink how people first reached the islands off south-east Asia. It suggests that humans arrived on Luzon, the largest and northernmost major island in the Philippines, at least 67,000 years ago, tens of thousands of years earlier than had been thought.

"The arrival of people in Australia 50,000 to 60,000 years ago is a good comparison," says expedition member Florent Detroit of the National Museum for Natural History in Paris, France. We have no idea how settlers got to Australia, he says, but we know from the archaeological evidence that they reached it settled it.

"It seems coherent for us to think that in south-east Asia and Australia, humans had sea-faring capabilities by 60,000 to 70,000 years ago."

Castaways

Getting to Luzon would have required crossing the open sea, long before any evidence that people had mastered boat-building or navigation. And the settlers of Luzon were not the only early humans who crossed the open ocean to live on the archipelago that sprawls between Asia and Australia.

The oldest fossils of Homo floresiensis, the famed "hobbits" of Flores, date from 38,000 years ago, but stone tools found on that Indonesian island date back a million years.

Stone tools older than the Luzon foot bone have also been found recently on Sulawesi and Timor, says William Jungers, an anthropologist at Stony Brook University in New York who has worked in south-east Asia but was not involved in the latest discovery.

Even during the peak of the most recent ice age, when sea level was as much as 120 metres lower than it is today, all of those islands were isolated from the mainland. That says we've been missing something very important: hominins – humans or the ancestors of humans – more than once crossed open ocean far earlier than

anyone had thought possible. Speculation has it that the remains of ancient rafts have been lost beneath the rising sea.

If the foot fits

The foot bone was discovered during an excavation of Callao cave by Armand Mijares of the University of the Philippines Diliman, and his colleagues.

At depths of 2.5 to 3 metres – well below the layer of stone-tool flakes and burnt animal bones from 26,000 years ago, the time the oldest evidence of human occupation of Luzon – the team found a layer rich in the bones and teeth of deer. It also included a fossilised human third metatarsal, the central long bone in the foot, which was dated to 67,000 years ago.

Mijares and colleagues say that the bone is definitely human, and they are provisionally calling it a lightly built modern human. Yet it's not a perfect match with any known group of humans.

Although the bone's size matches those of the pygmy Negrito people who now live on Luzon, Mijares notes that its shape is unusual, and that its size also falls within the ranges of Homo habilis and Homo floresiensis. Jungers calls its anatomy "intriguing" because it doesn't match that of any known human group.

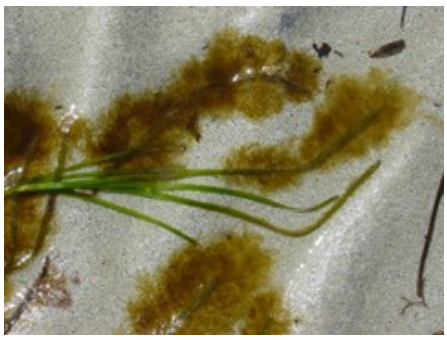
Journal reference: Journal of Human Evolution, DOI: 10.1016/j.jhevol.2010.04.008

How did higher life evolve?

Scientists have for the first time determined the complete genome sequence of a brown alga and opened a new door to the understanding of multicellularity and photosynthesis.

Bremerhaven - With the world's first complete sequencing of a brown algal genome, an international research team has made a big leap towards understanding the evolution of two key prerequisites for higher life on Earth - multicellularity and photosynthesis.

As the internationally renowned science magazine "Nature" reported in its latest issue, about 100 scientists and technicians, during a five-year research project, successfully decoded all hereditary information – commonly known as the "genome" - on Ectocarpus siliculosus, an up to 20 cm large brown seaweed, which occurs mainly along coastlines in temperate latitudes. They have analyzed approximately 214 million base pairs and assigned these to about 16,000 genes. The biologists, Dr. Klaus Valentin and Dr. Bank Beszteri of the Alfred Wegener Institute for Polar and Marine Research in the Helmholtz Association have been involved in this global project since the planning phase in 2005.



"Ectocarpus siliculosus" (here growing on Zostera) occurs mainly along coastlines in temperate latitudes **(Photo: Akira Peters, Station Biologique Roscoff).**

“As evolutionary scientists we are particularly interested in why the world has developed as we know it today” said Klaus Valentin about this project. “During earth’s history, complex multicellular life has evolved from unicellular organisms along five independent paths, which are: animals, plants, fungi, red algae and brown algae.” Evolutionary scientists have therefore set themselves the goal to decode a complete genome from a representative of each of these lines and to look for comparable genetic information. “This goal has now been achieved for the brown algal genome.

The decoding of a red algal genome has already been completed, and we are currently evaluating the data” says Valentin on the future prospects of comparative genomics. “And indeed, in the brown alga, we found many genes for so called kinases, transporter and transcription factors. Such genes are also commonly found in land plants, and we suspect that they also play a key role in the origin of multicellular organisms”.

The sequencing of the brown algal genome is also a milestone in the efforts to reconstruct the evolution of photosynthesis. “We now know that oxygen-producing photosynthesis was „invented” before about 3.8 billion years ago, by cyanobacteria, sometimes erroneously called ’blue-green algae’”, says Valentin about the elemental capability of plants to convert sunlight into biologically usable energy, whilst releasing oxygen. “Green and red algae have developed this ability after their ancestors scavenged living cyanobacteria, and thus more or less captured photosynthesis, to the benefit of both sides, since this symbiosis resulted in tremendous competitive advantages in the primordial ocean”.

Brown algae were assumed to have arisen from the fusion of photosynthetically inactive colourless cells with a unicellular red alga. However, as discovered in a previous research project on single-celled diatoms, AWI researchers showed that brown algae also arose from the fusion of a green alga with a red alga and thus refuted a widespread theory among experts. “Interestingly”, says Klaus Valentin, “In the brown alga we discovered, a high proportion of genes that are characteristic of green algae, including the kinases and

transporters typical for multicellular land plants, as mentioned above. To which extent we have traced common origins of multicellular life, will have to be determined in future investigations".

From an ecological point of view, however, brown algae are also an exciting study object. On the rocky shores of polar and temperate latitudes, their role in the ecosystem is similar to that of trees on the mainland. Some species can reach lengths of up to 160 meters. These "submarine forests" are not only an important habitat for marine animals, but in areas with strong tides, they often fall dry for several hours and reveal an incredible stress tolerance. "In the context of climate change, we have now become interested in how brown algae have adapted to UV light and increasing temperatures.

How they adjust to changing living conditions," mentions Klaus Valentin, is one of the aspects of research on ocean forests at the Alfred Wegener Institute. "In addition, brown algae are evolutionary speaking much older than terrestrial plants. They have multiple metabolic properties, but these have barely been studied. A better understanding of the properties locked up in the genes could also be a foundation for the development of new products and technologies".

This press release relates to the article „The Ectocarpus genome and the independent evolution of multicellularity in brown algae" to be published in the journal "Nature" on 3rd June 2010.

Key nutrient in maternal diet promises 'dramatic' improvements for people with Down syndrome

ITHACA, N.Y. – A nutrient found in egg yolks, liver and cauliflower taken by mothers during pregnancy and nursing may offer lifelong "dramatic" health benefits to people with Down syndrome .

A new study done at Cornell University and published June 2 in the peer-reviewed journal Behavioral Neuroscience found that more choline during pregnancy and nursing could provide lasting cognitive and emotional benefits to people with Down syndrome. The work indicated greater maternal levels of the essential nutrient also could protect against neurodegenerative conditions such as Alzheimer's disease.

"We found that supplementing the maternal diet with additional choline resulted in dramatic improvements in attention and some normalization of emotion regulation in a mouse model of Down syndrome," said lead author Barbara Strupp, professor of nutritional sciences and of psychology.

In addition to mental retardation, Down syndrome individuals often experience dementia in middle age as a result of brain neuron atrophy similar to that suffered by people with Alzheimer's disease. Strupp said the improved mental abilities found in the Down syndrome mice following maternal choline supplements could indicate protection from such neurodegeneration "in the population at large."

Strupp and her co-authors tested Down syndrome-model mice born from mothers that were fed a normal diet versus those given choline supplements during their three-week pregnancy and three-week lactation period. They also examined normal mice born from mothers with and without additional choline. The choline-supplemented mothers received about 4.5 times more choline (roughly comparable to levels at the higher range of human intake) than unsupplemented mothers.

Beginning at 6 months of age, the mice performed a series of behavioral tasks over a period of about six months to assess their impulsivity, attention span, emotional control and other mental abilities. The researchers found the unsupplemented Down syndrome-model mice became more agitated after a mistake than normal mice, jumping repeatedly and taking longer to initiate the next trial. The choline-supplemented Down syndrome-model mice showed partial improvement in these areas.

"I'm impressed by the magnitude of the cognitive benefits seen in the Down syndrome-model mice," Strupp said. "Moreover, these are clearly lasting cognitive improvements, seen many months after the period of choline supplementation."

Strupp said the results are consistent with studies by other researchers that found increased maternal choline intake improves offspring cognitive abilities in rats. However, this is the first study to evaluate the effects of maternal choline supplementation in a rodent model of Down syndrome.

Previous studies of humans and laboratory animals have shown that supplementing the diets of adults with choline has proven to be largely ineffective in improving cognition.

"Although the precise mechanism is unknown, these lasting beneficial effects of choline observed in the present study are likely to be limited to increased intake during very early development," Strupp said.

The study, funded in part by the National Institutes of Health, was part of the dissertation of Cornell doctoral candidate Jisook Moon. Other Cornell collaborators included Myla Strawderman, research associate in nutritional sciences, and David Levitsky, professor of nutrition and psychology. Strupp and collaborators have received additional NIH funding to study the neural mechanisms underlying the results observed in this study.

Stone Age Color, Glue 'Factory' Found

The color and glue trade could have been a blossoming industry some 58,000 years ago.

By Jennifer Viegas

The Stone Age version of successful businessmen like Steve Jobs and Bill Gates might have been involved in the color and glue trade.

A once-thriving 58,000-year-old ochre powder production site has just been discovered in South Africa. The discovery offers a glimpse of what early humans valued and used in their everyday lives.

The finding, which will be described in the Journal of Archaeological Science, also marks the first time that any Stone Age site has yielded evidence for ochre powder processing on cemented hearths -- an innovation for the period. A clever caveman must have figured out that white ash from hearths can cement and become rock hard, providing a sturdy work surface.

Ochre could have served many different functions during the Stone Age from makeup to medicine and more. **Lyn Wadley**

"Ochre occurs in a range of colors that includes orange, red, yellow, brown and shades of these colors," project leader Lyn Wadley told Discovery News. "Yellow and brown ochre can be transformed to red by heating them at temperatures as low as 250 degrees Celsius (482 degrees Fahrenheit)."

Wadley, who authored the study, is a professor in the School of Geography, Archaeology and Environmental Studies and in the Institute for Human Evolution at the University of the Witwatersrand. She said ochre has been found on bone awl tools probably used for working leather, so it is possible that the ancients sported colorful leather clothing and other leather goods.

Red-hot leather clothing is still found in stores today, but the probable wearers then were a far cry from today's fashion elite.

Ochre is derived from naturally tinted clay that contains mineral oxides. In addition to coloring objects, it makes a compound adhesive when mixed with other ingredients, such as plant gum and animal fat.

"This glue would have attached stone spear or arrowheads to hafts, or blades to handles for cutting tools," Wadley explained.

Ochre can also be used as body paint and makeup, as a preservative and as a medicinal component, so it could have served many different functions during the Stone Age.

Wadley analyzed the ochre "factory" at the large Sibudu rock shelter north of Durban in KwaZulu-Natal, South Africa. The site consisted of four cemented hearths containing the ochre powder. The cement workstations could have held grindstones and/or served as storage receptacles for the powder, according to Wadley, who also excavated about 8,000 pieces of ochre in the area.

She believes the natural material was collected just over a half a mile away from the site, where it would have been heated and ground or just ground directly onto coarse rocks.

Francesco d'Errico, director of research at the National Center of Scientific Research at the University of Bordeaux, said pigment material is found in bits and pieces at various early sites. However, not much was known in detail before about how it was processed and used.

Based on the nature of the cemented ash and the geology of the Sibudu site, d'Errico believes that people 58,000 years ago intended to produce large quantities of red pigment in a short time frame.

He now thinks ochre pigment was a "fundamental constitute of Middle Stone Age culture, and that its production likely involved the work of several members of the group."

Fractal haze may have warmed the early Earth

* 23:14 03 June 2010 **by Rachel Courtland**

A haze of fluffy fractal-shaped particles may have helped protect early life from harmful ultraviolet radiation, a new study suggests. The aerosols could help resolve a long-standing puzzle about how the early Earth stayed warm.

Billions of years ago, the sun emitted up to 30 per cent less light than it does today. That should have made the early Earth too cold to maintain liquid water on the surface until about 2 billion years ago. But geological studies of banded iron formations and other materials that can form in water suggest liquid water pooled on the surface much earlier.

In 1972, Carl Sagan and George Mullen of Cornell University in New York proposed a solution to this "faint young sun paradox". They reckoned a bit of ammonia – a powerful greenhouse gas – could keep the Earth

warm enough for liquid water to be present. But the idea was knocked down a few years later when researchers realised that the sun's ultraviolet light would break apart the gas molecules in less than 10 years.

Some 25 years later, Sagan and colleague Christopher Chyba, now at Princeton University, proposed a solution. They suggested that the early Earth, like Saturn's hazy moon Titan, may also have been surrounded by a haze of aerosol particles made of organic molecules.

This haze could have blocked the sun's ultraviolet light, allowing ammonia to survive. But models showed that the shield also would have blocked the sun's visible light, creating an "anti-greenhouse effect" that would have cooled the Earth even more.

Now Eric Wolf and Brian Toon of the University of Colorado at Boulder find that a protective haze could warm the early Earth after all, if the haze is made up of fluffy particles instead of solid ones.

Feedback loop

They propose that sunlight broke apart atmospheric methane and nitrogen molecules that then rejoined to make spherical particles. As these particles fell through the atmosphere, they collided and stuck together at random, bulking up to form loose aggregates with fractal geometries, in which a basic pattern is repeated at different scales.

Previous models assumed the haze particles were made from spheres that merged and formed larger and larger spheres when they collided. Those particles block visible light as effectively as ultraviolet light.

Since the fractal aggregates are full of gaps, they are relatively transparent to visible light. The spherical particles that form them block relatively more ultraviolet waves, making a haze that preserves ammonia to warm the Earth.

If the idea is right, "we would have a strong ultraviolet shield that would protect early Earth and make it a clement place for life to thrive," Wolf told New Scientist. Such an atmosphere could also form more complex organic molecules that could provide nutrients for life.

Building blocks of life?

It may have even helped give life its start. In the 1950s, Stanley Miller and Harold Urey zappedMovie Camera gases that also included ammonia and methane with electricity and formed amino acids, the building blocks of proteins.

But since then, the idea of an atmosphere rich in hydrogen – which is needed to make organic molecules such as methane – has fallen out of favour. It is unclear whether geological processes could have released enough methane to create a haze on the early Earth, before life evolved to spew out methane. "The current wisdom is there wasn't a lot of methane outgassing by ancient volcanism, but this is a question we'd like to investigate further," Wolf says.

Is the faint young sun paradox solved? A range of other ideas is still being considered. One recent proposal suggests bigger oceans and fewer clouds may have made the Earth darker and less reflective in the past, allowing it to absorb more sunlight.

It is possible that a combination of different mechanisms might have worked together to counteract the faint young sun, says Christopher Chyba. "My own view is this is a problem that, one way or another, the early Earth figured out how to solve," he says. *Journal reference: Science (vol 328, p 1266)*

Hints of life found on Saturn moon

* 01:10 04 June 2010 **by David Shiga**

Two potential signatures of life on Saturn's moon Titan have been found by the Cassini spacecraft. But scientists are quick to point out that non-biological chemical reactions could also be behind the observations.

Titan is much too cold to support liquid water on its surface, but some scientists have suggested that exotic life-forms could live in the lakes of liquid methane or ethane that dot the moon's surface.

In 2005, Chris McKay of NASA's Ames Research Center in Moffett Field and Heather R Smith of the International Space University in Strasbourg, France, calculated that such microbes could eke out an existence by breathing in hydrogen gas and eating the organic molecule acetylene, creating methane in the process.

This would result in a lack of acetylene on Titan and a depletion of hydrogen close to the moon's surface, where the microbes would live, they said.

Now, measurements from the Cassini spacecraft have borne out these predictions, hinting that life may be present.

Hungry for hydrogen

Infrared spectra of Titan's surface taken with the Visual and Infrared Mapping Spectrometer (VIMS) showed no sign of acetylene, even though ultraviolet sunlight should constantly trigger its production in the moon's thick atmosphere. The VIMS study, led by Roger Clark of the US Geological Survey in Denver, Colorado, will appear in the Journal of Geophysical Research.

Cassini measurements also suggest hydrogen is disappearing near Titan's surface, according to a study to appear in Icarus by Darrell Strobel of Johns Hopkins University in Baltimore, Maryland.

Observations with the spacecraft's Ion and Neutral Mass Spectrometer and its Composite Infrared Spectrometer revealed that hydrogen produced by UV-triggered chemical reactions in the atmosphere is flowing both upwards and off into space as well as down towards the surface.

Yet the hydrogen is not accumulating near the surface, hinting that something may be consuming it there. The results reveal "very unusual and currently unexplained chemistry", McKay told New Scientist. "Certainly not proof of life, but very interesting."

Too slow

It is possible that the hydrogen is combining with carbon in molecules on Titan's surface to make methane. But at the low temperatures prevalent on Titan, these reactions would normally occur too slowly to account for the disappearing hydrogen.

Similarly, non-biological chemical reactions could transform acetylene into benzene – a hydrocarbon that the VIMS instrument did observe on Titan's surface. But in that case, too, a catalyst would be needed to boost reaction rates enough to account for the dearth of acetylene.

"Scientific conservatism suggests that a biological explanation should be the last choice after all non-biological explanations are addressed," says Mark Allen of NASA's Jet Propulsion Laboratory in Pasadena, California. "We have a lot of work to do to rule out possible non-biological explanations."

Jonathan Lunine of the University of Arizona in Tucson, a member of Clark's team, agrees. But he says it may not be possible to distinguish between biological and non-biological explanations without additional missions to Titan. "The only way to know for sure would be to actually get hold of an organism and show that it is alive," he told New Scientist. *Journal references: Icarus (in press); Journal of Geophysical Research (forthcoming)*

Introducing the good food guide for cockroaches

Ever wondered how cockroaches seem to know the best place to grab a meal? New research at Queen Mary, University of London suggests that, just like humans, they share their local knowledge of the best food sources and follow 'recommendations' from others.

It is often striking how little we know about our closest neighbour. Until now, it was assumed that cockroaches forage on their own to find food and water. However, this work shows how groups of the insects seem to make a collective choice about the best food source, explaining why we so commonly find them feeding en masse in the kitchen late at night.

Dr Mathieu Lihoreau from Queen Mary's School of Biological and Chemical Sciences, explained the potential impact of his research, saying: "Cockroaches cost the UK economy millions of pounds in wasted food and perishable products. Better understanding of how they seek out our food would allow us to develop better pest control measures, which are frequently ineffective and involve the use of insecticides that can have health side-effects."

This study, published in the Springer journal Behavioural Ecology and Sociobiology, is the first demonstration that groups of cockroaches can forage for food collectively, rather than independently, relying on their individual experience.

In the experiment, hungry cockroaches (Blattella germanica) were released into an arena where they could choose between one of two piles of food. Lihoreau noted that, rather than choosing one randomly and splitting into two groups as would be expected if they were acting independently, the majority of the cockroaches fed solely on one piece of food until it was all gone. By following individual insects, it also emerged that the more of cockroaches there were on one piece of food, the longer each one would stay to feed. Through simple snowball effect then, most of the cockroaches accumulate on one source.

Once identified, a man-made 'foraging pheromone' could be used to improve pest control, making insecticide gels more effective or be used to create an insecticide-free trap. Lihoreau explains; "These observations coupled with simulations of a mathematical model indicate that cockroaches communicate through close contact when they are already on the food source. This is in contrast with the honeybees' waggle dance or ants' chemical trails, which are sophisticated messages that guide followers over a long distance. Although we think they signal to other cockroaches using a 'foraging pheromone', we haven't yet identified it; potential candidates include chemicals in cockroach saliva, and cuticular hydrocarbons, which cover the insects' bodies."

This work doesn't only provide the first evidence that these insects search for food collectively, but it also gives a simple explanation for it that could potentially apply to a wide array of animals, including humans. "We should definitively pay more attention to cockroaches and other simple 'societies' as they provide researchers with a good models for co-operation and emergent properties of social life, that we could extrapolate to more sophisticated societies, like ours," says Lihoreau.

Mathieu Lihoreau, Jean-Louis Deneubourg and Colette Rivault. "Collective foraging decision in a gregarious insect" is published in the Springer journal Behavioural Ecology and Sociobiology, DOI 10.1007/s00265-010-0971-7

How religion made Jews genetically distinct

* 13:00 04 June 2010 **by Andy Coghlan**

Jewish populations around the world share more than traditions and laws – they also have a common genetic background. That is the conclusion of the most comprehensive genetic study yet aimed at tracing the ancestry of Jewish people. In a study of over 200 Jews from cities in three different countries, researchers found that all of them descended from a founding community that lived 2500 years ago in Mesopotamia.

Harry Ostrer of New York University, whose team carried out the study, likens modern Jewish populations to a series of genetic islands spread across the world. The main reason that Jews continue to form a distinct genetic group, despite their wide dispersal is the exclusivity of the Jewish religion and the tight restrictions it imposes on marriage to those outside the Jewish faith.

Ostrer's colleague Gil Atzmon of Albert Einstein College of Medicine at Yeshiva University in New York says that the religious traditions and laws shared by practising Jews around the world, and their isolation from their non-Jewish neighbours, means that Jews share many more genomic segments with each other than they do with non-Jewish people.

Marrying out

Jewish law makes it hard for non-Jews to convert. Communities that do accept converts expect them to spend several years studying the traditions and laws of Judaism. Most observant Jews marry other Jews, which limits genetic mixing with other populations, although in the past century some communities have become more accepting of marriage outside the faith.

Atzmon and his colleagues studied the DNA of 237 Jews from New York, Seattle, Athens and Rome, representing Ashkenazi, Turkish, Greek, Italian, Syrian, Iranian and Iraqi groups. They searched for genetic similarities among these populations, and compared them with the DNA of 418 non-Jews.

The study compared 2 million distinct DNA markers known as SNPs spread across the entire genome. That's four times the number of markers used in previous studies. "We are the first to analyse genome-wide differences," says Atzmon.

Atzmon's team found that the SNP markers in genetic segments of 3 million DNA letters or longer were 10 times more likely to be identical among Jews than non-Jews. Atzmon says that overall, the genetic similarity among Jews is equivalent to what would be expected among fifth cousins from a random population.

Results of the analysis also tally with biblical accounts of the fate of the Jews. Using their DNA analysis, the authors traced the ancestors of all Jews to Persia and Babylon, areas that now form part of Iran and Iraq.

Exiled from Babylon

The genetic tree shows that between 100 and 150 generations ago – the equivalent of 2500 years – the founder population split in two, with half the Jews being dispersed into Europe and North Africa, the other half remaining in the Middle East.

This corresponds with accounts of the expulsion of the Jews into exile in 587 BC by the Babylonian king Nebuchadnezzar.

The genetic analysis shows that amongst modern Jews, the populations that are most genetically similar are those originating from Iraq and Iran. The rest share much more of their DNA with non-Jewish Europeans and North Africans, which may be why many Jews whose recent ancestors lived in Europe or Syria have blond hair or blue eyes.

The team found genetic traces of a period of intense conversion to Judaism during the time of the Roman Empire, when up to 10 per cent of citizens were Jewish. Among modern non-Jewish Europeans, Italians, Sardinians and the French are most closely genetically similar to modern Jews, the team found.

Atzmon says that the analysis could bring medical benefits by helping to identify genetic markers for diseases common in Jewish communities breast cancer, prostate cancer and the inherited metabolic condition, Tay-Sachs disease, which kills in infanthood.

Journal reference: American Journal of Human Genetics, DOI: 10.1016/j.ajhg.2010.04/015

Could life survive on Mars? Yes, expert says

McGill microbiologist looks at Martian-like environment on Earth and finds evidence of bacteria

Researchers at McGill's department of natural resources, the National Research Council of Canada, the University of Toronto and the SETI Institute have discovered that methane-eating bacteria survive in a highly unique spring located on Axel Heiberg Island in Canada's extreme North. Dr. Lyle Whyte, McGill University microbiologist explains that the Lost Hammer spring supports microbial life, that the spring is similar to possible past or present springs on Mars, and that therefore they too could support life.

The subzero water is so salty that it doesn't freeze despite the cold, and it has no consumable oxygen in it. There are, however, big bubbles of methane that come to the surface, which had provoked the researchers' curiosity as to whether the gas was being produced geologically or biologically and whether anything could survive in this extreme hypersaline subzero environment. "We were surprised that we did not find methanogenic bacteria that produce methane at Lost Hammer," Whyte said, "but we did find other very unique anaerobic organisms – organisms that survive by essentially eating methane and probably breathing sulfate instead of oxygen."

It has been very recently discovered that there is methane and frozen water on Mars. Photos taken by the Mars Orbiter show the formation of new gullies, but no one knows what is forming them. One answer is that there could be that there are springs like Lost Hammer on Mars. "The point of the research is that it doesn't matter where the methane is coming from," Whyte explained. "If you have a situation where you have very cold salty water, it could potentially support a microbial community, even in that extreme harsh environment."

While Axel Heiberg is already an inhospitable place, the Lost Hammer spring is even more so. "There are places on Mars where the temperature reaches relatively warm -10 to 0 degrees and perhaps even above 0ºC," Whyte said, "and on Axel Heiberg it gets down to -50, easy. The Lost Hammer spring is the most extreme subzero and salty environment we've found. This site also provides a model of how a methane seep could form in a frozen world like Mars, providing a potential mechanism for the recently discovered Martian methane plumes."

Selenium shows no benefit in prevention of lung cancer

CHICAGO - Selenium, a supplement taken daily by millions in hopes of protection against cancer and a host of other diseases, has proven to be of no benefit in reducing a patient's risk of developing lung cancer - either a recurrence or second primary malignancy, according to results of an international Phase III clinical trial.

Results from the decade-long study, initiated by the Eastern Cooperative Oncology Group, were presented today at the American Society of Clinical Oncology 2010 Annual Meeting by Daniel D. Karp, M.D., professor in the Department of Thoracic/Head and Neck Medical Oncology at The University of Texas MD Anderson Cancer Center.

"Several epidemiological and animal studies have long-suggested a link between deficiency of selenium and cancer development," said Karp, the study's principal investigator. "Interest and research escalated in the late 1990's after a skin cancer and selenium study, published in 1996, found no benefit against the skin cancer, but did suggest an approximate 30 percent reduction of prostate and lung cancers. Our lung cancer research and another major study for the prevention of prostate cancer evolved from that finding."

These large, follow-up clinical studies investigating the naturally occurring mineral, however, have since proven disappointing. In 2009, the National Cancer Institute (NCI) halted SELECT, an international study of more than 35,000 men investigating if either selenium or Vitamin E, alone or in combination, could reduce the risk of prostate cancer. Both supplements failed to show benefit.

According to the American Cancer Society, approximately 219,440 people were diagnosed with lung cancer in 2009 and 159,390 died from the disease, making it the leading cause of cancer death in both men and women. When caught as early as Stage I, and the tumor is surgically resectable, however, and can even be cured in about 80 percent of the cases. In this population, a chemoprevention agent would be desirable, as the risk of recurrence in Stage I patients after surgery accumulates by one to two percent annually. For example, a patient's risk of developing a new cancer at 10 years is approximately 10-20 percent, said Karp.

From 2000 to 2009, the international NCI-sponsored Phase III study, enrolled 1,522 Stage I non-small cell lung cancer patients, all of whom had their tumors surgically removed and were cancer-free for at least six months post-surgery. Participants were randomized to receive either 200 micrograms of selenium or placebo. The study's primary endpoints were reduction of development of a new cancer, or second primary, and/or recurrence of their initial cancer.

The study was halted early after an interim analysis revealed that the progression-free survival was superior in the placebo arm: 78 percent taking the placebo were alive without recurrence after five years, compared to 72 percent on selenium. A total of 216 secondary primary tumors developed, of which 84 (38.9 percent) were lung cancers. Of those taking selenium, 1.9 percent developed a second primary tumor after the first year, compared to 1.4 percent taking placebo. In total, 3.66 percent of participants in the selenium arm developed a secondary primary tumor of any type after one year, compared to 4.1 percent in the placebo group.

Side effects were minimal and no different in both groups: of those taking placebo, 38 percent had grade 1 or 2 toxicity, and 3 percent had grade 3, compared to 39 percent and 1 percent, respectively in those taking the supplement. The study was stopped by the independent Data and Safety Monitoring Committee due to futility.

The researchers did find that in a small group of the lung cancer patients who were never smoked, selenium did provide a small benefit; however, the size of the group of patients, 94, was too small to be statistically significant.

"Our results demonstrate that selenium is not an effective chemoprevention agent in an unselected group of lung cancer patients, and it's not something we can recommend to our patients to prevent a second cancer from developing or recurring," said Karp. "These findings also remind us that never smokers may represent a unique disease and should be an area for special consideration for research focus.

"Given our results and that of SELECT, physicians now can point to two large NCI-sponsored Phase III trials and tell patients that, at this time, the only definitive studies that have been conducted have been negative," said Karp.

In addition to Karp, other authors on the study include: John Ruckdeschel, M.D.; Sandra Lee, ECOG; Gail Shaw, M.D.; Steven Keller, M.D.; Steven Belinsky, Ph.D.; Seena Aisner, M.D.; Omer Kucuk, M.D.; Jean MacDonald; and Mary Steele.

Scientists Cite Advances on Two Kinds of Cancer

By ANDREW POLLACK

CHICAGO - Using two opposite strategies, one focused and one broad, scientists say they have made progress in taming two of the most intractable types of cancer.

The focused approach shrank tumors significantly in a majority of patients with advanced lung cancer marked by a specific genetic abnormality.

Even though the clinical trial was small (just 82 people, with no control group), the results were considered so striking for such sick patients that the study will be featured Sunday at the main session of the annual meeting of the American Society of Clinical Oncology here.

“This is a phenomenal example of finding the right patient and the right drug very early on,” said Dr. Pasi A. Janne of the Dana-Farber Cancer Institute in Boston, who was involved in the trial.

The broader strategy uses a drug that could potentially become a universal treatment for all types of cancer. It works by releasing a brake on the body’s immune system, letting the immune system attack the cancer more vigorously.

In a study of patients who had advanced melanoma, those who got an experimental drug lived a median of about 10 months, compared with 6.4 months for those in a control group. After two years, about 23 percent of those who got the drug were alive, compared with 14 percent in the control group.

Lung cancer and melanoma are among the hardest cancers to treat. So the studies are being viewed as significant advances, though far from cures.

Dr. Steven J. O’Day of the Angeles Clinic and Research Institute in Santa Monica, Calif., a lead investigator in the melanoma trial, called the result “historic,” and added, “This is the first randomized placebo-controlled trial ever to show a survival benefit in Stage 4 melanoma.”

Bristol-Myers Squibb, which sponsored the trial, is planning to apply for regulatory approval to sell the drug, ipilimumab.

The lung cancer drug, by contrast, blocks an aberrant protein called ALK that is found in only about 5 percent of non-small-cell lung tumors. But in patients whose tumors have this aberration, the drug seems to work wonders. The tumors shrank significantly in 57 percent of the 82 patients, and they remained stable in 30 percent more.

Beverly Sotir, 71, of Belmont, Mass., who has been taking the pills as part of the trial since July, said her tumors had shrunk without debilitating side effects. “For someone who’s been on chemo before, this is like a miracle drug,” she said. “You feel yourself. You look yourself.”

Pfizer, which sponsored the study, has started a more definitive trial aimed at winning approval of the drug, crizotinib.

There are caveats. The effects of crizotinib can wear off, though 72 percent of the patients in the trial were free of cancer progression for six months.

As for the melanoma drug, because it removes checks on the immune system, 10 percent to 15 percent of patients who took it in the study suffered severe side effects because their immune systems attacked their own organs. Seven patients out of 540 who got ipilimumab died from these immune effects, according to a report of the study published online Saturday by The New England Journal of Medicine.

Efforts to harness the immune system to fight cancer have suffered setback after setback. Because tumor cells are mutated forms of the body’s own cells, not an invading pathogen, they do not usually elicit a strong immune response.

But the Food and Drug Administration this year approved a “cancer vaccine” for prostate cancer called Provenge, so-called because it trains the immune system to attack the patient’s tumors. Most such vaccines focus on a single type of cancer, or are even tailored to individual patients.

Ipilimumab, by contrast, is a more general immune booster. It blocks a protein called CTLA-4 that acts as a brake on T cells, the soldiers of the immune system. It is already also being tested against lung and prostate cancer.

Still, if a tumor does not elicit a strong immune response to begin with, then just keeping the response going longer would not help much, just as lifting one’s foot from the brake usually will not make a car go faster if the accelerator is not pressed.

In at least one other melanoma trial, conventional chemotherapy drugs achieved median survival of about 10 months, the same as ipilimumab.

Dr. Charles M. Balch, a melanoma expert at Johns Hopkins who was not involved in the trial, called the results “a single, not a home run,” though he added that for this disease even a single was important.

About 68,000 Americans are expected to get melanoma this year, with 8,700 deaths, according to the American Cancer Society. The numbers have been increasing, probably because of sun exposure decades ago.

The trial involved 676 patients in the United States and 12 other countries with previously treated metastatic melanoma. They received either ipilimumab or an experimental cancer vaccine or both. Those who got ipilimumab alone did as well as those who got both, suggesting the vaccine had little effect.

Dr. Petra Rietschel of the Montefiore-Einstein Center for Cancer Care in the Bronx said melanoma experts were equally or even more excited about a drug being developed by Plexxikon and Roche that blocks a particular protein called B-RAF that is aberrant in more than half of all cases of the disease. That is similar to the approach of crizotinib, Pfizer’s lung cancer drug. They are part of a trend to genetically analyze a patient’s tumor and find drugs that block the particular genetic anomaly that drive that tumor’s growth.

Pfizer developed crizotinib to block another protein called MET. The fact that the drug also blocked ALK was considered unimportant.

But in 2007, after the clinical trial had started, Dr. Hiroyuki Mano and colleagues at Jichi Medical University in Japan reported that in a small number of lung cancers, there was a chromosome translocation that brought the gene for ALK together with the gene for another protein called EML4. That created a fusion protein that spurred tumor growth. Dr. Mano had discovered this by systematically testing all the active genes in a tumor removed from a lung cancer patient.

Pfizer turned on a dime and began enrolling lung cancer patients with this fusion protein in the trial. Japanese patients began flying to South Korea, the nearest place with trial sites.

Dr. Mano said the first Japanese patient who went was so sick - heavily dependent on oxygen tanks and unable to swallow - that he had to be taken to the airport by medical helicopter and met by an ambulance at the airport in Seoul.

Two weeks later, Dr. Mano said, he went to Seoul to check on the patient. The man no longer needed oxygen and was walking in the neighborhood each day looking for good restaurants. The patient returned to Japan and lived for several more months.

Scientists said the ALK gene aberration tends to be more frequent in younger patients and nonsmokers. Experts say that even though the drug might be useful for only 5 percent of non-small-cell lung cancer patients, that would still be about 10,000 people a year in the United States and 40,000 worldwide.

Finding drugs for each subset of tumors will take years. And cancers can mutate and become resistant to drugs blocking particular abnormalities.

Dr. James Allison, who paved the way for ipilimumab with work he did at the University of California, Berkeley, said the immune therapies might be helped by such mutations. So the targeted drugs and the immune boosting ones might work best together.

“It’s the ultimate personalized treatment for cancer,” said Dr. Allison, who is now chairman of immunology at the Memorial Sloan-Kettering Cancer Center.

Climate change made apes vanish in ancient Europe

By Katia Moskvitch Science reporter

Great apes were wiped out in ancient Europe when their environment changed drastically some nine million years ago, scientists say.

A study of fossil teeth from grazing animals sheds light on what Europe was like during Late Miocene times.

Researchers say changes in Europe's climate and environment at the time replaced many forests with grasslands - and great apes with monkeys.

The scientists described their findings in a Royal Society journal.

Ancient relatives of modern orangutans, gorillas, chimpanzees and gibbons were able to survive in Asia and Africa, where those changes were not as drastic.

A team led by Dr Gildas Merceron from Claude Bernard University Lyon 1 in France looked at the fossilised teeth of ancient antelopes that lived alongside apes during the Miocene epoch - in what now is Germany, Hungary and Greece. The researchers tried to determine what these animals ate millions of years ago. “The best way to reconstruct the past environment is to determine the diet of vegetarian species. Here we used fossils of antelopes because these animals dominated the fauna in Europe at the time," Dr Merceron told BBC News.

The scientists then analysed "micro scars" - specific patterns of wear that give researchers clues about the animals' dietary habits - on the teeth of these antelopes.

They found that when these mammals shared the land with great apes, the landscape in Europe was quite different from what it gradually became.

The changes didn't happen overnight - it took thousands of years, said Dr Merceron. But as the apes' original habitat changed and forests disappeared, these animals slowly became extinct in Europe.

Eventually, apes were replaced by their smaller cousins - a species of monkey called Mesopithecus, said the researcher.

Danger of extinction

Today, humans can cause much more rapid change to the environment than what was happening millions of years ago. People need to be mindful of their negative impact on the animal world, said Dr Merceron.

"If we dry out our swamps and cut down our forests, in the end we might get a very uniform environment and a decrease in biodiversity," said the scientist. "Deforestation leads to eventual isolation of different populations of great apes in small forests. When they get isolated, it becomes impossible for them to have a genetic exchange between populations - and the populations start to decline."

Numbers of apes living today have fallen sharply in recent years. Increased levels of poaching and deforestation are thought to be the main factors for the decline. Many species are critically endangered - only about 6,000 Sumatran orangutans and as few as some 700 mountain gorillas are thought to remain in the wild. But there is more, says Dr Merceron's colleague, Dr Ellen Schulz from the University of Hamburg in Germany.

"Great apes are in danger of extinction, mostly because of humans destroying their habitat," she said.

"But there's something else - people tend to forget that preserving biodiversity is important for their own survival as well - we never know what awaits us in the future."

Mind over mass: Cholesterol levels might be controlled by brain circuitry

By Katherine Harmon

When your stomach growls and you have the urge to reach for the nearest snack, it is, in a way, your tummy talking. Those signals are in part sparked by the gut-based hunger hormone ghrelin, which blocks certain receptors in the brain, telling your body when it is time to eat.

But a team of researchers thinks this hormone might be doing more than just urging you to pile on some calories. It might also be helping to regulate the levels of cholesterol in your bloodstream. The new research was published online June 6 in Nature Neuroscience (Scientific American is part of Nature Publishing Group).

Although so-called bad cholesterol (low-density lipoprotein, or LDL) can result in clogged arteries and cardiovascular disease, good cholesterol (high-density lipoprotein, or HDL) is thought to actually prevent plaque build-up in the arteries by helping to transport lipids more smoothly through the bloodstream. Cholesterol levels have long been thought to be mainly a factor of diet and liver function. But new research in mouse models shows that changes in ghrelin and in a ghrelin-inhibited receptor in the hypothalamus altered how much HDL went to the liver for processing and how much remained in the blood stream.

"Our study shows for the first time that cholesterol is also under direct 'remote control' by specific neurocircuitry in the central nervous system," Matthias Tschöp, a professor of endocrinology at the University of Cincinnati and coauthor of the paper, said in a prepared statement.

More specifically, by upping the levels of ghrelin in the mice, the researchers saw an increased amount of HDL cholesterol in the bloodstreams of the lab animals - regardless of diet or body mass. Because higher levels of HDL are thought to help prevent build-up of arterial plaque, boosting levels of it in the bloodstream could be a good way to fight harmfully high levels of LDL. The researchers got the same high HDL levels results when they blocked the hypothalamus' melanocortin 4 receptor (MC4R) either by knocking it out or shutting it down with other chemicals.

"We were stunned to see that by switching MC4R off in the brain, we could even make injected cholesterol remain in the blood much longer," Tschöp noted. Although further research will be necessary to see if the same pathway is active in humans, the link could pave the way for drugs that treat cholesterol or metabolic syndrome by targeting this hormone or brain receptor.