Herbal remedy reduces obesity and heart disease?

With unprecedented levels of obesity across the Western world, and incidence of associated heart disease, cancer and diabetes rising, there is a major drive to find new treatments. Scientists from Germany have recently discovered that extracts of a traditional herbal remedy derived from Tabebuia impetiginosa can act to delay the absorption of dietary fat in animal models. They believe that the extract could be incorporated into a food supplement which may not only reduce obesity, but also lessen the risk of development of type 2 diabetes and coronary heart disease. Dr Nils Roos from the Max Rubner Institute will present the results on Monday 7th July at the Society for Experimental Biology's Annual Meeting in Marseille [Poster Session P2].

Dr Roos and his team have shown that Tabebuia extract can reduce levels of triglycerides, a breakdown product of fat, in rats after they have been fed a fatty meal. "This result shows the extract may have a potential use in treating obesity," he observes. "However, as coronary heart disease and diabetes have also been shown to be associated with higher triglyceride levels after eating, we believe a food-supplement based on Tabebuia could reduce the incidence of these diseases as well. What is more, as obesity in developing countries is also on the increase, such extracts, taken as a capsule or added to food, may be a cheaper alternative for the rural population to pharmaceuticals."

Although it is clear that Tabebuia extract can act to inhibit the absorption of dietary fat, the scientists have not yet identified the exact compounds within the extract that are responsible for the effects. "The actual substances involved are probably even more active than the extract," says Dr Roos. "We are currently in the process of identifying these compounds, and will then test long-term efficacy and safety in miniature pigs whose physiology is closer to that of humans than rat physiology is, before moving onto human trials. At this point, we hope to be able to develop the extract, either as a food supplement or in a medicinal context."

Notes for editors

** Tabebuia impetiginosa, commonly known as Pink Ipê, is a deciduous tree, native to Central and South America, and is related to magnolias.*

** Results have been published, see: Möller, N. P., Roos, N., Schrezenmeir, J. (2008) Lipase inhibitory activity in alcoholic extracts of worldwide occurring plants and propolis, Phytotherapy Research, in press. pdf available on request*

A baby's smile is a natural high

The baby's smile that gladdens a mother's heart also lights up the reward centers of her brain, said Baylor College of Medicine researchers in a report that appears in the journal Pediatrics today.

The finding could help scientists figure out the special mother-infant bond and how it sometimes go wrong, said Dr. Lane Strathearn, assistant professor of pediatrics at BCM and Texas Children's Hospital and a research associate in BCM's Human Neuroimaging Laboratory.

"The relationship between mothers and infants is critical for child development," said Strathearn. "For whatever reason, in some cases, that relationship doesn't develop normally. Neglect and abuse can result, with devastating effects on a child's development."

To study this relationship, Strathearn and his colleagues asked 28 first-time mothers with infants aged 5 to 10 months to watch photos of their own babies and other infants while they were in a functional magnetic resonance imaging scanner. The machine measures blood flow in the brain. In the scans, areas of increased blood flow "light up," giving researchers a clue as to where brain activity takes place.

In some of the photos, babies were smiling or happy. In others they were sad, and in some they had neutral expressions.

They found that when the mothers saw their own infants' faces, key areas of the brain associated with reward lit up during the scans.

The areas stimulated by the sight of their own babies were those associated with the neurotransmitter dopamine. Specifically, the areas associated included the ventral tegmental area/substantia nigra regions, the striatum, and frontal lobe regions involved in emotion processing, cognition and motor/behavioral outputs.

"These are areas that have been activated in other experiments associated with drug addiction," said Strathearn. "It may be that seeing your own baby's smiling face is like a 'natural high' ".

The strength of the reaction depended on the baby's facial expression, he said.

"The strongest activation was with smiling faces," he said. There was less effect from pictures of their babies with sad or neutral expressions.

"We were expecting a different reaction with sad faces," he said. In fact, they found little difference in the reaction of the mothers' brains to their own babies' crying face compared to that of an unknown child.

Overall, the mothers responded much more strongly to their own infants' faces than to those of an unknown baby.

"Understanding how a mother responds uniquely to her own infant, when smiling or crying, may be the first step in understanding the neural basis of mother–infant attachment," said Strathearn.

Others who took part in this study include Drs. Jian Li and P. Read Montague of BCM and Peter Fonagy of the University College London in the United Kingdom.

Funding for this research to Strathearn came from the National Institutes of Health educational and mentoring grants and to the General Clinical Research Center. Other funding came from grants to Montague from the Kane Family Foundation, the National Institute of Neurological Disorders and Stroke and the National Institute on Drug Abuse.

When the embargo lifts, this report will be available at http://pediatrics.aappublications.org/

Newborn vitamin A reduces infant mortality

A single, oral dose of vitamin A, given to infants shortly after birth in the developing world can reduce their risk of death by 15 percent, according to a study conducted by researchers at the Johns Hopkins Bloomberg School of Public Health. The study is published in the July 2008 edition of the journal Pediatrics.

"It has long been known that vitamin A supplementation can reduce mortality in children over 6 months of age. Our study showed that vitamin A given at birth can also improve infant survival within the first 6 months of life," said Rolf D.W. Klemm, DrPH, MPH, the study's lead author and a researcher with the Bloomberg School's Center for Human Nutrition.

The study enrolled 15,937 newborns from rural communities in northwest Bangladesh, where over 90 percent of babies are born at home. Half were randomly selected to receive a 50,000 IU dose of vitamin A, while the other half received a placebo. A 200,000 IU dose of vitamin A is recommended semi-annually for older children. The vitamin A was given orally to the infants within a few days of birth, usually by 7 hours after delivery. The mortality rate for the vitamin A group was 38.5 deaths per 1,000 births compared to 45.1 deaths per 1,000 births for the non-vitamin A group.

Although vitamin A reduced infant deaths from all causes, lives were likely saved by reducing the severity of potentially fatal infections which are responsible for most deaths in early infancy in South Asia.

"This study supports the findings of previous vitamin A studies in Southern Asia where the evidence is now strong that vitamin A given to newborns can dramatically reduce mortality," said study co-author Keith West, DrPH, MPH, RD, the George G. Graham Professor in Infant and Child Nutrition at the Bloomberg School of Public Health. "More studies are urgently needed to determine if newborn vitamin A supplementation would reduce mortality among infants in other regions, especially Africa."

"We are excited by the results of this study, that build on two previous studies in South Asia, confirming this low cost intervention can significantly contribute to reducing mortality in the first 6 months of life," said Kent R. Hill, assistant administrator for Global Health at the U.S. Agency for International Development (USAID). He added, "A key next step is to consider the operational issues for using this intervention." In conjunction with other partners, USAID is conducting operations research in Nepal and Bangladesh to determine possible approaches for delivering vitamin A to newborn infants.

In the 1980s, Alfred Sommer, MD, MHS, demonstrated that vitamin A deficiency dramatically increased the risk of child mortality. Sommer, along with West and colleagues from Hopkins further demonstrated that a single dose of vitamin A could reduce child mortality by 34 percent. The control of vitamin A deficiency is a global goal of the World Health Organization and is considered one of the most cost-effective of all health interventions for saving young lives.

"Because childhood mortality is greatest during the first few months of life, a single dose of vitamin A administered by mouth to a newborn child can save the lives of an additional 300,000 children in Asia every year," said Alfred Sommer, MD, MHS, professor and dean emeritus of the Bloomberg School of Public Health. "That is on top of the one million lives a year that would be saved by dosing all vitamin A deficient children twice a year from six months through 5 years of age."

The research was supported by grants from the U.S. Agency for International Development and the Bill & Melinda Gates Foundation. Additional support was provided by the Sight and Life Research Institute, Nutrilite Health Institute, the Canadian International Development Agency and the National Integrated Population and Health Program of the Ministry of Health and Family Welfare of the government of the People's Republic of Bangladesh.

"Newborn Vitamin A Supplementation Reduced Infant Mortality in Rural Bangladesh" was written by Rolf D.W. Klemm, DrPH, MPH; Alain B. Labrique, MSc, MHS, PhD; Parul Christian, MPH, DrPH; Mahbubur Rashid, MBBS, MHS; Abu Ahmed Shamin, MSc; Joanne Katz, MS, ScD; Alfred Sommer, MD, MHS; and Keith West, DrPH, MPH, RD.

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Pregnancy associated with increased risk of heart attack

New study provides recommendations for diagnosing and managing condition

Although acute myocardial infarction (AMI) is rare in women of child-bearing age, pregnancy can increase a woman's risk of heart attack 3- to 4-fold, according to a study published in the July 15, 2008, issue of the Journal of the American College of Cardiology. Since women today may delay having children until later in life, and advances in reproductive medicine enable older women to conceive, the occurrence of AMI associated with pregnancy is expected to increase.

The study, authored by Arie Roth, M.D., Tel Aviv University in Israel, and Uri Elkayam, M.D., University of Southern California (USC), is a follow up to their initial report released in 1995. The report is based on a review of 103 women with pregnancy-related AMI in the last decade and outlines key recommendations for the diagnosis and treatment of this condition in pregnant women that also considers the health and safety of the developing baby.

"It's extremely important that physicians who take care of women during pregnancy and after delivery be aware of the occasional occurrence of AMI in pregnancy and not overlook symptoms in these young patients," said Dr. Elkayam, who is a professor of Medicine and Obstetrics and Gynecology at USC. "Although many of the standard principles for diagnosing and treating AMI in non-pregnant patients also apply to pregnant women, two patients need to be treated—the mother and her baby—and the health status of both should play a major role in the selection of diagnostic and therapeutic strategies."

Some of the standard diagnostic tests and medications (e.g., ACE inhibitors, angiotensin II receptor blockers (ARBs) and warfarin) used to manage AMI can be harmful to the baby, whether in the womb or through breastfeeding; therefore, their use should take into account potential risks and benefits. There is also limited evidence about the efficacy and safety of other commonly used drugs such as thrombolytic and antiplatelet therapy and devices such as drug-eluting stents, mainly because pregnant patients are routinely excluded from clinical trials.

"The good news is that we've seen a significant drop in maternal deaths related to AMI during and immediately following pregnancy in the last decade," said Dr. Elkayam. "Our initial report indicated a mortality rate of 20 percent, and nearly 40 percent was reported by other studies. In contrast, the new data suggest that only 5 percent to 10 percent of expectant and new mothers who have a heart attack die as a result."

The authors attribute this improvement to increased awareness, more aggressive clinical approaches to treating AMI in general, including standardized hospital protocols for screening and diagnosis, as well as the application of these approaches to pregnant women.

"Interestingly, the mechanism of AMI is somewhat different when it occurs in association with pregnancy. One in four women had a weakening and separation of the walls of the coronary arteries (coronary dissection), which is a rare cause of heart attack in the general population," explains Dr. Elkayam. "Another 13 percent had normal coronary arteries. These findings signify the need to establish the cause of AMI in pregnancy in order to decide on appropriate therapy."

At the same time, many patients reported standard risk factors for AMI, including smoking (45 percent), high cholesterol (24 percent), family history of heart attack (22 percent), high blood pressure (15 percent) and diabetes (11percent). These findings indicate that such risk factors are important even at younger ages and should be diagnosed early and treated aggressively.

Those who experienced AMI within 24 hours before or after delivery are twice as likely to die from heart attack as those who have a cardiac event before labor or postpartum (24 hours to three months after delivery). Overall, the majority of patients with stable AMI had a vaginal delivery, meaning that cesarean section should not be an automatic indication in patients who are stable, according to Dr. Elkayam.

This study is based on an extensive and systematic review of 103 cases of pregnancy-related AMI during the last decade, and compared them to 125 cases diagnosed prior to that time. Patients' ages ranged from 19 to 44 years, and older maternal age was shown to be a risk factor. The majority of patients (72 percent) were older than 30 years, and one in four was older than 35 years of age.

"We felt it was important to reexamine the literature about AMI related to pregnancy and provide updated recommendations for the diagnosis and management of heart attack in this group of women," said Dr. Elkayam. "It's been encouraging to see improvements in patient outcomes over the last 10 years, and we hope the guidelines presented in this paper will further increase awareness about AMI in pregnancy."

Dr. Elkayam reports no conflicts of interest related to this study.

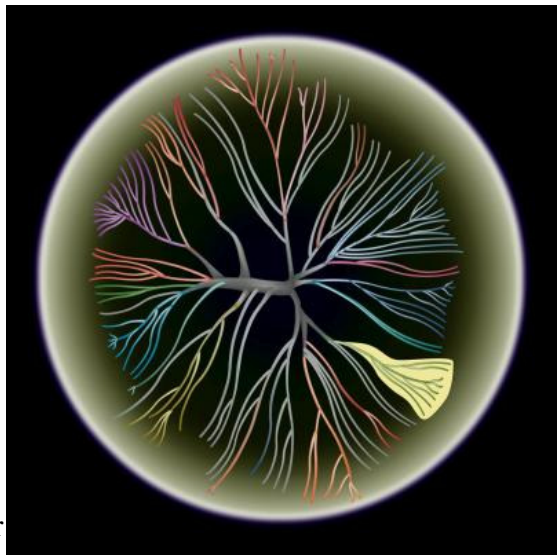
Can you hear me now?

LA JOLLA, CA — When it comes to cellular communication networks, a primitive single-celled microbe that answers to the name of Monosiga brevicollis has a leg up on animals composed of billions of cells. It commands a signaling network more elaborate and diverse than found in any multicellular organism higher up on the evolutionary tree, researchers at the Salk Institute for Biological Studies have discovered.

Their study, which will be published during the week of July 7-11 in the online edition of the Proceedings of the National Academy of Science, unearthed the remarkable count of 128 tyrosine kinase genes, 38 more than found in humans.

These kinases transmit essential signals for cell growth, stasis, and death. Though their activity is tightly regulated in normal cells, out-of-control kinases are a major cause of cancer. Many successful cancer drugs — such as Gleevec, which is used for the treatment of leukemia, — specifically target wayward tyrosine kinases.

This treasure trove of diverse and novel tyrosine kinases took the study's lead author Gerard Manning, who heads the Razavi-Newman Center for Bioinformatics, by surprise since it was long thought that tyrosine kinases are restricted to multicellular animals where they handle communication between cells.



"We were absolutely stunned," says Manning. "Based on past work, we had expected maybe a handful of these kinases but instead discovered that this primitive organism has a record number of them. Two other essential parts of the tyrosine kinase network - PTP and SH2 genes - are also more numerous than in any other genome, showing that it is the whole network that is elaborated here."

The 100 trillion cells in our bodies require elaborate communication systems to coordinating their activities. Tyrosine kinases, extremely well-studied enzymes that act as receivers for external cues such as a growth signals and relay their message within cells by attaching tiny phosphate groups to proteins, are a vital part or this communication system.

The phylogenetic tree, which shows the evolutionary relationship between all Monosiga tyrosine kinases, reveals that only a handful of them are related to human tyrosine kinases (yellow background). **Courtesy of Dr. Gerard Manning, Salk Institute for Biological Studies.**

At first glance, Monosiga brevicollis, which belongs to the group of choanoflagellates — microscopic, aquatic organisms that occupy the grey area between fungal and animal kingdoms — has little in common with multicellular animals that need to co-ordinate the activities of billions of cells. But its distinctive architecture – a collar of tentacle surrounding a whip-like tail known as flagellum – has the same basic structure as "collar cells" that aggregate to form sponges, which are considered the most primitive multicellular organisms or metazoans.

Because of their key evolutionary position, M. brevicollis was selected as a representative choanoflagellate for whole genome sequencing. "Choanoflagellates are like 'first cousins' of animals and their genome allows us a glimpse into the evolutionary origin of animals," says Manning.

The Monosiga kinases are more divergent than anything previously seen in animals, which may help scientists understand the fundamentals of how all tyrosine kinase signaling works. Despite their extreme diversity, Monosiga kinases time and again arrive at the same solution to a problem, as do animal kinases, but using a distinct method for instance to create a sensor structure that emerges from the cell, or to target a kinase to a specific part of the cell. "This convergent evolution suggests that there are only a limited number of ways build a functional network from these components," says Manning.

With all this new information, one obvious question remains unanswered: what is a single-celled organism doing with all this communications gear? "We don't have a clue!" says Manning, "but this discovery is the first step in finding out."

For more information, please go to: http://kinase.com/monosiga/

Researchers who also contributed to the work include Yufeng Zhai, Ph.D. from the Salk Institute, Susan L. Young, Ph.D., in the Center for Integrative Genomics at the University of California, Berkeley and W. Todd Miller, Ph. D. in the Department of Physiology and Biophysics at Stony Brook University, Stony Brook.

The work was supported by the NIH and the Razavi Newman Center for Bioinformatics.

New insight to demineralization

Scientists demonstrate amorphous silica dissolves by pathway similar to crystals

Blacksburg, Va. – From toothpaste to technology, noncrystalline or amorphous silica is an active ingredient in a myriad of products that we use in our daily lives. As a minor, but essential component of vertebrate bone, an understanding of silica reactivity in physiological environments is crucial to the development of successful biomedical implants and synthetic materials with bone-like properties.

One ongoing question is why solutions of water containing simple table salt or other electrolyte compounds (as in blood plasma for example) are able to break down noncrystalline silicas at speeds far faster than expected. Rates of decomposition by processes known as dissolution, or demineralization, are up to 100 times faster when the solutions contain little dissolved silica and suggest a means for controlling the speed of removal. Yet, traditional theory would say that the durability of amorphous solids, such as silica glasses, should change by a simple proportion to the amount of silica present in the dissolving solution.

In the July 7 , 2008 Online Early Edition of the Proceedings of the National Academy of Sciences (PNAS), Patricia Dove, professor of geosciences in the College of Science at Virginia Tech, and postdoctoral scientists Nizhou Han and Adam Wallace report that amorphous silica can dissolve by a nucleation process that was previously only viewed as possible in crystalline materials. The result is a very large increase in the rate of removal of ions from the surface of silica, which would not be predicted by classical theory.

In collaboration with James De Yoreo at the Molecular Foundry of the Lawrence Berkeley Laboratory, the Virginia Tech researchers demonstrate that structural order is not a requirement for a crystal-based model to describe dissolution when the reacting silica units are defined in terms of their coordination to the surface.

"This finding would seem heretical from the viewpoint of traditional thinking because classical nucleation theory is rooted in the concept that dissolution and growth occur by overcoming a barrier to forming a new phase within an existing phase," said Dove. "Because the transfer of units from a disordered amorphous surface to solution always leaves the surface free energy unchanged, the origin of a comparable energy barrier presents a paradox that is not easy to understand."

Using experimental and theoretical analyses, the paper explains this paradox and the dissolution behavior of silica glasses manufactured by different processes, a natural biologically produced silica, and a synthetic, dispersed or colloidal silica. Their findings present the basis for understanding how simple modulations in solution chemistry can tune the durability of silica in humid or wet environments. Moreover, the insights suggest a means by which one could use simple, environmentally benign solutions to regulate surface roughness at the nanoscale. "One example would be to add texture to a substrate surface for a biomedical application," said Dove "Or another could be to use a salt solution to clean a silica surface without toxic chemical compounds."

Dove and her research group study mineral nucleation, growth, and dissolution in projects focused on understanding the processes of biomineralization, mineral weathering, cementation, global elemental cycling, and climate proxy models. Using a bioinspired approach, much of their work is focused on establishing concepts used by Nature in biological and inorganic settings to understand underlying reaction mechanisms through direct, nanoscale measurements of mineral-water interactions and their kinetic and surface thermodynamic properties. Research in Dove's group is supported by the DOE Basic Energy Sciences, the NSF EAR program in Geobiology and Environmental Geochemistry and the NSF OCE program in Chemical Oceanography. For more information, visit Biogeochemistry of Earth Processes website. (www.geochem.geos.vt.edu/bgep/) Corresponding authors of the paper, "Kinetics of amorphous silica dissolution and the paradox of the silica polymorphs," are Dove at dove@vt.edu and De Yoreo at jjdeyoreo@lbl.gov.

Vaginal microbicides may prevent more infections in men than women

Researchers also say clinical-trial design may mask risk of drug resistance

Vaginal microbicides currently in clinical trials may be the only weapon that will protect women against infection from HIV. Yet, under likely circumstances, these microbicides may be of more benefit to men than women, according to a new UCLA AIDS Institute study.

The study, which used novel mathematical models to simulate clinical trials and population-level transmission of HIV, appears July 7 in the online issue of Proceedings of the National Academy of Sciences.

"At the moment, there is absolutely nothing that women can do to protect themselves from HIV —condoms are not in women's control," said senior study author Sally Blower, professor of psychiatry and biobehavioral sciences at the Semel Institute for Neuroscience and Human Behavior at UCLA and a member of the UCLA AIDS Institute. "Drug companies are developing vaginal microbicides to provide direct protection to women and basically empower them so women have some preventive measure that's under their control."

Microbicides are compounds that can be applied inside the vagina to protect against HIV and other sexually transmitted diseases. Pharmaceutical companies are currently conducting trials of second-generation microbicides that are based on antiretroviral, or ARV, drugs, Blower noted.

The UCLA study raises concerns that microbicides could lead to drug resistance if they are used by HIV-positive women and that this risk may be masked under current clinical trial designs — necessitating significant caution if the microbicides are licensed for use by the general public.

The researchers developed the mathematical models to determine if ARV-based microbicides that could cause moderate to high levels of drug resistance might pass clinical trials. They used epidemiological, clinical and behavioral data to construct models for both clinical trials and heterosexual transmission of HIV.

The models were based on the Phase 3 clinical trial for second-generation microbicides now under way in South Africa, Tanzania, Rwanda and Belgium. This trial is a 12-month, placebo-controlled study involving 10,000 participants.

The researchers developed simulations for two scenarios: one for high-risk microbicides, in which there is a high probability that the vagina will absorb dapivirine, the ARV drug in the microbicide; the other for low-risk microbicides, with a low probability of absorption. The team created the two scenarios because it is not currently known if ARV-based microbicides will be low- or high-risk.

The researchers found that men would likely benefit more than women if the microbicides' efficacy for women was less than 50 percent and if adherence was less than 60 percent. This would occur if HIV-positive women used microbicides and developed drug-resistant strains of HIV that are then less likely to be transmitted to men.

In the high-risk scenario, for instance, the microbicide could prevent infection in up to 21 percent of women and up to 27 percent of men. In the low-risk scenario, the microbicide would be of less benefit, preventing infection in up to 17 percent of women and 18 percent of men.

"The antiretroviral drugs within these microbicides are the same as those used to treat people who are infected with HIV, so there is great expectation that these microbicides will be very effective," said first author Dr. David Wilson, of the National Centre in HIV Epidemiology and Clinical Research at Australia's University of New South Wales.

"But the concern is that these microbicides are going to lead to drug resistance," he said.

The concern about drug resistance arises from the fact that women in the current clinical trial are being tested once a month for HIV infection and those found to be infected are dropped from the trial, according to researchers.

"Since monthly testing will take place in the dapivirine trial, we predict that few, if any, cases of acquired resistance will arise during the trial, even if the drug is readily absorbed (i.e., the microbicide is high risk)," the researchers write. "Therefore our analyses have shown that high-risk microbicides could pass Phase III trials, as their potential to cause resistance will be masked by frequent testing."

Other authors of the study are Paul Coplan, of the University of Pennsylvania School of Medicine, and Mark Wainberg, of McGill University's AIDS Centre at Montreal's Jewish General Hospital.

The International Partnership for Microbicides, the National Institute of Allergy and Infectious Diseases, and the Australian Research Council funded this study.

Crawling the Internet to track infectious disease outbreaks

Could Internet discussion forums, listservs, and online news outlets be an informative source of information on disease outbreaks? A team of researchers from Children's Hospital Boston and Harvard Medical School thinks so, and it has launched a real-time, automated data-gathering system called HealthMap to gather, organize and disseminate this online intelligence. They describe their project in this week's PLoS Medicine.

"Web-based electronic information sources," say John Brownstein and colleagues from the HealthMap project, "can play an important role in early event detection and support situational awareness by providing current, highly local information about outbreaks, even from areas relatively invisible to traditional global public health efforts."

However, information overload and difficulties in distinguishing "signal from noise" pose substantial barriers to fully using this information. To overcome these problems, the authors created the freely accessible HealthMap Project (www.healthmap.org), which they describe as a "multistream real-time surveillance platform that continually aggregates reports on new and ongoing infectious disease outbreaks." These reports are organized and disseminated in a variety of ways, including creating disease maps and "situational awareness windows."

Ultimately, say Brownstein and colleagues, the use of news media and other nontraditional sources of surveillance data can "facilitate early outbreak detection, increase public awareness of disease outbreaks prior to their formal recognition, and provide an integrated and contextualized view of global health information."

***Citation**: Brownstein JS, Freifeld CC, Reis BY, Mandl KD (2008) Surveillance sans frontières: Internet-based emerging infectious disease intelligence and the HealthMap project. PLoS Med 5(7): e151. doi:10.1371/journal.pmed.0050151.*

http://medicine.plosjournals.org/perlserv/?request=get-document&doi=10.1371/journal.pmed.0050151

PRESS-ONLY PREVIEW OF THE ARTICLE: http://www.plos.org/press/plme-05-07-brownstein.pdf

Japanese encephalitis virus causes 'double trouble' to brain

Japanese encephalitis (JE), commonly known as brain fever, is one of the prevalent mosquito-borne encephalitis in India and entire South East (SE) Asia. Besides resulting in thousand fatalities each year, JE virus (JEV) infection causes prominent neurological sequelae in approximately one-third of the survivors. Even those patients in the good recovery group commonly encounter psychiatric problems, which include mental retardation, learning disabilities, speech and movement disorders and behavioural abnormalities.

Recent research in National Brain Research Center, Manesar, India by Dr. Anirban Basu and his graduate student, Sulagna Das have shown that JE virus damages the brain in two ways, by not only killing brain cells but by preventing the birth of new cells from neural stem/progenitor cells (NPC) and depleting the NPC pool in the brain. "It's a double hit to the brain, the JE virus causes brain injury by killing neurons as well as prevents its repair" lead researcher and the senior author of the work Anirban Basu said in a statement.

The children are more vulnerable targets of this virus, which causes massive neuronal loss in the Central Nervous System. "Children are at a dynamic stage of brain development, hence infection at this stage can have devastating effects on mental functions later in life. Our study has tried to explore how JEV infection leads to development of long-term cognitive deficits in the survivors", says Dr. Anirban Basu who has been working in the neurobiology of JEV infection for the past 4 years. These findings have been published online in a paper in Journal of Neurochemistry for inclusion in a future issue of the journal.

"The breakthrough here is that the JE virus prevents neural stem and progenitor cells in the brain from dividing; it hangs them up," Basu said. "It's the first time that a mosquito-borne virus has ever been shown to affect neural stem cells." The progressive infection in these cells eventually results in decrease in proliferation ability, providing a possible explanation for their diminished pool upon infection," said Basu. He also went on to state, "The neurological and cognitive deficits in the JE survivors could be related to the drop in NPC cells in the neurogenic region of the brain called the subventricular zone".

Neural stem/progenitor cells are the saviours of the brain following any insult or infection and via the process of neurogenesis help the recovery process. These cells have the ability to self-renew over lifetime and generate both neurons and glia, which make up the CNS. The initial work with neural stem cells in cell culture dishes interestingly showed that unlike neurons, these stem cells are a resilient population and do not undergo robust cell death upon JEV infection. Instead, the virus lowers the NPC pool by disrupting the growth kinetics and the proliferative ability of these cells. The study was extended in mouse models of JE, where a significant decrease in the actively proliferating NPCs was observed in the subventricular zone or the primary niche of post-natal neurogenesis.

The possible mechanism by which JEV reduces the proliferating NPC pool was also worked out by the scientists utilising the cell cycle studies. Sustained proliferation is a key feature of NPCs, which have to pass through various cell cycle checkpoints and phases of division. Upon JEV infection, these cells halt at the resting phase and fail to proceed to the dividing S-phase. Both cell culture and animal studies indicate that JEV inhibits the DNA synthesis in these cells during progressive infection and induces cycle arrest in them. The researchers went on to show that the virus leads to increased expression of certain checkpoint proteins that block the transition of cells to S-phase, thus preventing the NPCs from multiplying.

Over the years, JE has become a major cause of mortality and morbidity in wide areas of SE Asia. The very high incidence of permanent and disabling neurological sequelae has considerable socioeconomic impact. "Knowing the mechanism, we can start to approach this therapeutically" Basu said. "This indicates that we might eventually treat this form of neurological and psychiatric problems by either ramping up brain repair or protecting the repair mechanism," Das added.

Baseball diamonds: the lefthander's best friend

By Tony Fitzpatrick

That's because the game was designed to make a lefty the "Natural," according to David A. Peters, Ph.D., the McDonnell Douglas Professor of Engineering at Washington University in St. Louis and über baseball fan. Peters is a mechanical engineer who specializes in aircraft and helicopter engineering and has a different approach to viewing America's Favorite Pastime.

First of all, some numbers.

"Ninety percent of the human population is right-handed, but in baseball 25 percent of the players, both pitchers, and hitters, are left-handed," said Peters, a devoted St. Louis Cardinal fan who attended "Stan the Man's" last ball game at Sportsman's Park in 1963. "There is a premium on lefthanders for a number of reasons. For starters, take seeing the ball.

"A right-handed batter facing a right-handed pitcher actually has to pick up the ball visually as it comes from behind his (the batter's) left shoulder. The left-handed batter facing the right-handed pitcher has the ball coming to him, so he has a much clearer view of pitches."

Then, Peters says, consider the batter's box. After a right-hander connects with a ball, his momentum spins him toward the third-base side and he must regroup to take even his first step toward first base. In contrast, the left-hander's momentum carries him directly toward first.

"The left-handed batter has a five-foot advantage over the right-handed batter," says Peters. "And that means the lefty travels the 90 feet to first roughly one-sixth of a second faster than the righty. That translates to more base hits for the left-hander, whether singles or extra base hits because lefties are getting to the bases more quickly."

Even Jim Thome and Jason Giambi?

The left-handed pitcher generally is much more difficult to steal off, as, from his stretch, he peers directly at the runner; the right-hander must look over his shoulder and wheel to first base, giving the runner more of a warning of the pitcher's intent.

Positions advantageous to southpaws are pitching, first base and right field. For the positions, the advantage is the favorable angles lefties get, enabling them to throw the ball more quickly across the diamond to second, third and home. One position a lefty rarely plays is catcher, for the obvious reason that it is difficult for a southpaw catcher to throw over so many right-hand batters.

"It wasn't all that long ago when first basemen were predominantly left-handed and most right fielders were left-handed," Peters says. "That has changed, at least since the late sixties."

There's even a bias toward the lefthander in ballpark design. Right field in most parks (just think of Yankee Stadium and Fenway Park) is usually shorter than left field because of the preponderance of right-handed hitters.

While traditional thinking holds that the right-handed batter has the advantage over the left-handed pitcher, because the breaking ball goes into the batter's power threshold, it's not always the case, says Peters. And it's that familiarity thing again.

"Because only 10 percent of the population is left-handed, kids grow up and mature in baseball seeing a left-hander just 10 percent of the time they bat," he says. "So, it can be hard for both lefties and righties to face a southpaw. It's why some left-handed batters look dreadful matched against a lefty."

Some batters don't like facing southpaws because their ball is purported to have a natural movement away from a right-hander and into a lefty.

"There's no scientific evidence to support this, but I wonder if lefties get that movement from learning to write in a right-hander's world," Peters says.

Wasps use parasitic mites as baby bodyguards

* 12:49 07 July 2008
* NewScientist.com news service
* **Helen Thomson**

Parasitic mites have been found to attack intruders in nests of potter wasps

Parents will go a long way to protect their children, and one type of wasp goes as far as offering a home to a parasitic mite that helps fight off intruders at its nest.

After breeding, potter wasps (Allodynerus delphinalis) build a nest and lay eggs inside cavities that contain food and are sealed with mud and saliva. But the insect's offspring are threatened by parasitic wasps that try to invade the nest and lay their eggs inside the cavities. This kills the baby potter wasp in the process.

Ensliniella parasitica, is a parasitic mite known to feed on the potter wasp's haemolymph, a vital circulatory fluid that is rich in nutrients. Inside a nest, some mites move to the cavities, feeding on the food stores and the baby wasp without damaging the developing offspring. But the mite was thought to offer nothing to the potter wasps in return.

Now, Kimiko Okabe and Shun'ichi Makino from the Forestry and Forest Products Research Institute in Tsukuba, Japan, have found that the mites actually serve as tiny bodyguards, attacking parasitic wasps that venture into a host's nest.

It was a surprising discovery since the mites normally show no aggressive behaviour. "None of astigmatid mites, which include this species, were previously known to attack other species, particularly ones larger than themselves," Okabe says.

Pocket protectors

By studying the behaviour of host and mite under lab conditions, the researchers discovered that the mites will surround and kill a parasitic wasp when it enters a potter wasp nest.

The mites are not adapted to killing the parasitic wasps. Instead, Okabe suspects that they haphazardly injure the parasitic wasp by clinging onto it, in the same way that they cling to their host to feed.

The mites do not always repel an intruder successfully. If fewer than six mites attacked an intruder they were themselves killed off. Six or more mites killed the intruder 70% of the time and ten always killed it.

The Japanese study is the first of to show a mutual partnership that involves adult costs directly benefiting one partner's offspring.

Potter wasps even have little pockets on their body called acarinaria that offer a comfy home for parasitic mites. Each acarinaria usually contains more than six mites and Okabe is now interested in working out how this magic number is maintained.

Journal reference: Proceedings of the Royal Society B (DOI: 10.1098/rspb.2008.0586)

Love really is blind, or at least blinkered

* 13:47 07 July 2008
* NewScientist.com news service
*** Rachel Nowak**

Love is blind, said Shakespeare. Now it seems there may be some truth in the bard's words.

Researchers have found that people who are in love pay less visual attention to attractive people of the opposite sex.

Jon Maner at Florida State University in Tallahassee, US, and colleagues asked 57 students in heterosexual relationships to write about occasions they felt extreme love towards their partner. Another 56 students wrote about feeling extreme happiness.

The students then viewed 500 microsecond flashes of 60 photos, comprising equal numbers of highly attractive men, highly attractive women, average-looking men, and average-looking women.

As the faces disappeared, a square or a circle appeared elsewhere on the screen. The students were instructed to identify the object as quickly as possible – a measure of a person's visual attention at a subconscious level.

Students primed with thoughts of love took significantly less time to identify shapes after viewing an attractive face of the opposite sex, compared with those who had written essays on happiness.

Repulsive beauty

"We found that when people just thought about being in love with their current partner, their visual attention got repelled, rather than grabbed, by an attractive member of the opposite sex," says Maner. The finding may help explain why those in love do not seek out other, perhaps better, mates.

"[The repulsion] happens at the very initial stages of visual processing, at the very first moment they are aware of the photo," says Maner.

Previous studies had suggested that people in committed relationships put less value on potential alternative partners. For example, they will claim to find potential alternative partners less attractive than single people do.

But what has been unclear – until now – is whether that is what they really think, or whether they are trying to convince themselves that they have made the right choice. In the current study, the repulsive affect was so rapid, that the students would not have been able to exert conscious control over it.

Evolutionary advantage

Only attractive potential partners appear to have the repelling affect, as the two groups of students took the same time to identify the shapes when viewing average-looking faces, or faces of the same sex.

"Psychologists have long had a problem explaining the functions of romantic love: a very strong emotion that sometimes seems to take over our lives and lead to what appear to be irrational feelings and actions," says Joseph Forgas, a social psychologist at the University of New South Wales in Sydney.

"What these studies suggest is that romantic love serves a very important function, tempering our natural desire to pay attention to, and to continuously seek out, the best available mate," he says.

A subconscious repulsion by attractive members of the opposite sex could have evolved because committed relationships may provide a reproductive advantage by improving the chances that offspring survive.

Journal reference: Evolution and Human Behaviour (DOI: 10.1016/j.evolhumbehav.2008.04.003)

Really?

The Claim: Beware of Drink Mixers Based on Diet Soda

By ANAHAD O'CONNOR

THE FACTS Usually it is solely the liquor component of a cocktail — not the mixer — that determines its inebriating effects. But some people contend the artificial sweeteners in diet soda speed the absorption of alcohol.

Odd, perhaps, but research suggests it's true. In a 2006 study, a team of scientists recruited healthy subjects and had them consume vodka cocktails. On some occasions, it was a 20-ounce drink mixed with a sugar-sweetened beverage, and on others it was a nearly identical drink mixed instead with a diet beverage.

In the diet-mixer conditions, the alcohol entered the subjects' bloodstream about 15 minutes faster, and their blood-alcohol concentration was higher, peaking at 0.05 percent, compared with 0.03 percent with the regular mixer.

One theory is that the alcohol is absorbed more quickly because there is no sugar to slow it down, which would mean that club soda would have a similar effect. A second study in 2007 also showed that alcohol was absorbed far more quickly when mixed with carbonated beverages than with flat mixers, possibly because of the effervescence. As a result, experts say, it's best to choose flat mixers like orange or cranberry juice over diet sodas or juices.

THE BOTTOM LINE Compared with sugar-sweetened drinks, artificial sweeteners can speed inebriation.

Vital Signs

Prevention: Rotavirus Vaccine Said to Be Working

By NICHOLAS BAKALAR

The vaccine against rotavirus, first offered last fall, appears to be working. The Centers for Disease Control and Prevention reports a marked reduction in incidence in the 2007-8 season compared with average seasons from 1991 to 2006.

Rotavirus causes severe acute gastroenteritis among infants and young children, and results in tens of thousands of hospitalizations every year. It is grueling for child and parent alike. "It's different from other gastrointestinal diseases," said Daniel Payne, an epidemiologist with the disease centers. "It involves five to seven days of high fever, vomiting and diarrhea. It only kills a few dozen a year, but it is a huge burden."

Compared with the average for the seven preceding seasons, the number of children who had to be tested for the virus fell 37 percent, and the number of positive tests was 78.5 percent lower.

The vaccine is administered orally, Dr. Payne said, and it is very well tolerated. The researchers write in The Morbidity and Mortality Weekly Report for June 27 that the changes in rotavirus activity appear greater than could be accounted for by vaccine use alone, and that there are indirect benefits to unvaccinated children who are protected by a general reduction in transmission.

Cases

Not a Moment Too Soon, I Thought of Tim Russert

By MICHAEL BICKS

Katherine Streeter

Most Saturday mornings, I bicycle with a group of men, mostly in their 50s, whom I affectionately call the Cheat Death group. We are all in pretty good shape, competitive but supportive, and convinced that hard-core exercise is our ticket to postponing the inevitable.

The ride a few Saturdays back was a tough one. At 6:30 a.m., the pack took off fast and immediately headed for the hills near Durham, N.H. The first few climbs felt pretty good, but by the third hill I started to feel nauseated.

Figuring that was probably a result of the four beers and large Chinese dinner the night before, I kept going. Twenty-five miles into the ride, I had fallen to the back of the pack. I was short of breath and wondering how I was going to make it much farther.

I am someone who hates to quit. But after the third time the group had to stop and wait for me, I decided I had no choice. I watched them pedal away, then lay down in the grass.

I was angry and scared. For the first time my body had given out on me, and I had no clue what was going on. Besides the nausea, my only symptoms were a persistent cough and an overwhelming feeling that something was not right.

I called my wife and got a ride home.

After showering, I lay down in bed and started thinking. Though I am a 50-year-old guy with a stressful job and a little too much around the middle, I had a clean bill of health. I had good cholesterol numbers and a great doctor, and recently I had passed a cardiac stress test.

That's when Tim Russert popped into my head. In the last couple of weeks, like almost every middle-age man, I had taken a very personal interest in every detail of his story. Yes, he was overweight. But hadn't he just passed a stress test?

That's when the light went on. I bolted out of bed, went to the computer and Googled "How do you know you are having a heart attack?" The first Web site that popped up was a list of warning signs from the American Heart Association. As I read on, I started to sweat.

"Nausea." Check.

"Shortness of breath." Check.

"Chest discomfort." Perhaps, though it really didn't feel like much.

Ignoring the Web site's advice to call 911 (I was too vain to have an ambulance pull up to my house), I drove to the hospital.

When I stepped up to admissions desk the nurse asked why I was there. "Mild chest pains," I said. "How old?" she asked. "Fifty," I replied.

She nonchalantly turned to the orderly and said, "Hey, Lenny, we got another one." I guess many men, stunned by Mr. Russert's sudden death, were doing just the same thing I was.

A doctor attached some wires to my body and conducted a quick EKG. "Mr. Bicks," he said minutes later, "you are suffering a heart attack."

"Are you sure?"

"Yes," he answered, then produced those squiggly lines on the graph paper. I swore. Then I called my wife and I started to cry.

This is one of those times that defines your life, like the death of a parent or the birth of a child. In a split-second, you cross the invisible "before and after" line and realize that nothing is ever going to be the same. For that moment my life had been removed from my hands. But I kept thinking, I'm supposed to be invulnerable. I'd passed a stress test, drank red wine, used a lot of olive oil, exercised like an insane person. This could not possibly be happening to me.

The doctor took out a large needle full of a sedative. The rest is a blur: a trip in an ambulance to a larger hospital, sirens blaring, an hour on the table in a cath lab, a stent implanted to open the blocked artery, my wife crawling tearfully into my bed to give me a hug, a doctor showing me before-and-after pictures of my artery, and losing his temper when I asked when I might return to work.

As in Tim Russert's case, there were no warning signs. No sign I was suffering from coronary artery disease. A piece of plaque in one of my arteries just broke off and created a massive blood clot. When it did, I suffered a severe heart attack. If I had not gone to the hospital, I might very well have died.

Because at the right moment I thought of Tim Russert, I am one of the lucky ones. I get to hug my wife and my kids, understand how wonderful my friends are and realize exactly how much I love my life. It is a debt I can never repay. *Michael Bicks produces documentaries for ABC News.*

Kaiser Permanente study finds keeping a food diary doubles diet weight loss

Study is 1 of few trials to recruit large percentage of African American participants

July 8, 2008 (Portland, Ore.) – Keeping a food diary can double a person's weight loss according to a study from Kaiser Permanente's Center for Health Research. The findings, from one of the largest and longest running weight loss maintenance trials ever conducted, will be published in the August issue of the American Journal of Preventive Medicine.

Funded by the National Heart, Lung and Blood Institute at the National Institutes of Health, the study is one of the few studies to recruit a large percentage of African Americans as study participants (44 percent). African Americans have a higher risk of conditions that are aggravated by being overweight, including diabetes and heart disease. In this study, the majority of African American participants lost at least nine pounds of weight, which is higher than in previous studies.

"The more food records people kept, the more weight they lost," said lead author Jack Hollis Ph.D., a researcher at Kaiser Permanente's Center for Health Research in Portland, Ore. "Those who kept daily food records lost twice as much weight as those who kept no records. It seems that the simple act of writing down what you eat encourages people to consume fewer calories."

In addition to keeping food diaries and turning them in at weekly support group meetings, participants were asked to follow a heart-healthy DASH (a Dietary Approaches to Stop Hypertension) diet rich in fruits and vegetables and low-fat or non-fat dairy, attend weekly group sessions and exercise at moderate intensity levels

for at least 30 minutes a day. After six months, the average weight loss among the nearly 1,700 participants was approximately 13 pounds. More than two-thirds of the participants (69 percent) lost at least nine pounds, enough to reduce their health risks and qualify for the second phase of the study, which lasted 30 months and tested strategies for maintaining the weight loss.

"More than two-thirds of Americans are overweight or obese. If we all lost just nine pounds, like the majority of people in this study did, our nation would see vast decreases in hypertension, high cholesterol, diabetes, heart disease and stroke," said study co-author Victor Stevens, Ph.D., a Kaiser Permanente researcher. For example, in an earlier study Stevens found that losing as little as five pounds can reduce the risk of developing high blood pressure by 20 percent.

The Kaiser Permanente Care Management Institute's Weight Management Initiative (http://www.kpcmi.org/weight-management/index.html) has recommended food journaling as a strategy for losing weight since 2002. The Weight Management Initiative unites clinicians, researchers, insurers, and policymakers to identify practical, effective, non-surgical approaches for the prevention and treatment of overweight and obesity.

"Keeping a food diary doesn't have to be a formal thing. Just the act of scribbling down what you eat on a Post-It note, sending yourself e-mails tallying each meal, or sending yourself a text message will suffice. It's the process of reflecting on what you eat that helps us become aware of our habits, and hopefully change our behavior," says Keith Bachman, MD, a Weight Management Initiative member. "Every day I hear patients say they can't lose weight. This study shows that most people can lose weight if they have the right tools and support. And food journaling in conjunction with a weight management program or class is the ideal combination of tools and support."

The study, coordinated by the Kaiser Permanente Center for Health Research in Portland, also was conducted at Duke University Medical Center, Pennington Biomedical Research Center, and Johns Hopkins University. In addition to Hollis and Stevens, the Kaiser Permanente research team included William M. Vollmer, Ph.D.; Cristina M. Gullion, Ph.D.; Kristine Funk, M.S.; and Daniel Laferriere, MR. Other study co-authors included Phillip J. Brantley, Ph.D. and Catherine M. Champagne, Ph.D. at Pennington; Jamy D. Ard, MD, at the University of Alabama at Birmingham; Thomas P. Erlinger, MD, MPH, at the University of Texas; Lawrence J. Appel, M.D., and Arlene Dalcin at Johns Hopkins; Pao-Hwa Lin, Ph.D., and Laura P. Svetkey, MD, at Duke University; Carmen Samuel-Hodge, Ph.D. from the University of North Carolina at Chapel Hill; and Catherine M. Loria, Ph.D., at the National Heart, Lung, and Blood Institute and National Institutes of Health.

Brain chemical shown to induce both desire and dread

Dopamine's opposing effects separated by a few millimeters in the brain

Washington, DC — The chemical dopamine induces both desire and dread, according to new animal research in the July 9 issue of The Journal of Neuroscience. Although dopamine is well known to motivate animals and people to seek positive rewards, the study indicates that it also can promote negative feelings like fear. The finding may help explain why dopamine dysfunction is implicated not only in drug addiction, which involves excessive desire, but in schizophrenia and some phobias, which involve excessive fear.

"This study changes our thinking about what dopamine does," said Howard Fields, MD, PhD, of the University of California, San Francisco, an expert unaffiliated with the study. "There is a huge body of evidence out there to support the idea that dopamine mediates positive effects, like reward, happiness, and pleasure. This study says, it does do that, but it can also promote negative behaviors through actions in an adjacent brain area," Fields said.

Kent Berridge, PhD, and his colleagues at the University of Michigan, identified dopamine's dual effect on the nucleus accumbens, a brain region that motivates people and animals to seek out pleasurable rewards like food, sex, or drugs, but is also involved in fear. They found that inhibiting dopamine's normal function prevented the nucleus accumbens neurons from inducing both rewarding and fearful behaviors, suggesting that dopamine is important in both.

In previous research, Berridge and colleagues showed that a distance of only a few millimeters separated desire and dread functions in the nucleus accumbens (which is only about 5 millimeters long in humans). Because dopamine is an important neurotransmitter in this brain structure, the researchers investigated its role in generating these functions in the current study.

When dopamine was allowed to act normally, injection of a chemical to model normal signaling in the front of the nucleus accumbens caused rats to eat nearly three times as much as they normally do. In contrast, injection of the chemical in the back of the nucleus accumbens caused rats to display fearful behavior normally shown in response to a predator.

"It has always been assumed that discrete neurotransmitters might separate fear from desire, but this report shows that transmitters such as dopamine play a constant role and that the anatomy is providing for emotional

discretion," said Peter Kalivas, PhD, at the Medical University of South Carolina, who was unaffiliated with the study.

Berridge speculates that disruption of dopamine neurotransmission in one region of the nucleus accumbens may be a mechanism for pathological excesses of fear in disorders such as schizophrenia, whereas disruptions in dopamine neurotransmission in an adjacent region may be a mechanism for excessive reward-seeking in conditions like addiction.

The research was supported by the National Institute of Mental Health and the National Institute on Drug Abuse.

Do we think that machines can think?

When our PC goes on strike again we tend to curse it as if it was a human. The question of why and under what circumstances we attribute human-like properties to machines and how such processes manifest on a cortical level was investigated in a project led by Dr. Sören Krach and Prof. Tilo Kircher from the RWTH Aachen University (Clinic for Psychiatry and Psychotherapy) in cooperation with the Department of "Social Robotics" (Bielefeld University) and the Neuroimage Nord (Hamburg). The findings are published July 9 in the online, open-access journal PLoS ONE.

Almost daily, new accomplishments in the field of human robotics are presented in the media. Constructions of increasingly elaborate and versatile humanoid robots are reported and thus human-robot interactions accumulate in daily life. However, the question of how humans perceive these "machines" and attribute capabilities and "mental qualities" to them remains largely undiscovered.

In the fMRI study, reported in PLoS ONE, Krach and colleagues investigated how the increase of human-likeness of interaction partners modulates the participants' brain activity. In this study, participants were playing an easy computer game (the prisoners' dilemma game) against four different game partners: a regular computer notebook, a functionally designed Lego-robot, the anthropomorphic robot BARTHOC Jr. and a human. All game partners played an absolutely similar sequence, which was not, however, revealed to the participants.

The results clearly demonstrated that neural activity in the medial prefrontal cortex as well as in the right temporo-parietal junction linearly increased with the degree of "human-likeness" of interaction partners, i.e. the more the respective game partners exhibited human-like features, the more the participants engaged cortical regions associated with mental state attribution/mentalizing.

Further, in a debriefing questionnaire, participants stated having increasingly enjoyed the interactions most when their respective interaction partners displayed the most human features and accordingly evaluated their opponents as being more intelligent.

This study is the first ever to investigate the neuronal basics of direct human-robot interaction on a higher cognitive level such as mentalizing. Thus, the researchers expect the results of the study to impact long-lasting psychological and philosophical debates regarding human-machine interactions and especially the question of what causes humans to be perceived as human.

Why musicians make us weep and computers don't

Music can soothe the savage breast much better if played by musicians rather than clever computers, according to a new University of Sussex-led study published in the online, open-access journal PLoS ONE.

Neuroscientists looked at the brain's response to piano sonatas played either by a computer or a musician and found that, while the computerised music elicited an emotional response – particularly to unexpected chord changes - it was not as strong as listening to the same piece played by a professional pianist.

Senior research fellow in psychology Dr Stefan Koelsch, who carried out the study with colleagues at the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, played excerpts from classical piano sonatas to twenty non-musicians and recorded electric brain responses and skin conductance responses (which vary with sweat production as a result of an emotional response).

Although the participants did not play instruments and considered themselves unmusical, their brains showed clear electric activity in response to musical changes (unexpected chords and changes in tonal key), which indicated that the brain was understanding the "musical grammar". This response was enhanced, however, when the sonatas were played by musicians rather than a computer.

Dr Koelsch said: "It was interesting for us that the emotional reactions to the unexpected chords were stronger when played with musical expression. This shows us how musicians can enhance the emotional response to particular chords due to their performance, and it shows us how our brains react to the performance of other individuals."

The study also revealed that the brain was more likely to look for musical meaning when the music was played by a pianist.

"This is similar to the response we see when the brain is responding to language and working out what the words mean," says Dr Koelsch. "Our results suggest that musicians actually tell us something when they play The brain responses show that when a pianist plays a piece with emotional expression, the piece is actually perceived as meaningful by listeners, even if they have not received any formal musical training."

For information about Dr Stefan Koelsch, visit: http://www.sussex.ac.uk/psychology/profile198964.html. For information about the Max Planck Institute for Human Cognitive and Brain Sciences, visit: http://www.cbs.mpg.de.

Sex really does get better with age

Research paper: Secular trends in self reported sexual activity and satisfaction in Swedish 70 year olds: Cross sectional survey of 4 populations, 1971-2001

An increasing number of 70 year olds are having good sex and more often, and women in this age group are particularly satisfied with their sex lives, according to a study published today on BMJ.com.

Knowledge about sexual behaviour in older people (70 year olds) is limited and mainly focuses on sexual problems, less is known about "normal" sexual behaviour in this age group.

Nils Beckman and colleagues from the University of Gothenburg in Sweden, studied attitudes to sex in later life among four representative population samples of 70 year olds in Sweden, who they interviewed in 1971-2, 1976-7, 1992-3, and 2000-1. In total, over 1 500 people aged 70 years were interviewed about different aspects of their sex lives including sexual dysfunctions, marital satisfaction and sexual activity.

The authors found that over the thirty year period the number of 70 year olds of both sexes reporting sexual intercourse increased: married men from 52% to 68%, married women from 38% to 56%, unmarried men from 30% to 54%, and unmarried women from 0.8% to 12%.

In addition, the number of women reporting high sexual satisfaction increased, more women reported having an orgasm during sex and fewer reported never having had an orgasm.

While the proportion of women reporting low satisfaction with their sex lives decreased, the proportion of men reporting low satisfaction increased. The authors suggest that this might be because it is now more acceptable for men to admit "failure" in sexual matters.

They also note that the number of men reporting erectile dysfunction deceased, whereas the proportion reporting ejaculation dysfunction increased, but the proportion reporting premature ejaculation did not change.

Interestingly, both men and women blame men when sexual intercourse stops between them. This finding replicates the results of other studies in the 1950s and 2005-06.

"Our study…shows that most elderly people consider sexual activity and associated feelings a natural part of later life", they conclude.

These findings emphasise the important and positive part sex plays in the lives of 70 year olds and is a welcome contribution to the limited literature about sexual behaviour in older people, writes Professor Peggy Kleinplatz from the University of Ottawa in Canada.

It will hopefully highlight the need for doctors to be trained to ask all patients, regardless of age, about their sexual concerns, she adds.

Fossil feathers preserve evidence of color, say Yale scientists

New Haven, Conn. — The traces of organic material found in fossil feathers are remnants of pigments that once gave birds their color, according to Yale scientists whose paper in Biology Letters opens up the potential to depict the original coloration of fossilized birds and their ancestors, the dinosaurs.

Bird fossil from the Oligocene epoch, approximately 30 million years old.: M.Marsland/Yale

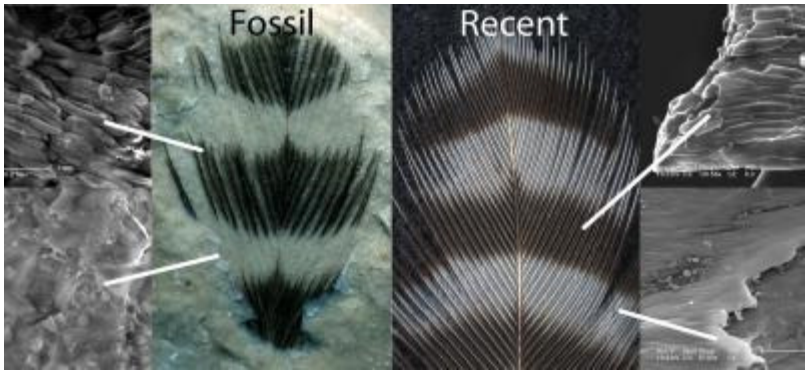
Closer study of a number of fossilized bird feathers by Yale PhD student Jakob Vinther revealed that organic imprints in the fossils — previously thought to be carbon traces from bacteria — are fossilized melanosomes, the organelles that contain melanin pigment.

"Birds frequently have spectacularly colored plumage which are often used in camouflage and courtship display," said Vinther. "Feather melanin is responsible for rusty-red to jet-black colors and a regular ordering of melanin even produces glossy iridescence. Understanding these organic remains in fossil feathers also demonstrates that melanin can resist decay for millions of years."

Working with Yale paleontologist Derek E. G. Briggs and Yale ornithologist Richard O. Prum, Vinther analyzed a striped feather found in 100 million-year-old rocks from the Lower Cretaceous Period in Brazil. The team used a scanning electron microscope to show that dark bands of the feather preserved the arrangement of

the pigment-bearing structures as a carbon residue — organized much as the structures are in a modern feather. The light bands showed only rock surface.

Striped fossil feather and recent woodpecker feather. Under the scanning electron microscope there are melanosomes in the dark but not the light areas (left arrows) of the fossil. For comparison, melanosomes from a broken black feather and a white feather are shown (right arrows). **J.Vinther/Yale**



In another fossil of a bird from the Eocene Epoch — 55 million years ago — in Denmark there were similar traces in the feathers surrounding the skull. That fossil also preserved an organic imprint of the eye and showed structures similar to the melanosomes found in eyes of modern birds.

"Many other organic remains will presumably prove to be composed of melanin," said Vinther. He expects that fur of ancient mammals and skin from dinosaurs preserved as organic imprints will likely be the remains of the melanin.

"Now that we have demonstrated that melanin can be preserved in fossils, scientists have a way to reliably predict, for example, the original colors of feathered dinosaurs," said Prum, who is the William Robertson Coe Professor of Ornithology and chair of the Department of Ecology and Evolutionary Biology, as well as curator of ornithology at Yale's Peabody Museum of Natural History.

Briggs is professor of geology and geophysics and director of Yale's Peabody Museum of Natural History. Another co-author, Vinodkumar Saranathan, is a doctoral student in the Prum Laboratory. The research was funded by the National Science Foundation and completed while Briggs was a Humboldt Award holder at the University of Bonn.

***Citation**: Biol.Lett. (July 9, 2008)*

Wake Forest researchers say popular fish contains potentially dangerous fatty acid combination

Tilapia low in omega-3s, high in omega-6s

WINSTON-SALEM, N.C. – Farm-raised tilapia, one of the most highly consumed fish in America, has very low levels of beneficial omega-3 fatty acids and, perhaps worse, very high levels of omega-6 fatty acids, according to new research from Wake Forest University School of Medicine.

The researchers say the combination could be a potentially dangerous food source for some patients with heart disease, arthritis, asthma and other allergic and auto-immune diseases that are particularly vulnerable to an "exaggerated inflammatory response." Inflammation is known to cause damage to blood vessels, the heart, lung and joint tissues, skin, and the digestive tract.

"In the United States, tilapia has shown the biggest gains in popularity among seafood, and this trend is expected to continue as consumption is projected to increase from 1.5 million tons in 2003 to 2.5 million tons by 2010," write the Wake Forest researchers in an article published this month in the Journal of the American Dietetic Association.

They say their research revealed that farm-raised tilapia, as well as farmed catfish, "have several fatty acid characteristics that would generally be considered by the scientific community as detrimental." Tilapia has higher levels of potentially detrimental long-chain omega-6 fatty acids than 80-percent-lean hamburger, doughnuts and even pork bacon, the article says.

"For individuals who are eating fish as a method to control inflammatory diseases such as heart disease, it is clear from these numbers that tilapia is not a good choice," the article says. "All other nutritional content aside, the inflammatory potential of hamburger and pork bacon is lower than the average serving of farmed tilapia."

The article notes that the health benefits of omega-3 fatty acids, known scientifically as "long-chain n-3 polyunsaturated fatty acids" (PUFAs), have been well documented. The American Heart Association now recommends that everyone eat at least two servings of fish per week, and that heart patients consume at least 1 gram a day of the two most critical omega-3 fatty acids, known as EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid).

But, the article says, the recommendation by the medical community for people to eat more fish has resulted in consumption of increasing quantities of fish such as tilapia that may do more harm than good, because they contain high levels of omega-6 fatty acids, also called n-6 PUFAs, such as arachidonic acid.

"The ratio of arachidonic acid (AA) to very long-chain n-3 PUFAs (EPA and DHA) in diets of human beings appears to be an important factor that dictates the anti-inflammatory effects of fish oils," the researchers write.

They cite numerous studies, including a recent one that predicts "that changes in arachidonic acid to EPA or DHA ratios shift the balance from pro-inflammatory [agents] to protective chemical mediators … which are proposed to play a pivotal role in resolving inflammatory response" in the body.

For their study, the authors obtained a variety of fish from several sources, including seafood distributors that supply restaurants and supermarkets, two South American companies, fish farms in several countries, and supermarkets in four states. All samples were snap-frozen for preservation pending analysis, which was performed with gas chromatography.

The researchers found that farmed tilapia contained only modest amounts of omega-3 fatty acids – less than half a gram per 100 grams of fish, similar to flounder and swordfish. Farmed salmon and trout, by contrast, had nearly 3 and 4 grams, respectively.

At the same time, the tilapia had much higher amounts of omega-6 acids generally and AA specifically than both salmon and trout. Ratios of long-chain omega-6 to long-chain omega-3, AA to EPA respectively, in tilapia averaged about 11:1, compared to much less than 1:1 (indicating more EPA than AA) in both salmon and trout.

The article notes that "there is a controversy among scientists in this field as to the importance of arachidonic acid or omega-6:omega-3 ratios vs. the concentration of long-chain omega-3 alone with regard to their effects in human biology." Those issues are raised in an editorial in the same issue of the Journal.

The Wake Forest article anticipates that criticism and notes that one human study involving AA showed a probable gene-nutrient connection to coronary heart disease in a specific group of heart disease patients. In another study, four subjects were removed after consumption of high amounts of AA due to concerns about the effect of the acid on their blood platelets.

Floyd H. "Ski" Chilton, Ph.D., professor of physiology and pharmacology and director of the Wake Forest Center for Botanical Lipids, is the senior author of the Journal article. He said that in next month's Journal, he will publish a rebuttal to this month's editorial.

"We have known for three decades that arachidonic acid is the substrate for all pro-inflammatory lipid mediators," Chilton said in an interview. "The animal studies say unequivocally that if you feed arachidonic acid, the animals show signs of inflammation and get sick.

"A New England Journal of Medicine article three years ago said if you had heart disease and had a certain genetic makeup, and you ate arachidonic acid, the diameter of your coronary artery was smaller, a major risk factor for a heart attack," said Chilton. "My point is that it's likely not worth the risk in this or other vulnerable populations."

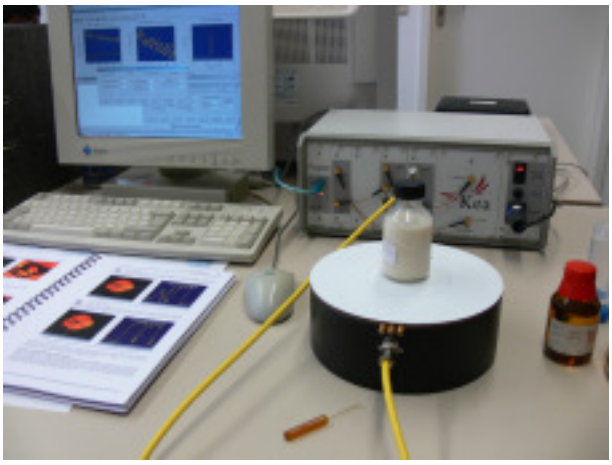
Chilton said tilapia is easily farmed using inexpensive corn-based feeds, which contain short chain omega-6s that the fish very efficiently convert to AA and place in their tissues. This ability to feed the fish inexpensive foods, together with their capacity to grow under almost any condition, keeps the market price for the fish so low that it is rapidly becoming a staple in low-income diets.

"We are all familiar with the classical Hippocratic admonition, *Primum no nocere*, 'First, do no harm.' I think it behooves us to consider this critical directive when making dietary prescriptions for the sake of health," Chilton said.

"Cardiologists are telling their patients to go home and eat fish, and if the patients are poor, they're eating tilapia. And that could translate into a dangerous situation."

Co-authors of the study are Kelly L. Weaver, Ph.D., Priscilla Ivester, Joshua A. Chilton, Martha D. Wilson, Ph.D., and Prativa Pandey, all with Wake Forest School of Medicine. The research was funded by the National Center for Complementary and Alternative Medicine and the Office of Dietary Supplements of the National Institutes of Health (NIH), and by an NIH Molecular Medicine training grant.

Pocket-sized magnetic resonance imaging



The term “MRI scan” brings to mind the gigantic, expensive machines that are installed in hospitals. But research scientists have now developed small portable MRI scanners that perform their services in the field: for instance to examine ice cores.

Magnetic resonance imaging yields deep insights – into the atomic structure of a biomolecule, for instance, or into the tissues of a patient's body. Magnetic resonance imaging is one of the most important imaging methods used in medicine. However, MRI scanning has one major disadvantage: The machines are huge and extremely expensive, and almost impossible to transport.

The Magnetic Resonance working group at the Fraunhofer Institute for Biomedical Technology Engineering IBMT in Sankt Ingbert has made magnetic resonance imaging mobile. They collaborated with the New Zealand company Magritek to develop small portable devices. Dr. Frank Volke, head of the Magnetic Resonance working group, explains the core technology: "Instead of the large superconducting magnets that have to be cooled with liquid helium and nitrogen, extra-strong permanent magnets are installed in our devices. There is no need for cooling anymore." To make this possible, several permanent magnets are so arranged that the magnetic field lines overlap to form a homogeneous field. In this way, the developers have succeeded in developing small, less expensive, and above all portable magnetic resonance spectrometers that can even be powered by batteries.

Physicians and researchers alike can benefit from the mobile pocketsized nuclear magnetic resonance (NMR) devices: The first "Kea NMR moles" are already in use in the Antarctic, helping researchers to study the effects of environmental change by analyzing the structure of ice masses or drilled ice cores. Nevertheless, they cannot replace clinical MRI scanners for whole human body studies. There are many more potential applications for such devices, including delivering important data – directly and online – during production processes. Industrial manufacturers of sausages, cheese or candies, for instance, can use them to analyze the fat or water content of their food products. The spectrometers can also be employed to measure the humidity of materials, characterize the molecular structure of polymers, or determine the quality of trees for wood production. Together with Magritek, the Fraunhofer researchers provide technical instruction for users in Germany and Europe and support them with device maintenance.

Argyrin: natural substance raises hope for new cancer therapies

Scientists at HZI, MHH and LUH publish previously-unknown chemical mechanism

The effective treatment of many forms of cancer continues to pose a major problem for medicine. Many tumours fail to respond to standard forms of chemotherapy or become resistant to the medication. Scientists at the Helmholtz Centre for Infection Research (HZI) in Braunschweig, the Hannover Medical School (MHH) and Leibniz-Universität (LUH) in Hanover have now discovered a chemical mechanism with which a natural substance - argyrin - destroys tumours. Today, the researchers publish their findings in the renowned scientific journal "CancerCell".

The basis for this breakthrough was an observation made by the MHH scientist Prof. Nisar Malek: he had been studying the role of a certain protein - a so-called cyclin-kinase inhibitor - in the development of cancer. In the process, Malek noted that mice in which the breakdown of the kinase inhibitor was suppressed by genetic change have a significantly lower risk of suffering from intestinal cancer. "I needed a substance that would prevent the breakdown of the protein that I was investigating in the cancer cells," says Nisar Malek: "This molecule, in all likelihood, would make a good anti-cancer agent."

Nisar Malek approached Dr. Ronald Frank, a chemist at HZI, with his considerations. Ronald Frank has established extensive collections of chemical substances at the HZI that can be tested for their biological activity in a fast, automated procedure. The two agreed to develop a special cell line in which the quantity of the cyclin kinase inhibitor can be measured using simple optical methods. Ronald Frank: "We adapted this cell based assay system to allow automated screening of large numbers of different chemical substances."

"Myxobacteria provide another potential cancer medicine

Malek and Frank found what they were looking for in a collection of natural substances which had originally been isolated from microorganisms which live in soil – the so called Myxobacteria. Myxobacteria have proven to be a treasure trove of potential medicines, also being used in the production of epothilone, an active agent identified at the HZI. This drug has been approved as a cancer medicine in the USA last year. "The myxobacterial agent for our purposes is argyrin," says Ronald Frank.

With this knowledge, Ronald Frank and Nisar Malek joined up with the chemist Prof. Markus Kalesse of the LUH to launch an extensive research programme to discover how argyrin can be produced chemically and how it functions. In the process they stumbled upon a completely new mechanism, which was subsequently revealed in a publication in the non plus ultra of oncology journals, "CancerCell". "Argyrin blocks the molecular machinery of the cell which breakdowns proteins that are no longer required," explains Malek, "and thereby naturally also prevents the breakdown of the kinase inhibitor in question, the lack of which triggers cancer."

The research team has already conducted detailed studies of the effects of argyrin on mice: "When we treat animals with cancer with argyrin," says Nisar Malek, "the tumour ceases growing, it decreases by up to 50 percent and it begins to breakdown internally." Scarcely any side effects have been noted. Although the findings published in CancerCell are viewed by the scientists as an important result, it is merely the first step of a longer journey: "Research into argyrin continues at a fast pace," says Markus Kalesse: "We are already

altering the argyrin molecule in all details and looking to see if it is possible to improve its performance further. Our goal is to submit such an optimised structure for clinical testing in the near future."

Irina Nickeleit, Steffen Zender, Florenz Sasse, Robert Geffers, Gudrun Brandes, Inga Sörensen, Heinrich Steinmetz, Stefan Kubicka, Teresa Carlomagno, Dirk Menche, Ines Gütgemann, Jan Buer, Achim Gossler, Michael P. Manns, Markus Kalesse, Ronald Frank, and Nisar P. Malek: Argyrin A Reveals a Critical Role for the Tumor Suppressor Protein p27kip1 in Mediating Antitumor Activities in Response to Proteasome Inhibition; Cancer Cell 2008 14: 23-35.

UNC study ties ending moderate drinking to depression

CHAPEL HILL – Scientific evidence has long suggested that moderate drinking offers some protection against heart disease, certain types of stroke and some forms of cancer.

But new research shows that stopping drinking – including at moderate levels – may lead to health problems including depression and a reduced capacity of the brain to produce new neurons, a process called neurogenesis.

The findings from the Bowles Center for Alcohol Studies at the University of North Carolina at Chapel Hill appear online in the journal Neuropsychopharmacology.

"Our research in an animal model establishes a causal link between abstinence from alcohol drinking and depression," said study senior author Clyde W. Hodge, Ph.D., professor of psychiatry and pharmacology in the UNC School of Medicine. "In mice that voluntarily drank alcohol for 28 days, depression-like behavior was evident 14 days after termination of alcohol drinking. This suggests that people who stop drinking may experience negative mood states days or weeks after the alcohol has cleared their systems,"

The mice were tested for depression-like behavior using a widely recognized method called the Porsolt Swim Test. The mice are placed inside a beaker filled with water and allowed to swim for six minutes. Mice are good swimmers and have no problem completing this task. The amount of time they spend immobile (floating and not swimming) is measured as an index of despair or depression-like behavior. The more time a mouse spends immobile, the more "depressed" it is thought to be.

"This research provides the first evidence that long-term abstinence from moderate alcohol drinking – rather than drinking per se – leads to a negative mood state, depression," Hodge said.

The study also found that the emergence of depression was associated with a profound reduction in the number of neural stem cells (cells that will become neurons) and in the number of new neurons in a brain region known as the hippocampus. This brain region is critical for normal learning and memory, and recent studies show that the development of neurons in the hippocampus may regulate mood, Hodge said.

According to the researcher, the negative mood state in mice may represent depression in humans and appears to be linked to a diminished capacity of the brain to form new neurons. "Thus, people who drink moderate alcohol socially, or for potential health benefits, may experience negative mood or diminished cognitive abilities due to a loss of the brain's ability to form new neurons," he said.

But the study also found that treatment with an antidepressant drug during 14 days of abstinence prevented the development of depression and restored the capability of the brain to produce new cells.

"Treatment with antidepressant drugs may help people who suffer from both alcoholism and depression by restoring the brain's ability to form new neurons," Hodge said. "Moreover, this research provides an animal model of alcohol-related depression with which we can begin to fully understand the neurobiology underlying co-occurring alcoholism and depression, and thereby develop successful treatment options. At this point it appears that blunted neurogenesis may underlie the effects of abstinence from alcohol drinking on mood, but understanding the mechanisms by which this occurs is a key challenge for future research."

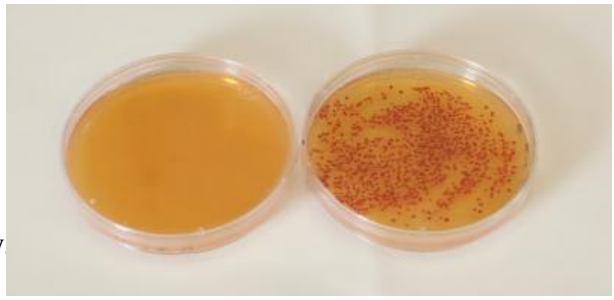
Several co-authors, all from UNC, also contributed to the study: Jennie R. Stevenson, neurobiology graduate student; Jason P. Schroeder, Ph.D., and Kimberly Nixon, Ph.D., research associates with the Bowles Center; Joyce Besheer, Ph.D., assistant professor of psychiatry; and Fulton T Crews, Ph.D., director of the Bowles Center and professor of psychiatry and pharmacology.

From foe to friend: Researchers use salmonella as a way to administer vaccines in the body

TEMPE, Ariz. – Researchers at the Biodesign Institute at Arizona State University have made a major step forward in their work to develop a biologically engineered organism that can effectively deliver an antigen in the body. The researchers report that they have been able to use live salmonella bacterium as the containment/delivery method for an antigen.

The work is a major step forward in development of a new means of biological containment that would be a key component to a new way to deliver vaccines in animals and humans. If fully developed, the new method could be used to administer vaccines to many of those who do not benefit from traditional vaccines because of their cost, because of drug resistance or because of limited effects on children.

Outlined in the paper, "Regulated programmed lysis of recombinant Salmonella in host tissues to release protective antigens and confer biological containment," published on the online version (July 7) of the Proceedings of the National Academy of Sciences, the researchers describe a new, novel and effective means of biological containment for antigen delivery. The method not only effectively delivers the antigen in the body but does so in a way that does not infect the body with salmonella and does not leave any vaccine cells in the environment.



The plate on the left shows the minimal growth of Salmonella enterica. The plate on the right shows enhanced growth with the presence of arabinose, demonstrating an ability to effectively control bacteria cell growth. **ASU-Biodesign Institute**

The research team includes scientists formally at Washington University, St. Louis, and Megan Health Inc., St. Louis, who are now at ASU's Biodesign Institute and the School of Life Sciences.

"Our goal is to design, engineer and evaluate a live bacterial (using salmonella) antigen delivery system that would display regulated delayed lysis in vivo after invasion into and colonizing internal lymphoid tissues in an immunized individual," said Roy Curtiss, director of the Center for Infectious Diseases and Vaccinology at the Biodesign Institute and a professor in ASU's School of Life Sciences. Curtiss was part of the research team that made the discovery.

"We wanted to do this in a way so that no disease symptoms due to salmonella would arise, a protective immune response would be induced to the pathogen whose protective antigen was delivered by the vaccine construction (in this case against S. pneumoniae due to an immune response to PspA), and there would be no ability for live bacterial vaccine cells to either persist in vivo or to survive if shed into the environment," Curtiss added.

"The biological containment system we developed is sufficient by itself on conferring attenuation, the inability to cause disease symptoms, and ability to deliver an antigen to induce protective immunity," Curtiss said. "We have high expectations that this delivery system will be safe and effective when administered to animals and humans."

A key to the project, according to Curtiss, is "turning a foe into a friend." That foe is the salmonella bacterium—the leading cause of human food-borne illness and which is currently in the news due to contaminated tomatoes and other food crops. Curtiss' team, through genetic know-how, has developed a variety of ways to tame salmonella in the lab and use it as a delivery vector for vaccines.

"We try to genetically modify the salmonella bacterium to eliminate its harmful effects -- the diarrhea, gut inflammation and fluid secretion -- while keeping the wherewithal to induce immunity against the bacteria causing pneumonia or other infectious diseases," Curtiss said. Several in his research team attack the problem from different angles, with some focusing on weakening salmonella, others boosting the immune response and others optimizing the self-destruct mechanism.

Speaking about the application of a pneumonia antigen, team leader Wei Kong, of the Biodesign Institute, said: "If we tried to use live Streptococcus pneumoniae causing pneumonia for a vaccine, we would obviously kill the patient. The benefit of a live vaccine that uses a weakened form of salmonella, is that the salmonella can be taken up through the intestinal lining and stimulate an immune response by using just a portion of the bacteria causing pneumonia that itself is not deadly."

In experiments, the genetically modified Salmonella enterica bacterium colonizes the lymph tissues of the host and manufactures a protein from the S. pneumoniae bacterium, which then triggers a strong antibody response. Unlike most vaccines that are entirely manufactured by a vaccine company, the attenuated recombinant salmonella vaccine after entry into the immunized individual serves as its own factory to produce (manufacture) the protective antigens (proteins) from the S. pneumoniae pathogen. This ability to cause manufacture in the immunized individual dramatically decreases the cost of such vaccines to make them affordable for use in the developing world, Curtiss said.

An important factor for the research team was to genetically program the S. enterica bacterium to destroy itself so that it is not released into the environment, Curtiss said.

"Biological containment systems are important to address the potential risk posed by any unintentional release of the modified salmonella into the environment," he explained. The salmonella life cycle is balanced to allow enough time to enter the body and build an immune response, while leading to cell death by bursting the cells and preventing the vaccine strain from spreading into the environment.

"The data show that the system we have devised results in cell lysis in the absence of arabinose and clearance of the strain from host tissues," the researchers state in the PNAS article.

"More importantly, our strain was fully capable of delivering a test antigen and inducing a robust immune response comparable to that of a vaccine strain without this containment system, thereby demonstrating that this system has all of the features required for biological containment of a recombinant attenuated salmonella vaccine," they added.

The research was funded by the U.S. Department of Agriculture and the National Institutes of Health.

Insect warning colors aid cancer and tropical disease drug discovery

Colorful beetle may indicate useful plant chemicals. **Don Windsor, STRI**

Brightly colored beetles or butterfly larvae nibbling on a plant may signal the presence of chemical compounds active against cancer cell lines and tropical parasitic diseases, according to researchers at Smithsonian's Tropical Research Institute in Panama. Such clues could speed drug discovery and provide insight into the ecological relationships between tropical-forest plants and insects that feed on them. The report is published in the Ecological Society of America's journal Frontiers in Ecology and the Environment.

"These findings are incredibly exciting and important," said Todd Capson, STRI research chemist, who directed the project. "The results of this study could have direct and positive impacts on the future of medical treatment for many diseases around the world."

For this research scientists used plants already known to have anti-cancer compounds; those proven to be active against certain disease-carrying parasites; and plants without such activity. The study showed that beetles and butterfly larvae with bright warning coloration were significantly more common on plants that contained compounds active against certain diseases, such as breast cancer and malaria. There was no significant difference in the number of plain-colored insects between plants with and without activity, according to the study by the Smithsonian's Panama International Cooperative Biodiversity Group Program.

"We put two and two together," said researcher Julie Helson. "We knew that brightly colored insects advertise to their predators that they taste bad and that some get their toxins from their host plants. But because other insects cheat by mimicking the toxic ones, we weren't sure if insect color was really going to work to identify plants containing toxins—it did!" Helson was a student at McGill University when she conducted this research in 2005.

The Smithsonian's PICBG program first demonstrated that theories about chemical defense in rainforest plants—such as the idea that young leaves tend to be richer in defense chemicals—can significantly improve the efficiency and lower the cost of drug discovery, when compared with a random screening approach.

Although the idea that brightly colored insects could facilitate the search for medicinally active plants has been discussed for decades, the concept had never been rigorously tested. This new work at the Smithsonian provides another example of how ecology can contribute to the discovery of novel medicines. The study suggests that a quick screen for insects with warning coloration on tropical plants may increase the efficiency of the search for compounds active against cancer and tropical parasitic disease by four-fold. "It's very gratifying to see that it works in the field." said Capson. "I am hopeful that other investigators will follow our lead and test our theory that insects can lead us to plants with disease-fighting properties."

This work also demonstrates that protecting tropical forests - not just the insects and plants, but at every level—has the potential to provide immeasurable benefits to human health.

The authors thank staff at Panama's Institute of Advanced Scientific Research and High Technology Services, Panama's National Authority of the Environment and the University of Panama.

USC School of Dentistry researchers uncover benefits of aspirin for treating osteoporosis

Drug appears to prevent both improper bone resorption and the death of bone-forming stem cells

(Los Angeles CA) Researchers at the University of Southern California, School of Dentistry have uncovered the health benefits of aspirin in the fight against osteoporosis. Forty-four million Americans, 68 percent of whom are women, suffer from the debilitating effects of osteoporosis according to the National Institute of Health. One out of every two women and one in four men over 50 will have an osteoporosis-related fracture in their lifetime.

This latest study identifies aspirin's medicinal role on two fronts. In mice, the drug appears to prevent both improper bone resorption and the death of bone-forming stem cells. The findings will be published in PLoS ONE http://www.plosone.org/doi/pone.0002615 on Wednesday, July 9.

An aspirin regimen appears to help mice recover from osteoporosis in two useful ways, striking a balance between bone formation and resorption, according to Associate Professor Songtao Shi and Research Associate Takayoshi Yamaza of the USC School of Dentistry's Center for Craniofacial Molecular Biology (CCMB).

The silent disease affects both men and women. In women, bone loss is greatest during the first few years after menopause. Osteoporosis occurs when bone resorption (loss of bone) occurs too quickly or when formation (replacement) occurs to slowly.

According to Shi, the removal of the ovaries and the resulting decrease in estrogen induces osteoporosis in mice, much like the onset of the disease in post-menopausal women. It is commonly thought that T-lymphocytes, a type of immune system cell, play a pivotal part in this process by over-activating osteoclasts, the bone cells that reabsorb bone material from the skeleton. Most current osteoporosis therapies aim to curb overactive osteoclasts.

However, there seems to be another side to the T-lymphocytes', or T-cells', role in osteoporosis, Yamaza says. While the immune cells typically attack disease cells and other foreign entities, the T-cells can mistakenly attack healthy stem cells.

"After infusing the mice with T-cells, the T-cells impaired the function of bone marrow mesenchymal stem cells as well as caused osteoclast numbers to increase," he says.

The bone marrow mesenchymal stem cells, or BMMSC, differentiate to become many different cells including osteoblasts, the cells responsible for bone formation. If this processed is impaired by T-cells, bone formation cannot keep up with bone resorption caused by osteoclasts, and bone mineral density decreases – the hallmark of osteoporosis that leads to skeletal structural deterioration and fractures.

An aspirin regimen has been linked in earlier epidemiological studies to better bone mineral density, but the mechanisms of its interactions in regards to bone health had not yet been studied extensively, Shi said.

"We've shown how aspirin both inhibits bone resorption and promotes osteoblast formation," Shi says.

Another exciting aspect of the aspirin treatment is that the dose administered to the mice in order to increase their bone mineral density is the same as that of a typical human aspirin regimen when adjusted for body weight differences, he adds. While the species difference is still a factor, the results are promising.

"When we gave a large amount of aspirin to the mouse by injection, it did not work," Shi says, "but when we gave a low dose in the mice's water for a long period of time, similar to a human dosage, the bone mineral density increased."

Shi and Yamaza hope that their work will translate into new clinical strategies for osteoporosis.

"We have opened a door," Shi says. "We hope other scientists can confirm what we've found and move the treatment forward."

The use of aspirin offers hope to patients and doctors searching for a potential alternative to bisphophonates currently being used as a means of prevention and treatment for osteoporosis. This latest study opens up the possibility that aspirin some day will not only be prescribed to ward off heart disease but also osteoporosis.

The national and international collaborations for this study included top scientists; Drs. WanJun Chen, Yanming Bi, Yongzhong Liu, Voymesh Patel, Silvio Gutkind, Marian Young from NIDCR/NIH, Dr. Yasuo Miura from Japan, Dr. Stan Gronthos from Australia, Dr. Cun-Yu Wang from UCLA, and Drs. Kentaro Akiyama, An Le and Wataru Sonoyama from USC, who present evidence that aspirin fights a dual battle as it pertains to osteoporosis.

Pulling a tooth could lead to tailor-made sperm

* 15:06 08 July 2008
* NewScientist.com news service
*** Linda Geddes**

Could sacrificing a tooth enable some infertile men to father children? That's the goal of researchers in Brazil, who suggest that stem cells from human teeth can be coaxed into becoming sperm by injecting them into the testes of mice.

Irina Kerkis of the Butantan Institute, São Paulo, and her colleagues injected stem cells from the dental pulp of human teeth into the testes of live mice.

The cells seemed to migrate to the tubules where sperm usually mature and differentiate into cells resembling human sperm.

However, the process was inefficient and some of the human cells fused with mouse cells – a problem that would have to be solved before the technique could be used therapeutically.

Baby teeth

The cells were also taken from baby teeth, so it is unclear if the approach would work with teeth from adult men.

"I think we are on the right track, but we need to understand more about the mechanism," says Kerkis, whose team will present the results at the meeting of the European Society of Human Reproduction and Embryology in Barcelona, Spain, on 9 July.

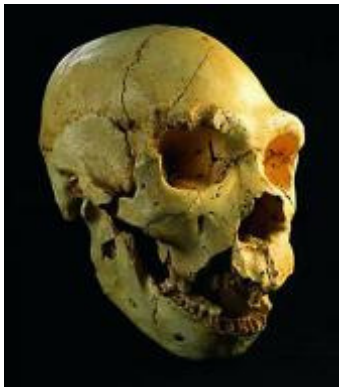
Other researchers are sceptical. It takes human sperm several weeks to develop, yet the Brazilian team's cells seemed to have matured within nine days.

Given that human sperm stem cells have previously failed to mature in mouse testes, it seems unlikely that dental cells would fare better, adds Robin Lovell-Badge of the National Institute for Medical Research in London, UK.

Loud and clear

Fossil finds suggest an early origin for human speech

By Tia Ghose July 7th, 2008



It may be time to rethink the stereotype of grunting, wordless Neandertals. The prehistoric humans may have been quite chatty — at least if the ear canals of their ancestors are any indication.

The findings suggest human speech may have originated earlier than some researchers contend. Anthropologists disagree about whether language sprang up rapidly around 50,000 years ago or emerged more gradually over a longer period of time, says Rolf Quam, a paleoanthropologist at the American Natural History Museum in New York and coauthor of the new study.

ALL EARS CT scanning of H. heidelbergensis skulls, like the one shown here, helped a team reconstruct the structure of the ear canal of this Neandertal ancestor. The skulls, more than 530,000 years old, were found at the Sima de los Huesos site in Atapuerca, Spain. **Javier Trueba**

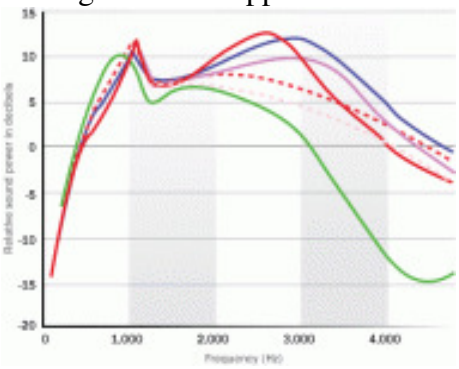
The auditory bones of 530,000-year-old skulls indicate that an early human species called Homo heidelbergensis may have heard sounds much the way people do today. H. heidelbergensis are thought to be an ancestor of Neandertals. The findings could reignite debate about whether Neandertals could speak, Quam and colleagues report. The study is the first to use a fossil to reconstruct sensory perception in any Homo species, they add.

The skulls are from a site in Atapuerca, Spain called Sima de los Huesos, or “pit of the bones.” The Atapuerca research team, which includes members from many disciplines and universities, used CT scanning of the skulls to reconstruct the size and shape of the ear canals, Quam says.

access

The length of the ear canal determines what frequencies of sound waves resonate, and are therefore heard more easily, says Sunil Puria of Stanford University, who models hearing patterns from ear structure.

The geometry of the ear canal reveals that the hearing patterns of H. heidelbergensis overlapped with those of modern-day humans. Both modern people and the ancient hominids have especially sharp hearing in the 2 kilohertz to 4 kilohertz frequency range, where much of the sound energy of spoken language is transmitted.



Chimpanzees, the closest living relatives of Homo sapiens, by contrast, have a dip in sensitivity around 4 kilohertz, says Mark Coleman of Midwestern University’s campus in Glendale, Ariz. Coleman studies primate hearing but was not involved in the study. “Of course primates can differentiate sounds related to speech — so can my dog — the key is that humans appear to have a maximum sensitivity in the range that contains a lot of overtones in speech.”

NOT HARD OF HEARING Like in modern humans (shown in solid blue), the ear canal of H. heidelbergensis (shown in red and magenta lines) had a peak in auditory sensitivity in the frequency range from 2 kilohertz to 4 kilohertz, where much spoken information is transmitted. Chimpanzees (shown in solid green) have a dip in sensitivity in that range. **I. Martinez et al**

The results don’t necessarily show that the ancient humans could speak, Quam says. “We're saying that the ear changed for some reason and that those changes facilitated the possibility of language development,” he says. The team reported the findings July 3 in Paris during the Acoustics ’08 conference.

Researchers have long tried to determine whether Neandertals could speak by reconstructing their vocal tracts, Quam says. But soft tissue makes up most of the voice box, so few traces remain in the fossil record. The ear is a better candidate because the bony structure reveals more about hearing capacity.

But, says Coleman, the model Quam and colleagues used to reconstruct the ear requires researchers to input many different variables — including characteristics such as the elasticity of ligaments that are no longer

present in the fossils. “You kind of have to make some assumptions, and I worry that at some point the assumptions of the models are going to break down.”

If H. heidelbergensis did have modern hearing capacity, however, it’s logical to assume they had a primitive form of human communication, he adds. Though it’s possible that H. heidelbergensis could hear in that frequency range but didn’t use that ability for anything special, “sensory systems are extremely neurologically expensive,” Coleman says. It’s unlikely that the body would invest the resources in maintaining such a system if it didn’t serve a purpose, he says.

The research comes on the heels of an April Molecular Biology and Evolution study showing that Neandertals had two genes that are similar to those implicated in language development in humans but differ from those in chimpanzees.

New fossil tells twisted tale of how flatfishes ended up with two eyes on one side of head

Study eliminates a long-lingering challenge to the theory of evolution through natural selection

CHICAGO—A newly identified fossil and the reinterpretation of previously known fossils, all from Europe and about 50 million years old, fill in a "missing link" in the evolution of flatfishes and explain one of nature's most extraordinary phenomena.

All living flatfishes, which include halibut, flounder and sole, have a bizarre structural adaptation: both eyes are on one side of their head. What is even more remarkable is that every flatfish is born symmetrical, with one eye on each side of its skull. However, as it develops from a larva to a juvenile, it undergoes a metamorphosis where one eye moves (or "migrates") gradually up and over the top of the head, coming to rest in its adult position on the opposite side of the skull.

This unique specialization provides a clear survival advantage: it allows flatfishes to use both of their eyes to look up when they are lying on the seafloor. But scientists have had no idea how the forces of evolution gave rise to this curious structural adaptation because no fishes—living or fossil—with intermediate characteristics of this adaptation have ever been identified.

What might have led to this adaptation? What evolutionary advantage might intermediates have possessed? Many famous evolutionary thinkers, including Jean-Baptiste Lamarck, Charles Darwin, Alfred Russel Wallace, and Richard Goldschmidt, have had their say on this issue, but the new discoveries to be published in the journal Nature July 10, 2008, settle the matter.

"This problem of the evolution of asymmetrical flatfishes was particularly puzzling to biologists because it was very hard to explain what evolutionary forces might have led to this transition," said Matt Friedman, a research associate at The Field Museum, a graduate student at the University of Chicago and author of the study. "How can you arrive at the pattern seen in living flatfishes via gradual evolution? There seems to be no adaptive reason to start down the gradual evolutionary path toward the flatfish condition, because surely these intermediates would not have any kind of evolutionary advantage."

For this reason, flatfishes became a key example for a novel evolutionary argument that went like this: sometimes groups arise instantaneously from large-scale mutations that are usually deleterious but, under unusual conditions, might be adaptive. This "hopeful monster" scenario was invoked for flatfishes in the 1930s, and has been the popular perception of their origins ever since. But the new study in Nature, called "The evolutionary origin of flatfish asymmetry," determines that flatfishes are not "monsters" or mistakes, nor did their unusual body plan evolve suddenly.

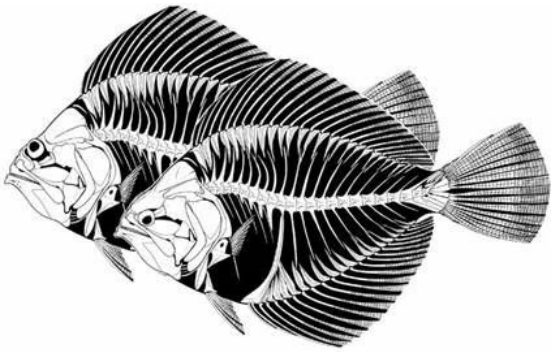
Something old, something new

More than 500 species of modern flatfishes live in fresh and salt water. All have an unusual flattened body form that is well adapted to life at the bottom. Some families of flatfishes have both eyes on the right side of their head while other families have both eyes on the left side.

Typically, the undersides of flatfishes are white or pale, but their uppersides are camouflaged to fit in with the surroundings. Some species are able to change the color of their upperside. Weighing up to 720 pounds, these carnivorous bottom-feeders vary considerably in size from 4 inches to 7 feet. Many are important game and food fishes.

The Nature study examined several specimens of two kinds of fossil fishes from the Eocene (about 50 million years ago) of northern Italy. One of these is a newly described genus that Friedman has named Heteronectes (meaning "different swimmer"). He discovered it in a museum drawer at the Naturhistorisches Museum in Vienna, Austria.

The other fossil, Amphistium, is known from several specimens from the same Italian site as Heteronectes and a single fossil from France. It has been known to science but incorrectly classified for more than 100 years. All previous studies of Amphistium mistakenly concluded that it had a symmetrical skull.



Examining the anatomy of Amphistium and Heteronectes with a diverse range of techniques (including CAT scanning and chemical preparation, which dissolves the rock surrounding the fossil skeleton), Friedman discovered that both represent primitive flatfishes with a somewhat asymmetrical skull. Nevertheless, in both cases the eyes remain on opposite sides of the head in adults. In other words, the fossils show incomplete asymmetry, displaying an intermediate condition between what is found in ordinary symmetrical fishes and extraordinary asymmetrical flatfishes.

This discovery rejects the notion that flatfishes must have arisen suddenly as "hopeful monsters" and documents two steps in the gradual assembly of one of the most bizarre body plans found among vertebrates. The position of Amphistium and Heteronectes within the fish evolutionary tree is confirmed by many aspects of their anatomy. Features unrelated to asymmetry link these fossils with flatfishes, but the specimens also show characters more primitive than those found in any living form.

Adding a further twist to the story, the right eye migrated in some specimens of Amphistium, while the left eye moved in other specimens. This is unlike most living species of flatfishes, where individuals are always right- or left-eyed. It also indicates that that mixed 'handedness' is primitive for flatfishes.

"There is a broad implication for the tempo and mode of evolution here," Friedman concluded. "Scientists had long assumed flatfishes must have arisen suddenly because they could not imagine the adaptive significance of intermediates, but this work delivers clear evidence that such intermediates did exist, and therefore, that flatfish asymmetry arose gradually."

The fossils described in Nature give clues to the lifestyle of these primitive flatfishes and the possible evolutionary forces that might have led to their bizarre anatomy. One specimen of Amphistium preserves the remains its last meal in its stomach: a fish nearly half its own length.

"It is certain that these extinct fishes were predators," Friedman said. "Many flatfishes lie in wait on their sides to ambush unsuspecting prey, but they don't always lie flat—they often prop themselves above the seafloor with their fins. It's possible that Amphistium and Heteronectes did the same, and that even incomplete asymmetry would have given them a better view of things above and around them than no asymmetry at all."

Ionophore reverses Alzheimer's within days in mouse models

Scientists report a remarkable improvement in Alzheimer's transgenic mice following treatment with a new drug. The study, published by Cell Press in the July 10th issue of the journal Neuron, provides the first demonstration that an ionophore, a compound that transports metal ions across cell membranes, can elicit rapid and pronounced improvement in neuropathology and cognitive function in mouse models of Alzheimer's Disease (AD).

Recent research has implicated dysregulation of metal ions in the brain, particularly copper and zinc, in the pathogenesis of AD and the damaging accumulation of amyloid beta (Aβ) protein that is characteristic of this devastating disease. The ionophore clioquinol (CQ), an 8-hydroxyquinoline, has been shown to increase intracellular copper and zinc levels and decrease Aβ levels in cultured cells and in the brains of transgenic (Tg) AD mice. However, further studies in mice and humans demonstrated that brain entry of CQ was quite limited.

Dr. Ashley I. Bush from the Mental Health Research Institute of Victoria in Australia, with Dr. Paul A. Adlard and colleagues examined the therapeutic potential of PBT2, a second generation 8-hydroxyquinoline designed for easier synthesis, higher solubility and increased blood-brain barrier permeability, in two well established Tg mouse models of AD. The Tg mice examined in the study overexpress the precursor protein for Aβ and possess mutations that cause AD in humans. One of the Tg models also expresses the human presenilin deletion mutation that also causes AD.

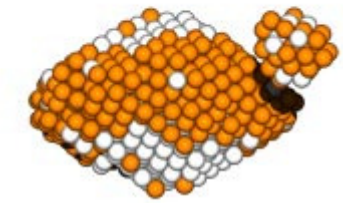
"Both types of Tg mice exhibit progressive spatial learning deficits that are accompanied by increasing A? levels and plaque formation. Demonstrating benefits of PBT2 treatment in the two separate models was both a stringency test, increasing confidence that PBT2 is more likely to show benefit in clinical trials, and also allowed us to determine whether specific forms of Aβ change in register with cognitive improvement in both strains. This is significant as cognitive loss in AD is not just a simple product of rising Aβ levels," explains Dr. Bush.

PBT2 was shown to be a superior ionophore when compared to CQ and the researchers went on to test A? levels and cognitive outcomes after oral treatment with PBT2. "We found that oral treatment with PBT2 induced a dramatic improvement in learning and memory in both Tg models of AD, accompanied by a marked inhibition of AD-like neuropathology. These outcomes were rapid, with reduction of soluble interstitial Aβ

occurring within hours, and significant cognitive benefits seen within days of first administration of the compound," says Dr. Bush.

These results encourage further testing of compounds that target synaptic metals as a possible treatment of AD. Further, recent clinical trials in AD patients taking oral PBT2 have been promising and support PBT2 as a viable treatment for AD.

Study Puts Solar Spin on Asteroids, their Moons & Earth Impacts



COLLEGE PARK, Md. -- Asteroids with moons, which scientists call binary asteroids, are common in the solar system. A longstanding question has been how the majority of such moons are formed. In this week's issue of the journal Nature, a trio of astronomers from Maryland and France say the surprising answer is sunlight, which can increase or decrease the spin rate of an asteroid.

Watch an animated model of the spin-up and binary formation from two views, on the left is an overhead view. The right pane of the movie looks at the equator of the primary body, which is also the plane in which the asteroid's satellite is formed **(courtesy of the authors). http://www.astro.umd.edu/%7Ekwalsh/BinaryFormation.mpg**

Derek Richardson, of the University of Maryland, his former student Kevin Walsh, now Poincaré Fellow in the Planetology Group in the Cassiopée Laboratory of CNRS at the Côte d'Azur Observatory, France, and that group's leader, co-author Patrick Michel outline a model showing that when solar energy "spins up" a "rubble pile" asteroid to a sufficiently fast rate, material is slung off from around the asteroid's equator. This process also exposes fresh material at the poles of the asteroid.

If the spun off bits of asteroid rubble shed sufficient excess motion through collisions with each other, then the material coalesces into a satellite that continues to orbit its parent. Because the team's model closely matches observations from binary asteroids, it neatly fills in missing pieces to a solar system puzzle. And, it could have much more down-to-earth implications as well. The model gives information on the shapes and structure of near-Earth binary asteroids that could be vital should such a pair need to be deflected away from a collision course with Earth.

Finally, the authors say, these findings suggest that a sample return mission to such a binary asteroid could bring back exposed pristine material from the poles of the parent asteroid, providing a chance to probe the internal composition of an asteroid without having to dig into it.

Solar Spin Power

It's estimated that about 15 per cent of near-Earth and main-belt asteroids with diameters less than 10 kilometers have satellite Scientists have determined that these small binary asteroid pairs were not formed at the beginning of the solar system, indicating that some process still at work must have created them. "It was at first thought the moons in these asteroid pairs probably formed through collisions and/or close encounters with planets," said Richardson, an associate professor of astronomy at the University of Maryland. "However, it was found that these mechanisms could not account for the large number of binary asteroids present among near-Earth and inner main belt asteroids."

Recent studies have outlined a thermal process - known as the YORP effect after the scientists (Yarkovsky, O'Keefe, Radzievskii, Paddack) who identified it - by which sunlight can speed up or slow down an asteroid's spin. Widespread evidence of this mechanism can be seen in the notable abundance of both fast and slow rotators among [near-Earth asteroids] and small main belt asteroids, Walsh, Richardson and Michel write in the Nature paper.

Animation of the KW4 system as viewed from Earth during May/June 2001 (with the actual star background and simulated solar illumination). **(Courtesy NASA) http://echo.jpl.nasa.gov/%7Eostro/kw4_2001_060830.S3M.320.mov**

The trio modeled different types of 'rubble pile' asteroids -- chunks of rock held together by gravity. This work, supported by the National Science Foundation and NASA, as well as the European Space Agency and the French National Planetology Program, is the first to show how the slow spinup of such asteroids leads over millions of years to mass loss that can form binaries. "Our model almost exactly matches the observations of our test case, binary asteroid KW4, which was imaged incredibly well by the NSF-supported Arecibo radio telescope in Puerto Rico," Walsh said.

Asteroid Deep Impacts

"Based on our findings, the YORP effect appears to be the key to the origin of a large fraction of observed binaries," said Michel. "The implications are that binary asteroids are preferentially formed from aggregate objects [rubble piles], which agrees with the idea that such asteroids are quite porous. The porous nature of

these asteroids has strong implications for defensive strategies if faced with an impact risk to Earth from such objects, because the energy required to deflect an asteroid depends sensitively on its internal structure," he said.

These twin circular lakes in Quebec, Canada were formed by the impact of an asteroidal pair which slammed into the planet approximately 290 million years ago. **(Courtesy NASA)**

Doublet craters formed by the nearly simultaneous impact of objects of comparable size can be found in a number of places on Earth, suggesting that binary asteroids have hit our planet in the past. Similar doublet craters also can be found on other planets. The authors say that their current findings also suggest that a space mission to a binary asteroid could bring back material that might shed new light on the solar system's early history.

The oldest material in an asteroid should lie underneath its surface, explained Richardson, and the process of spinning off this surface material from the primary asteroid body to form its moon, or secondary body, should uncover the deeper older material. "Thus a mission to collect and return a sample from the primary body of such a binary asteroid could give us information about the older, more pristine material inside an asteroid, just as the University of Maryland-led Deep Impact mission gave us information about the more pristine material inside a comet," Richardson said. Michel added, "Bringing back pristine material is the goal of our proposed Marco Polo mission, which is currently under study by the European Space Agency, in partnership with JAXA in Japan."

Vaccinated infants well protected against severe pneumococcal infection in Norway

Pneumococcus is a bacterium that can cause serious illnesses in some young children, e.g. meningitis, blood poisoning and pneumonia. Most of those who become ill are previously healthy without any known predisposing factors. The bacterium is present in the nose of up to 80 - 90% of healthy young children.

A growing problem

A major reason for the introduction of the pneumococcal vaccine in the childhood vaccination programme was a steady increase in the number of cases of severe pneumococcal infection among young children in Norway. The vaccine protects against seven serotypes of pneumococcus which account for 70% of the serious cases of the disease.

Good effect with no vaccine failures

* Having summed up the experience gained from the first two years after introducing the vaccine, the results confirm that it works as well as intended," says Marianne R. Bergsaker, senior medical officer at the Norwegian Institute of Public Health and co-author of the article in Vaccine.

* Among all children under two years, in the first two years after the introduction of the vaccine there was a 70 % decline of serious pneumococcal infections caused by the targeted serotypes, compared with pre-introduction figures," she says.

Of the children who received at least two vaccine doses, none have had serious pneumococcal infections.

* We have so far failed to find an example of what is called vaccine failure for children who have received two or more vaccine doses," says Bergsaker.

Practical details

In Norway, the vaccine is administered at 3, 5 and 12 months of age, i.e. a 3-dose programme. In most other countries, giving four doses of vaccine is common.

* Our experience shows that a three-dose programme is sufficient to give the children good protection. A three-dose programme is also advantageous because the vaccine can be administered at the same time as other vaccines in the Norwegian childhood vaccination programme. This makes it easier for both parents and the health services.

Good support from the beginning

In the first year there was already high accept of the vaccine. Of the children who were offered the vaccine in 2006, 95% had at least one dose, 90% received two doses and 80% had all three doses.

Have there been any unexpected events or adverse effects from the vaccine?

* We have not seen any unexpected serious reactions or permanent damage caused by the pneumococcal vaccine. Generally, the most common reactions to vaccines in children are tenderness at the injection site, a light fever and a general feeling of unwell. Feedback indicates that the pneumococcal vaccine causes immediate pain at the injection site and high fever somewhat more frequently than other childhood vaccines. The health clinic gives parents information on how to deal with such relatively common reactions to vaccines, says Bergsaker.

The Vaccine-article pointed out that so far an increase of the other pneumococcus serotypes has not been seen. What does this mean?

* After the introduction of the vaccine, we have seen a reduced incidence of the serotypes that the vaccine targets in children under two years of age. So far, we have not seen any other serotypes increasing and "taking over". This is something we will continue to monitor, says Bergsaker.

10 people killed by new CJD-like disease

Andy Coghlan

NewScientist http://www.newscientist.com

A NEW form of fatal dementia has been discovered in 16 Americans, 10 of whom have already died of the condition. It resembles Creutzfeldt-Jakob disease - with patients gradually losing their ability to think, speak and move - but has features that make it distinct from known forms of CJD.

No one yet knows how the disease originates, or under what conditions it might spread. Nor is it clear how many people have the condition. "I believe the disease has been around for many years, unnoticed," says Pierluigi Gambetti, director of the US National Prion Disease Pathology Surveillance Center at Case Western Reserve University in Cleveland, Ohio. Cases may previously have been mistaken for other forms of dementia.

Since Gambetti's team wrote a paper describing an initial 11 cases referred to his centre between 2002 and 2006 (Annals of Neurology, vol 63, p 697), another five have come to light. "So it is possible that it could be just the tip of the iceberg," Gambetti says.

As in other spongiform encephalopathies, such as CJD and mad cow disease (BSE), the brain tissue of victims is full of tiny holes. This damage is thought to be caused by the accumulation of prions, misfolded versions of a brain protein called PrP that can convert normal PrP molecules into their own misshapen form.

Some features of the new disease are different, however. All known disease-causing prions resist degradation by proteases - enzymes which digest the normal form of PrP. But prions from patients with the new disease are broken down by the enzymes.

Some very rare forms of CJD run in families and are caused by mutations in the gene for PrP. Six of the cases described in Gambetti's paper were from families with a history of dementia, suggesting a genetic cause. However, these people had no mutations in their PrP genes. "Maybe there are other genes that have an influence on the disease," suggests James Ironside of the UK's National CJD Surveillance Unit in Edinburgh.

Most forms of CJD develop spontaneously, for unknown reasons, but can be spread if someone is exposed to brain material from people with CJD, for instance, by neurosurgery using inadequately sterilised instruments.

One variant of CJD has been linked to the consumption of contaminated meat from cattle with mad cow disease. If the new condition is similarly caused by something in the victims' diet, or another environmental cause, new measures might be needed to protect public health.

Gambetti is now conducting experiments in mice to see how the disease is transmitted. He suspects that there is no cause for alarm. "I believe the disease occurs naturally, and is not due to environmental causes," he says.

Money Makes the Heart Grow Less Fond ... but More Hardworking

Money is a necessity: it provides us with material objects that are important for survival and for entertainment, and it is often used as a reward. But recent studies have shown that money is not only a device for gaining wealth, but a factor in personal performance, interpersonal relations and helping behavior, as well.

In a recent set of experiments, psychologists Kathleen D. Vohs of the University of Minnesota, Nicole L. Mead of Florida State University and Miranda R. Goode of the University of British Columbia found that participants' personal performance improved, and interpersonal relationships and sensitivity towards others declined, when they were reminded of money.

To set up one of the experiments, the researchers used four different types of reminders about money. One reminder involved participants playing a game of Monopoly and then being given either four thousand or two hundred dollars worth of play money before moving onto another task. In another, participants were asked to think about life with many or few financial resources. Participants in other experiments were reminded of money via organizing phrases that either were or were not related to money, and, in a final scenario, participants were exposed to computer screensavers of either cash or neutral items.

The results, recently published in Current Directions in Psychological Science, a journal of the Association for Psychological Science, show remarkably clear conclusions. In each of the conditions, all participants who were reminded of money demonstrated behaviors consistent with decreased interpersonal skills and increased personal performance.

Specifically, those participants who were exposed to money spent less time helping a person who needed it, sat farther away from another person and preferred solitary activities. In addition, they showed preferences for working alone and asked for help less frequently. On the other hand, participants also revealed an increased desire to take on more work and showed greater persistence in difficult tasks.

The authors argue that, desirable or undesirable, money obviously plays a large role in human behavior and there is not enough experimental research on its psychological influence: “We encourage scientists to turn their attention toward the cognitive, motivational and behavioral consequences of money because the centrality of money in people’s lives shows no sign of waning,” they concluded.

Big brains arose twice in higher primates

Large-brained simians of the New and Old Worlds independently arose from smaller-brained ancestors

After taking a fresh look at an old fossil, John Flynn, Frick Curator of Paleontology at the American Museum of Natural History, and colleagues determined that the brains of the ancestors of modern Neotropical primates were as small as those of their early fossil simian counterparts in the Old World. This means one of the hallmarks of primate biology, increased brain size, arose independently in isolated groups—the platyrrhines of the Americas and the catarrhines of Africa and Eurasia.

Fossil Chilecebus from South America. **John Weinstein, The Field Museum**

"Primatologists have long suspected that increased encephalization may have arisen at different points in the primate evolutionary tree, but this is the first clear demonstration of independent brain size increase in New and Old World anthropoids," says Flynn of the paper that appeared in the Museum's publication Novitates this June. Encephalization is the increase in brain size relative to body size. Animals with large encephalization quotients (E.Q.'s) are those with bigger brains relative to their body size in comparison to the average for an entire group. Most primates and dolphins have high E.Q.'s relative to other mammals, although some primates (especially apes and humans) have higher E.Q.'s than others.

At the heart of the new paper is the development of more accurate equations for estimating body size in platyrrhines, or New World "monkeys." Most fossils are fragments of skulls or teeth so, to help in estimating their body size (and then E.Q.), Flynn and colleagues collected 80 measurements of the skulls, jaws, and teeth of 17 different species of living New World monkeys that ranged across the full spectrum of body sizes. This study is one of the first to estimate body size with platyrrhines instead of their better-studied counterparts from the Old World, and this detailed analysis uses new statistical approaches to tease out which characteristics correlate best with body size. The goal is to apply this equation to fossilized specimens.

Chilecebus, found high in the Andes and described by Flynn and collaborators in 1995 in Nature, is one such fossil. The skull dates to 20 million years ago and is the oldest and most complete well-dated primate skull from the New World. In the Novitates paper, Flynn and colleagues more accurately estimate that Chilecebus weighed about 583 grams and had an E.Q. of only 1.11—a much smaller relative brain size than any living New or Old World anthropoid, which have E.Q.'s ranging from 1.39-2.44 (and even higher for humans).

"The result is clear: early fossil members of both the New World and Old World anthropoid lineages had small brain sizes, thus the larger brain sizes seen in both groups today must have arisen independently," says Flynn. "Documenting that large brains evolved separately several times within Primates will enhance understanding of the timing and pathways of brain expansion and its effects on skull growth and shape, and may lead to new insights into the genetic controls on encephalization."

Eric Delson, the Chair of Anthropology at Lehman College, City University of New York and a Research Associate at the Museum, concurs. "This work confirms that brain size increase may be one of the common characteristics of all primates," he says. "The relatively small brain of Chilecebus contrasts with that of the slightly younger (16.5 million years ago), larger brained fossil Killikaike found in Argentina and described two years ago. It is probable that brain size also increased independently in the lemurs of Madagascar, as well as in the apes (of which humans are the extreme case) and the cercopithecid monkeys of Africa and Asia."

Other researchers on the study include lead author Karen E. Sears of the Department of Animal Biology at The University of Illinois at Urbana-Champaign, John A. Finarelli of the Department of Geological Sciences at the University of Michigan, and Andre R. Wyss of the Department of Geological Sciences at the University of California at Santa Barbara. This research was supported by the National Science Foundation, the John S. Guggenheim Memorial Foundation, and fellowships from The Field Museum, the University of Chicago and the University of Michigan

Some drugs increase risk of falling: UNC researchers

CHAPEL HILL – Researchers at the University of North Carolina at Chapel Hill have created a list of prescription drugs that increase the risk of falling for patients aged 65 and older who take four or more medications on a regular basis.

"Falls are the leading cause of both fatal and non-fatal injuries for adults 65 and older, and research suggests that those taking four or more medications are at an even greater risk than those who don't – perhaps two to three times greater," said Susan Blalock, Ph.D., an associate professor at the UNC Eshelman School of Pharmacy.

Blalock is the principal investigator of an ongoing study of a falls-prevention program she and fellow researchers developed for pharmacists to implement. Both the list of prescription drugs and some of the study's finding were published in the June issue of the American Journal of Geriatric Pharmacotherapy.

"What we've done as part of our study is to identify specific prescription drugs that are most likely to contribute to the falls," she said. The medications on the list cover a wide range of common prescription antidepressants, seizure medications, painkillers and more. The common denominator among them is that they all work to depress the central nervous system, which can make patients less alert and slower to react.

Stefanie Ferreri, Pharm.D., lead author of the paper and a clinical assistant professor in the pharmacy school, warns that patients need to be wary of more than just prescription medications, as many over-the-counter medications can also contribute to falls.

"Some allergy medications, sleep aids and some cold and cough remedies can have the same effects as prescription drugs," Ferreri said. "Always let your doctor know what over-the-counter medications you are taking and be sure to read the labels. Anything that can cause drowsiness can put you at increased risk of falling."

The researchers offered the following advice to patients and practitioners:

* For Patients

If patients see a drug they are taking on the list, they should not stop taking it. Next time they see their doctor, talk about the risk of falling and possible alternative medications.

* For Doctors

Physicians should look for medications that have been proven safe and effective in older adults and look for medicines that have less of a sedating effect. Physicians should be especially wary of anticholinergics, a class of drugs that affect nerve cells used to treat a wide range of conditions.

* For Pharmacists

Pharmacists should be alert for patients 65 and older who are taking four or more drugs and be sure the patients know about the additional risk of falling created by their medications.

The authors of the study are Ferreri, Blalock and assistant professor Mary Roth McClurg, Pharm.D., of the UNC Eshelman School of Pharmacy; Karen Demby, Ph.D., social research specialist with the UNC Injury Prevention Research Center; and Carri Casteel, Ph.D., a research assistant professor with the UNC Injury Prevention Research Center and the UNC School of Public Health department of epidemiology.

The article is available online at *http://ajgeripharmacother.com/current.html.*

To download a list of the prescription medications that increase the risk of falls for patients 65 and older, *http://uncnews.unc.edu/images/stories/news/health/2008/drugslist.pdf*

Scientists learn how food affects the brain

In addition to helping protect us from heart disease and cancer, a balanced diet and regular exercise can also protect the brain and ward off mental disorders.

"Food is like a pharmaceutical compound that affects the brain," said Fernando Gómez-Pinilla, a UCLA professor of neurosurgery and physiological science who has spent years studying the effects of food, exercise and sleep on the brain. "Diet, exercise and sleep have the potential to alter our brain health and mental function. This raises the exciting possibility that changes in diet are a viable strategy for enhancing cognitive abilities, protecting the brain from damage and counteracting the effects of aging."

Gómez-Pinilla analyzed more than 160 studies about food's affect on the brain; the results of his analysis appear in the July issue of the journal Nature Reviews Neuroscience and are available online at www.nature.com/nrn/journal/v9/n7/abs/nrn2421.html.

Omega-3 fatty acids — found in salmon, walnuts and kiwi fruit — provide many benefits, including improving learning and memory and helping to fight against such mental disorders as depression and mood disorders, schizophrenia, and dementia, said Gómez-Pinilla, a member of UCLA's Brain Research Institute and Brain Injury Research Center.

Synapses in the brain connect neurons and provide critical functions; much learning and memory occurs at the synapses, Gómez-Pinilla said.

"Omega-3 fatty acids support synaptic plasticity and seem to positively affect the expression of several molecules related to learning and memory that are found on synapses," Gómez-Pinilla said. "Omega-3 fatty acids are essential for normal brain function.

"Dietary deficiency of omega-3 fatty acids in humans has been associated with increased risk of several mental disorders, including attention-deficit disorder, dyslexia, dementia, depression, bipolar disorder and schizophrenia," he said. "A deficiency of omega-3 fatty acids in rodents results in impaired learning and memory."

Children who had increased amounts of omega-3 fatty acids performed better in school, in reading and in spelling and had fewer behavioral problems, he said.

Preliminary results from a study in England show that school performance improved among a group of students receiving omega-3 fatty acids. In an Australian study, 396 children between the ages 6 and 12 who were given a drink with omega-3 fatty acids and other nutrients (iron, zinc, folic acid and vitamins A, B6, B12 and C) showed higher scores on tests measuring verbal intelligence and learning and memory after six months and one year than a control group of students who did not receive the nutritional drink. This study was also conducted with 394 children in Indonesia. The results showed higher test scores for boys and girls in Australia, but only for girls in Indonesia.

Getting omega-3 fatty acids from food rather than from capsule supplements can be more beneficial, providing additional nutrients, Gómez-Pinilla said.

Scientists are learning which omega-3 fatty acids seem to be especially important. One is docosahexaenoic acid, or DHA, which is abundant in salmon. DHA, which reduces oxidative stress and enhances synaptic plasticity and learning and memory, is the most abundant omega-3 fatty acid in cell membranes in the brain.

"The brain and the body are deficient in the machinery to make DHA; it has to come through our diet," said Gómez-Pinilla, who was born and raised in salmon-rich Chile and eats salmon three times a week, along with a balanced diet. "Omega-3 fatty acids are essential."

A healthy diet and exercise can also reduce the effect of brain injury and lead to a better recovery, he said.

Recent research also supports the hypothesis that health can be passed down through generations, and a number of innovative studies point to the possibility that the effects of diet on mental health can be transmitted across generations, Gómez-Pinilla said.

A long-term study that included more than 100 years of birth, death, health and genealogical records for 300 Swedish families in an isolated village showed that an individual's risk for diabetes and early death increased if his or her paternal grandparents grew up in times of food abundance rather than food shortage.

"Evidence indicates that what you eat can affect your grandchildren's brain molecules and synapses," Gómez-Pinilla said. "We are trying to find the molecular basis to explain this."

Controlled meal-skipping or intermittent caloric restriction might provide health benefits, he said.

Excess calories can reduce the flexibility of synapses and increase the vulnerability of cells to damage by causing the formation of free radicals. Moderate caloric restriction could protect the brain by reducing oxidative damage to cellular proteins, lipids and nucleic acids, Gómez-Pinilla said.

The brain is highly susceptible to oxidative damage. Blueberries have been shown to have a strong antioxidant capacity, he noted.

In contrast to the healthy effects of diets that are rich in omega-3 fatty acids, diets high in trans fats and saturated fats adversely affect cognition, studies indicate.

Junk food and fast food negatively affect the brain's synapses, said Gómez-Pinilla, who eats fast food less often since conducting this research. Brain synapses and several molecules related to learning and memory are adversely affected by unhealthy diets, he said.

Emerging research indicates that the effects of diet on the brain, combined with the effects of exercise and a good night's sleep, can strengthen synapses and provide other cognitive benefits, he added.

In Okinawa, an island in Japan where people frequently eat fish and exercise, the lifespan is one of the world's longest, and the population has a very low rate of mental disorders, Gómez-Pinilla noted.

Folic acid is found in various foods, including spinach, orange juice and yeast. Adequate levels of folic acid are essential for brain function, and folate deficiency can lead to neurological disorders such as depression and cognitive impairment. Folate supplementation, either by itself or in conjunction with other B vitamins, has been shown to be effective in preventing cognitive decline and dementia during aging and enhancing the effects of antidepressants. The results of a recent randomized clinical trial indicate that a three-year folic acid supplementation can help reduce the age-related decline in cognitive function.

In patients with major depression and schizophrenia, levels of a signaling molecule known as brain-derived neurotrophic factor, or BDNF, are reduced. Antidepressants elevate BDNF levels, and most treatments for depression and schizophrenia stimulate BDNF. Here, too, omega-3 fatty acids are beneficial, as is the curry spice **curcumin**, which has been shown to reduce memory deficits in animal models of Alzheimer's disease and brain trauma. BDNF is most abundant in the hippocampus and the hypothalamus — brain areas associated with cognitive and metabolic regulation.

The high consumption of curcumin in India may contribute to the low prevalence of Alzheimer's disease on the subcontinent.

In humans, a mutation in a BDNF receptor has been linked to obesity and impairments in learning and memory.

"BDNF is reduced in the hippocampus, in various cortical areas and in the serum of patients with schizophrenia," Gómez-Pinilla said. "BDNF levels are reduced in the plasma of patients with major depression."

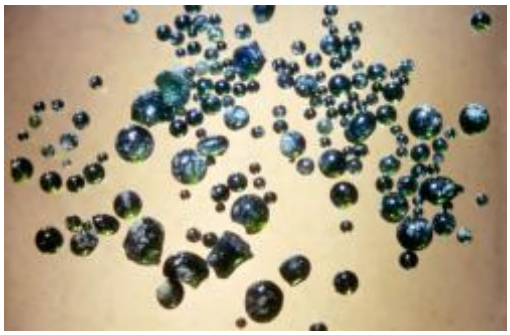
Smaller food portions with the appropriate nutrients seem to be beneficial for the brain's molecules, such as BDNF, he said.

Gómez-Pinilla showed in 1995 that exercise can have an effect on the brain by elevating levels of BDNF.

He noted that while some people have extremely good genes, most of us are not so lucky and need a balanced diet, regular exercise and a good night's sleep.

The research was funded by the National Institutes of Health's National Institute of Neurological Disorders and Stroke.

Now the Moon reveals its water



WE THOUGHT it was dry as a bone, but now it seems the moon's parched surface has water hidden beneath it.

Alberto Saal of Brown University in Providence, Rhode Island, and colleagues re-examined lunar volcanic rocks collected in the 1970s during the Apollo 15 and 17 missions. They found up to 50 parts per million of water trapped in tiny spheres of volcanic glass.

That's not much compared with the 500 to 1000 ppm of water in Earth's mantle. Yet when the lava erupted some 3 billion years ago it was exceedingly hot - perhaps up to 7000 °C - so most of the water initially present would have diffused out of the magma, leaving only a small amount by the time it cooled.

***Green glass spherules, about 0.2 mm across, were collected from the Apollo 15 landing site at Hadley Rille on the Moon* (Image: NASA)**

To find out how much water was in the magma, Saal's team measured its concentration - as well as volatile chemicals such as chlorine - at the core of the glass spherules and compared them with levels at the outer edge to work out how fast each was lost.

They concluded the moon's mantle has between 260 and 700 ppm of water. "This is very surprising, because for 40 years people have studied lunar rocks and no one found any water," says Saal. "We got lucky."

Saal cautions that future crewed missions will not be able to wring any water out of the rocks. There is, however, a slim chance that the vapour has accumulated in ice somewhere on the moon's surface.

Location, location, location

Researchers discover that learning suffers if brain transcript isn't transported far out to end of neurons

Washington, D.C. - Neuroscientists at Georgetown University Medical Center have solved a mystery that lies at the heart of human learning, and they say the solution may help explain some forms of mental retardation as well as provide clues to overall brain functioning.

Researchers have long puzzled over why a gene known as brain-derived neurotrophic factor (BDNF), which is crucial to the ability of neurons in the hippocampus to grow and connect to each other – forming the basis of memory and learning – produces two different transcripts, which then each fabricate identical proteins.

In the July 11 issue of Cell, the scientists report the answer, and it has to do with transportation. They found that the longer of the two transcripts (messenger RNAs, or mRNAs) include extra sequences that "motor" molecules attach to, in order to move the information far away from the nucleus of the cell and toward the long, tree-like branches of the nerve cell known as dendrites. There, protein-synthesizing machines use that mRNA to produce protein that helps small protrusions (called dendritic spines) on these dendrites grow.

The shorter of the mRNAs are also moved from the nucleus into the cytoplasm of the neuron, but they do not need to be transported to dendrites. These transcripts produce an identical protein, but in this case, investigators believe they help the axon, the long cable-like body of a neuron, grow.

Learning occurs when both axons and dendritic spines grow and touch each other, forming connections, and existing connections are strengthened. The scientists' findings provide a critical understanding of how dendritic spines grow and mature, but this understanding may be more broadly applied.

That's because as exciting as the findings are for understanding the function – and dysfunction - of BDNF as it relates to human learning, they also are relevant for other genes and proteins, says the study's lead investigator, Baoji Xu, Ph.D., an assistant professor in the Department of Pharmacology at Georgetown.

"The fascinating thing is that many genes produce multiple transcripts for the same protein – and no one has known why," he says. "So what we found here is likely very applicable to other genes. It reveals a mechanism for differential regulation of subcellular functions of proteins."

In this study, Xu and his research team, which included investigators from the National Institute of Child Health and Human Development (NICHHD), Emory University, and the University of Colorado, looked at why a neuron needs two "species" of BDNF mRNAs.

The gene produces a growth factor that makes neurons grow, and is vital to initial development of the brain; mice born without BDNF have developmental deficits and soon die. BDNF is also secreted by neurons in adult brains when needed, and that is usually when synaptic junctions between neurons require strengthening, a condition known as "synaptic plasticity" that underlies memory and learning. "If BDNF is deleted in an adult animal's brain, the animal will struggle to learn new tasks," Xu says.

Scientists had found that protein translation occurs in dendrites, and they believed that this protein production was important for synaptic plasticity, "but it has been difficult to study local protein synthesis only in dendrites," Xu says. "When you change protein synthesis in dendrites, you also affect protein production in other parts of the neuron."

To solve that problem, Xu and the scientists managed to create mouse mutants in which the long BDNF mRNA variant is converted to the shorter mRNA form. They found that in these mice, dendritic spines form normally, but do not mature properly and aren't "pruned" as they need to be. "This process is important for the normal function of the brain. Without it, the mice can't refine neuronal connections in response to learning," he says.

Some people diagnosed with mental retardation suffer from the same problem, Xu adds. "At a certain stage of development, maturation of dendritic spines is frozen. For example, in Fragile X Syndrome, there are too many immature dendritic spines.

"What we see in our mutant mouse and in Fragile X is similar," he says. "If we could find a way to increase BDNF synthesis in dendrites, it may be helpful to people with mental retardation.

"That, of course, is just a theory, but now that we understand the function of these two different mRNAs, we can begin to explore what issues their dysfunction causes in humans," Xu says.

The study was funded by grants from the National Institutes of Health, the American Heart Association, the Whitehall Foundation, and the American Diabetes Association.

Study co-authors include, from Georgetown: Juan Ji An, Ph.D., Kusumika Gharami, Ph.D., Guey-Ying Liao, Ph.D., and Filip Vanevski, B.A. Other contributors include Newton H. Woo, Ph.D., and Bai Lu, Ph.D., from NICHHD; Enrique R. Torre, Ph.D., Yue Feng, Ph.D., and Anthony G. Lau, B.A., from Emory University; and Kevin R. Jones, Ph.D., from the University of Colorado.

Naturopaths support tougher regulation of complementary medicine

Naturopaths are strongly in favour of regulation of their industry, a University of Queensland researcher has found.

Naturopaths believed that regulation would lift the quality of practitioners, improve patient safety, promote research and allow for greater collaboration between complementary and conventional medicine, researcher Jon Wardle, a PhD student with the School of Population Health, said.

"Naturopaths represent the largest group of complementary medicine practitioners in Australia. Studies show that around half of all health consultations are with complementary medicine practitioners. By dragging their feet on this issue, governments may be putting patients at risk," Mr Wardle said.

His study confirmed earlier findings that practitioners were not the barrier to regulation of complementary medicine in Australia.

"In fact naturopaths want more regulation and more collaboration with conventional medicine, rather than less", he said.

"A small, but vocal section of the complementary medicine industry disagrees with tighter regulation and this is portrayed as the industry view. However, this is not representative of grass-roots practitioners."

A review of the regulation issue by Mr Wardle found that most professional natural therapist associations, the Australian Medical Association and government reports from the Therapeutic Goods Administration and the Victorian Department of Human Services have strongly advocated regulation.

The review found that surveys conducted by professional associations showed patients were overwhelmingly in favour of ensuring minimum standards of practice and the Australian Medical Association, in addition to a raft of medical literature, specifically identified the lack of regulation as a major hurdle to the integration of complementary therapies.

"Despite support of patients, the medical fraternity, government agencies and the practitioners themselves government in Australia has made no serious moves towards regulation," Mr Wardle said.

Referees award more points when they see red

* 14:20 10 July 2008
* NewScientist.com news service
*** Matt Kaplan**

Referees were shown taekwondo bouts with the contestants in red and blue **(Image: Jan Leissing)**

Referees try to be fair, but on occasion even the best make bad calls. Now it would seem that sometimes they cannot help it. Researchers reveal that colours worn by competitors can shape referee decisions.

In 2005, evolutionary biologists Russell Hill and Robert Barton at the University of Durham, UK showed that wearing red clothing positively impacted an athlete's performance. They suggested that this was due to an association between red and dominance and/or aggression.

Psychology groups immediately started debating the idea, with some attributing the bias to differences in opponents' visibility. Now Norbert Hagemann and colleagues at the University of Münster, Germany, suggest a different possibility: the colour worn by an athlete might affect the decisions made by referees.

Seeing red

To test their theory, they showed 42 referees of the martial art taekwondo video excerpts from sparring rounds between similarly skilled athletes. In each video, one athlete wore blue protective gear and one wore red (see image, top right).

Each referee individually judged each clip, assigning points for the attacks made. They then watched the same bouts, in a different order, but this time with the colour of the protective gear digitally reversed, so that combatants wearing blue now appeared to wear red, and vice versa (see image, below right).

The team found that referees gave 13% more points to red competitors, even when the performances were exactly the same.

Then the same clips were presented to the refs again with the colours reversed. Even with the same footage, refs awarded more points to the contestant wearing red **(Image: Jan Leissing)**

"This is a neat experiment. It reinforces the fact that colour influences the outcome of sporting contests," says Barton. It appears that referees' judgements are also influenced, he says, perhaps by altering their subconscious attributions of dominance in the contest they are observing.

Olympic questions

With the Olympics coming up, the find raises questions about how such psychological effects will shape competitions. Boxing, tae kwon do, and wrestling have traditionally used red and blue for competitors and are expected to use them again in Beijing.

Competitors at taekwondo tournaments often wear electronic blow detectors to aid referees, says Hagemann. "But such devices are not used in boxing and still do not alter any psychological benefit granted to athletes merely wearing red."

As for team games, Hagemann expects some minor bias amongst referees, "but the effect should be small compared to a combat sport [where] the outcome is mainly based on several judgments," he says. "In team sports there could be a bias only in ambiguous tackling situations and these are usually rare."

Journal reference: Psychological Science (vol 19, issue 8)

Retina transplants show promise in patients with retinal degeneration

Experimental technique yields improved vision in 7 of 10 patients, reports American Journal of Ophthalmology

Philadelphia, 10 July 2008 – Preliminary research shows encouraging results with transplantation of retinal cells in patients with blindness caused by retinitis pigmentosa (RP) and age-related macular degeneration (AMD), according to a report in the August issue of American Journal of Ophthalmology (http://www.AJO.com).

In the FDA-monitored study, Dr. Norman D. Radtke of University of Louisville, Ky., lead author of the study and colleagues performed the experimental transplant procedure in ten patients with vision loss resulting from retinal degeneration: six patients with RP and four with the "dry" form of AMD. Although they have different causes, both RP and AMD lead to destruction of the light-receiving (photoreceptor) cells of the retina. There is currently no effective treatment for recovery of visual loss from either condition.

All patients underwent transplantation of fetal retinal cells. The cells were implanted along with their attached retinal pigment epithelium, which plays a key role in nourishing the photoreceptor cells. The concept behind the experimental procedure was that the new cells would grow to replace the damaged photoreceptor cells, connecting to the patient's remaining retina.

Follow-up testing showed visual improvements in seven of the ten patients: three of the patients with RP and all four patients with AMD. Although vision remained in the "legally blind" range for all patients, the gains in vision were significant and measurable.

"This clinical evidence shows the promise of our method to alter progressive vision loss due to incurable degenerative diseases of the retina," comments Dr. Radtke.

In one patient with RP, the visual improvement was still present up to six years after surgery, while vision in the opposite (untreated) eye continued to deteriorate. In the same patient, specialized tests showed a 27 percent increase in light sensitivity in the treated eye.

There were no problems with rejection of the transplants by the patients' immune systems, despite the lack of a perfect immunological match between the transplant donors and recipients. This likely reflected the special "immunologic protection" of tissues within the eye. Two patients also had improved vision in the untreated eyes. The reason for this unexpected result is unknown, but may involve some effect of transplantation on the immune system.

The experimental transplant procedure was designed on the basis of animal studies showing that transplantation of retinal cells can lead to the development of new retinal tissues. Previous "phase I" studies established the safety of the procedure. The new "phase II" trial provides the first evidence of improved vision—the first treatment of any type to restore lost vision in patients with RP or AMD.

Much further research will be needed to determine the potential for retinal transplantation to improve vision in patients with these diseases. "Retinal implants that combine retina and retinal pigment epithelium demonstrated an apparent ability to integrate with host retinas and to re-establish the visual pathways interrupted by disease," adds Dr. Radtke. "What we have learned will help us to refine this method and obtain further evidence that retinal implants may be a viable therapy for retinal degenerative disease."

Notes to Editors: *The full citation for the article is: Radtke ND, Aramant RB, Petry HM, et al. Vision improvement in retinal degeneration patients by implantation of retina together with retinal pigment epithelium. Am J Ophthalmol 2008; 146:172-182.*

Link shown between thunderstorms and asthma attacks in metro Atlanta area

In the first in-depth study of its kind ever done in the Southeastern United States, researchers at the University of Georgia and Emory University have discovered a link between thunderstorms and asthma attacks in the metro Atlanta area that could have a "significant public health impact."

While a relationship between thunderstorms and increased hospital visits for asthma attacks has been known and studied worldwide for years, this is the first time a team of climatologists and epidemiologists has ever conducted a detailed study of the phenomenon in the American South.

The team, studying a database consisting of more than 10 million emergency room visits in some 41 hospitals in a 20-county area in and around Atlanta for the period between 1993 and 2004, found a three percent higher incidence of visits for asthma attacks on days following thunderstorms.

"While a three percent increase in risk may seem modest, asthma is quite prevalent in Atlanta, and a modest relative increase could have a significant public health impact for a region with more than five million people," said Andrew Grundstein, a climatologist in the department of geography at UGA and lead author on the research. Grundstein went on to say that "three percent is likely conservative because of limitations in this study."

The next step for the UGA and Emory team will be, for the first time, to apply Doppler radar, modeling and observational data to the "thunderstorm asthma" problem based on what Grundstein calls an intriguing initial

finding. He points out that "radar data coupled with the metro Atlanta database will allow us to correlate thunderstorm-asthma interactions that we are probably missing today."

Paige Tolbert, professor and chair of the department of environmental and occupational health in the Rollins School of Public Health at Emory and a co-author of the just-published study, said the expertise of the two universities came together strongly in studying the problem.

"The Emory team has experience with a comprehensive emergency department database, and the UGA team can provide a much more refined characterization of thunderstorms than was performed in the previous studies of this question," she said. "The study will thus provide new insight into the mechanisms under the phenomenon of thunderstorm-induced asthma."

The research was published in the online edition of the medical journal Thorax. Other authors of the paper include: Marshall Shepherd and Thomas Mote from the UGA department of geography; Luke Naeher from the UGA department of environmental health science; and Stefanie Ebelt Sarnat and Mitchell Klein, who along with Tolbert are from the department of environmental and occupational health in the Rollins School of Public Health at Emory.

About 20 million Americans have asthma, according to the American Academy of Allergy, Asthma and Immunology. There has also been a dramatic increase in reported cases of the disease, with its prevalence increasing 75 percent between 1980 and 1994. Some 5,000 Americans die annually from asthma attacks.

Approximately 210,000 Georgia children under the age of 17 have asthma, according to the Division of Public Health of the Georgia Department of Human Resources. Some 65 percent of that number had an attack within the last year.

While associations between thunderstorm activity and asthma deaths and emergency room visits have been reported around the world, virtually no studies have been done in the American South, where hundreds of thousands suffer from asthma and thunderstorms are prevalent.

Some people may find it odd that thunderstorms, which supposedly "clear the air" of pollen and pollutants, are implicated in asthma attacks. The most prominent hypothesis as to why it happens, the authors of the paper say, is that "pollen grains may rupture upon contact with rainwater, releasing respirable allergens, and that gusty winds from thunderstorm downdrafts spread particles . . . which may ultimately increase the risk of asthma attacks."

The team used thunderstorm occurrences from meteorological data gathered at Atlanta's Hartsfield-Jackson International Airport and compared that information with the vast database of emergency room visits to arrive at the figure of a three percent increase in asthma-related emergency room visits following thunderstorms for the study period.

In all, during the 11-year period, there were 564 thunderstorm days, and in order to better understand the physical mechanisms that relate thunderstorms and asthma, the team also mined the information on total daily rainfall and maximum five-second wind gusts, which they used as "a surrogate for thunderstorm downdrafts and to indicate the maximum wind speed of the storm."

In all, there were 215,832 asthma emergency room visits during the period and 28,350 of these occurred on days following thunderstorms. While the new study is the first of its kind in the South and does clearly indicate a relationship between thunderstorms and asthma in the metro Atlanta area, much more work remains, Grundstein said.

"Obtaining a better understanding of the mechanistic basis of the phenomenon of thunderstorm-induced asthma will allow for better intervention strategies and improved emergencies services planning," said Stefanie Ebelt Sarnat of Emory. "This will be particularly important in the era of climate change."

Grundstein added that in the Atlanta area conditions favorable for an estimated doubling of severe thunderstorms are expected within this century.

MIT opens new 'window' on solar energy

Cost effective devices expected on market soon

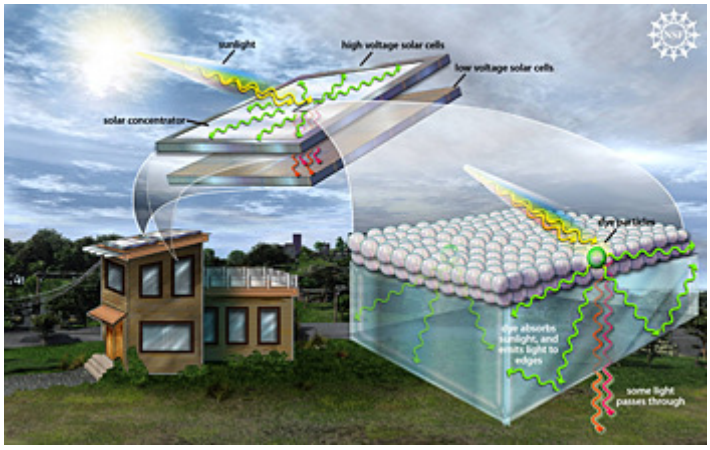
Elizabeth A. Thomson, News Office July 10, 2008

Imagine windows that not only provide a clear view and illuminate rooms, but also use sunlight to efficiently help power the building they are part of. MIT engineers report a new approach to harnessing the sun's energy that could allow just that.

The work, to be reported in the July 11 issue of Science, involves the creation of a novel "solar concentrator." "Light is collected over a large area [like a window] and gathered, or concentrated, at the edges," explains Marc A. Baldo, leader of the work and the Esther and Harold E. Edgerton Career Development Associate Professor of Electrical Engineering.

As a result, rather than covering a roof with expensive solar cells (the semiconductor devices that transform sunlight into electricity), the cells only need to be around the edges of a flat glass panel. In addition, the focused light increases the electrical power obtained from each solar cell "by a factor of over 40," Baldo says.

Because the system is simple to manufacture, the team believes that it could be implemented within three years--even added onto existing solar-panel systems to increase their efficiency by 50 percent for minimal additional cost. That, in turn, would substantially reduce the cost of solar electricity.



An artist's representation shows how a cost effective solar concentrator could help make existing solar panels more efficient.
Nicolle Rager Fuller, NSF

*** *Fact sheet: MIT's solar concentrators*** **http://web.mit.edu/newsoffice/2008/solarcells-faq-0710.html**

In addition to Baldo, the researchers involved are Michael Currie, Jon Mapel, and Timothy Heidel, all graduate students in the Department of Electrical Engineering and Computer Science, and Shalom Goffri, a postdoctoral associate in MIT's Research Laboratory of Electronics.

"Professor Baldo's project utilizes innovative design to achieve superior solar conversion without optical tracking," says Dr. Aravinda Kini, program manager in the Office of Basic Energy Sciences in the U.S. Department of Energy's Office of Science, a sponsor of the work. "This accomplishment demonstrates the critical importance of innovative basic research in bringing about revolutionary advances in solar energy utilization in a cost-effective manner."

Solar concentrators in use today "track the sun to generate high optical intensities, often by using large mobile mirrors that are expensive to deploy and maintain," Baldo and colleagues write in Science. Further, "solar cells at the focal point of the mirrors must be cooled, and the entire assembly wastes space around the perimeter to avoid shadowing neighboring concentrators."

The MIT solar concentrator involves a mixture of two or more dyes that is essentially painted onto a pane of glass or plastic. The dyes work together to absorb light across a range of wavelengths, which is then re-emitted at a different wavelength and transported across the pane to waiting solar cells at the edges.

In the 1970s, similar solar concentrators were developed by impregnating dyes in plastic. But the idea was abandoned because, among other things, not enough of the collected light could reach the edges of the concentrator. Much of it was lost en route.

The MIT engineers, experts in optical techniques developed for lasers and organic light-emitting diodes, realized that perhaps those same advances could be applied to solar concentrators. The result? A mixture of dyes in specific ratios, applied only to the surface of the glass, that allows some level of control over light absorption and emission. "We made it so the light can travel a much longer distance," Mapel says. "We were able to substantially reduce light transport losses, resulting in a tenfold increase in the amount of power converted by the solar cells."

This work was also supported by the National Science Foundation. Baldo is also affiliated with MIT's Research Laboratory of Electronics, Microsystems Technology Laboratories, and Institute for Soldier Nanotechnologies.
Mapel, Currie and Goffri are starting a company, Covalent Solar, to develop and commercialize the new technology. Earlier this year Covalent Solar won two prizes in the MIT $100K Entrepreneurship Competition. The company placed first in the Energy category ($20,000) and won the Audience Judging Award ($10,000), voted on by all who attended the awards.

Keeping hands where you can see 'em alters perception, study finds

Hands on steering wheel may help keep eyes on road

By Melissae Stuart

Psychologists at Washington University in St. Louis, led by Richard A. Abrams, Ph.D., professor of psychology in Arts & Sciences, have shown that to see objects better, you should take the matter into your own hands.

Abrams' study demonstrates that humans more thoroughly inspect objects when their hands are near the object rather than farther away from it. This reflexive, non-conscious difference in information processing exists, they posit, because humans need to be able to analyze objects near their hands, to figure out how to handle the objects or to provide protection against them.

Recognizing that the location of your hands influences what you see is a new insight into the wiring of the brain, one that could lead to rethinking current rehabilitative therapy techniques and prosthetic design.

For a stroke victim trying to regain use of a paralyzed hand, just placing the good hand next to the desired object could help the injured hand grasp it. Likewise, prosthetics could be redesigned to include additional information flow from the hand to the brain, rather than just the brain controlling the spatial location of the prosthetic, as with today's artificial limb technology.

The findings also may lend scientific support for recently enacted California legislation barring the use of hand-held cell phones while driving.

"Being able to have both hands on the wheel might enhance a driver's perception of the wheel and the nearby instruments," Abrams suggests. "If the car is perceived to be a type of extension of the wheel, then having both hands on the wheel might enhance the driver's perception of the car's location and of objects near to the car. So it is quite possible that there could be an unexpected benefit of having both hands on the wheel."

Participants in the study were asked to search for the letters S or H among groups of letters displayed on a computer monitor. When they found the letter, the subjects responded by pressing one of two buttons, located either on the sides of the monitor or on their laps. The subjects' search rate was slower when their hands were on the side of the monitor than on their laps, meaning "This is the first experiment to investigate the effect of hand position on response time for a visual search task," said Abrams. "In all previous visual search experiments, subjects viewed stimuli on a display and responded by pressing buttons on a table, where their hands were far from the stimuli. In our experiment, the subjects responded using buttons attached to the display so that their hands were next to the stimuli."

Response times from the hands-on monitor experiment were compared with those from a typical experiment where the subjects responded by pushing buttons that were far from the display, he added.

Results were published in the June issue of Cognition.

Abrams compares this new mode of information processing to the robotic arm on a space vehicle. The camera on the end of the arm sends an image to the operator about its surroundings, allowing the operator to guide the arm into position.

"The engineers who designed the arm knew that positioning it would be easier if they had the camera right in hand," he said. "What we didn't know until now was that humans have a mechanism for doing this, too."

Magnolia Compound Hits Elusive Target in Cancer Cells

A natural compound from magnolia cones blocks a pathway for cancer growth that was previously considered "undruggable," researchers have found.

A laboratory led by Jack Arbiser, MD, PhD, at Emory University School of Medicine, has been studying the compound honokiol, found in Japanese and Chinese herbal medicines, since discovering its ability to inhibit tumor growth in mice in 2003.

Arbiser's team's results were published in the July issue of Clinical Cancer Research. The research was a collaboration with the laboratory of David Foster, PhD, at Hunter College of the City University of New York. Hunter graduate students Avalon Garcia and Yang Zheng are the first authors of the paper. The collaboration also involved the lab of Dafna Bar-Sagi at New York University School of Medicine.

"Knowing more about how honokiol works will tell us what kinds of cancer to go after," says Arbiser, who is an associate professor of dermatology. "We found that it is particularly potent against tumors with activated Ras."

Ras refers to a family of genes whose mutation stimulates the growth of several types of cancers. Although the Ras family is mutated in around a third of human cancers, medicinal chemists have considered it an intractable target.

Honokiol's properties could make it useful in combination with other antitumor drugs, because blocking Ras activation would prevent tumors from escaping the effects of these drugs, Arbiser says.

"Honokiol could be effective as a way to make tumors more sensitive to traditional chemotherapy," he says.

One of the effects of Ras is to drive pumps that remove chemotherapy drugs from cancer cells. In breast cancer cell lines with activations in Ras family genes, honokiol appears to prevent Ras from turning on an enzyme called phospholipase D, Arbiser and his colleagues found. It also has similar effects in lung and bladder cancer cells in the laboratory. Phospholipase D provides what have come to be known as "survival signals" in cancer cells, allowing them to stay alive when ordinary cells would die.

Emory University is in the process of licensing honokiol and related compounds so that they can be tested in people in cooperation with industry partners.

The research was funded by the National Institutes of Health.
Dr. Arbiser, as an inventor of the technology, has a financial interest that has been reviewed and approved by Emory University in compliance with its conflict of interest policies.

Reference: "Honokiol Suppresses Survival Signals Mediated by Ras-Dependent Phospholipase D Activity in Human Cancer Cells." Clinical Cancer Research 14, 4267-4274, July 1, 2008. doi: 10.1158/1078-0432.CCR-08-0102. Avalon Garcia, Yang Zheng, Chen Zhao, Alfredo Toschi, Judy Fan, Natalie Shraibman, H. Alex Brown, Dafna Bar-Sagi, David A. Foster and Jack L. Arbiser ###

Nanotubes bring artificial photosynthesis a step nearer

* 10:20 11 July 2008
* NewScientist.com news service
*** Colin Barras**

Carbon nanotubes are the crucial chemical ingredient that could make artificial photosynthesis possible, say a team of Chinese researchers. The team has found that nanotubes mimic an important step in photosynthesis that chemists have been unable to copy until now.

Artificial photosynthesis has the potential to efficiently produce hydrogen that could be used as a clean fuel for vehicles. It could also be used to mop up carbon dioxide from the atmosphere.

Photosynthetic organisms use the energy from light to break down water into oxygen and hydrogen. The hydrogen then reacts with carbon dioxide to help synthesise carbohydrates, the molecules organisms use to store energy.

Chemists have long tried in vain to reproduce the process, but one key step in particular has proven impossible to copy.

Visible photons can only contribute a limited amount of energy towards a chemical reaction. This energy is absorbed by electrons involved in the reaction.

Elusive goal

Reactions that require more energy, such as the synthesis of carbohydrates, can only proceed when several energised electrons are available to contribute. For that reason, chemists say the photosynthesis falls into a class of reactions known as multiple electron systems.

But nobody has succeeded in making artificial multiple electron systems that could provide the necessary energy for artificial photosynthesis.

Such a system would comprise of a donor molecule that can absorb visible light and release many electrons, and a receiver molecule capable of accepting and storing those electrons. Existing systems can donate and receive only one electron at a time.

Nanotube key

Now, a team led by Xian-Fu Zhang at the Hebei Normal University of Science and Technology in Qinhuangdao, China, has found that single-walled carbon nanotubes could act as the chemical heart of a multiple electron system.

A carbon nanotube can accept one electron for every 32 carbon atoms it contains, and so even a short nanotube accepts many electrons, says Zhang. That means a carbon nanotube could act as the receiver molecule in artificial photosynthesis.

Although there are no known small molecules capable of releasing a large number of electrons after absorbing visible light, a class of molecule called the phthalocyanines (PCs) does release a single electron when it absorbs light.

Zhang's team realised that by covalently bonding a large number of PC molecules to a carbon nanotube, they could create a multiple electron system activated by visible light.

'Basic requirement'

They found that they could bond 120 PC molecules to a nanotube just 1 micrometer long, and that about 25% of the electrons donated from those PCs end up being stored in the nanotube.

"We decided to create this system initially simply to efficiently convert solar energy into electricity," says Zhang.

But he thinks the nanosystem could form a key component of an artificial photosynthesis model. The extra electrons stored in the nanotubes could be used to convert a chloroplast chemical called NADP into NADPH, which could then reduce carbon dioxide to carbohydrates.

James Barber at Imperial College London, UK, is an expert in photosynthesis. "A lot of people working in this area don't address a basic requirement – that you need to have multiple electrons in photosynthesis," he says. "I think these researchers are right to make this an issue."

Journal Reference: ChemPhysChem (DOI: 10.1002/cphc.200800191)

Side-effects analysis reveals new uses for old drugs

* 11:28 11 July 2008
* NewScientist.com news service
*** Ewen Callaway**

Unexpected drug side effects run from bothersome headaches to catastrophic heart attacks, and even suicides. But by connecting the dots between the common side effects of different drugs, scientists might give new life to old medicines, a new study suggests.

Researchers compared the side effects of 746 drugs with the premise that drugs with similar symptoms might incidentally affect the same proteins.

Mining the information on warning labels could also make for cheaper and safer drugs, says Peer Bork, a computational biologist at the European Molecular Biology Laboratory in Heidelberg, Germany, who led the study.

Among hundreds of pharmaceutical surprises, his team discovered that a stomach ulcer drug also tweaks a molecular sensor for dopamine, a key brain chemical that's reduced in Parkinson's disease.

Unwanted but unavoidable, side effects are a way of life for the drug industry. Chemicals built for one job usually meddle elsewhere. Antidepressants such as Prozac and Zoloft may battle depression by making more serotonin available to the brain, but they can also cause insomnia and dampen sex drive.

Government warnings

Sometimes such surprises turn into goldmines. Sildenafil (Viagra) was first developed to treat a type of chest condition called angina, until users noticed a peculiar side effect that has since reinvigorated the sex lives of millions of impotent men.

In search of a less serendipitous way to uncover such beneficial side effects, Bork and his colleagues sifted through warning labels of 746 drugs – basically admonitions of headache, nausea, dizziness and other symptoms that people hopefully glance over before popping a pill.

The researchers compared these government-required warnings with a database of the proteins the drugs were designed to target, and then drew lines between targets and symptoms.

The result was a list of nearly 3,000 pairs of drugs with similar side effects that targeted the same protein. Many of these were known, but Bork's team say 261 of them are surprises.

Unknown side effects

For instance, a drug that treats ulcers by blocking cells from spewing acidic molecules into the stomach also blocks the same brain cell receptors as a pill that eases symptoms of Parkinson's disease. Bork's team confirmed this link in test tubes and in living cells.

"You could use this kind of stomach ulcer drug and look whether it has an impact on Parkinson’s or Alzheimer's," he speculates.

Lab tests on another 20 predictions confirmed 13 surprising links, including a brain-boosting Alzheimer's drug that might combat depression.

However, his list should also reveal unknown side effects of existing meds. Discovering new uses for drugs might also slash costs because the drugs have already been proven to be safe in costly clinical trials, Bork says.

Restrictive culture

Tests in animals and eventually in humans for effectiveness will be needed before any of drugs can be marketed for such novel uses. But physicians in many countries, including the US and Britain, can prescribe drugs for such "off-label" uses.

Bork warns that doctors should not use the predictions to discover off-label uses, however.

Yet drug company culture, which usually divides research into disease-specific areas such as cancer and heart disease, might impede new applications, says Bork, who has previously launched four biotechnology companies.

Atul Butte, a computational biologist at Stanford University Medical School in California, says it will take time for computer predictions of new drug uses find their way to the medicine cabinet.

"We're used to doing genomics and informatics at internet speed. The minute it leaves the computer, it enters regulatory speed," he says. *Journal reference: Science (DOI: 10.1126/science.1158140)*

Giant vacuum cleaner leaves reefs thriving

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* NewScientist.com news service

*** Mark Schrope**

It sounds like a harebrained idea from some whacky movie: Seaweed overgrowing the reefs? Why not just suck it up with a vacuum?

But a team in Hawaii is using a device dubbed the Super Sucker to do just that, and new results presented at the International Coral Reef Symposium in Fort Lauderdale, Florida, suggest it might work.

Around the globe, the explosive growth of invasive and native seaweed species is wreaking economic and ecological damage. The Super Sucker was developed as a potential solution to the problem, which is blamed on overexploitation of algae-grazing fish and pollution from fertilisers.

Super Sucker is a modified gold dredging system. Seaweed from reefs is sucked up and dumped onto mesh sorting tables on a barge, with live animals returned

To create the Super Sucker, biologists modified a system designed for gold dredging. Seaweed from reefs is sucked up and dumped onto mesh sorting tables on a barge. Native organisms inadvertently vacuumed are removed and returned to the reef and the seaweed is eventually used by farmers as fertiliser.

Grazed clean?

Eric Conklin, a marine science advisor for the Nature Conservancy in Honolulu, Hawaii, US, and project leader says that the team has cleared some 8,000 kilograms of algae – mainly the invasive Gracilaria salicornia – from two 210-square-meter reef plots, leaving a control plot in between.

The researchers could only remove about 90% of the seaweed, so they expected that the algae would grow back, necessitating periodic cleaning. Instead, within weeks, the remaining seaweed was gone and two years later it has still not returned.

"I was flat-out amazed," says Conklin. The group's theory is that they removed enough material that herbivorous fish could finish the job.

Conklin says Super Sucker would have to be coupled with other efforts to manage all reef problems. Brian Lapointe, a macroalgae specialist at the Harbor Branch Oceanographic Institute in Fort Pierce, Florida, US, agrees. "It's great that they are doing this," he says, "but there needs to be several approaches."

Hot super-Earths could host life after all

* 16:44 11 July 2008
* NewScientist.com news service

*** Ker Than**

Massive, rocky worlds called 'super-Earths' – even those orbiting searingly close to their stars – may provide the right conditions for life, new research suggests.

At up to 15 times the mass of Earth, the rocky bodies are bigger and easier to spot than Earth-sized worlds, which have yet to be detected. In fact, technological advances recently led to the discovery of up to 45 new super-Earths, and astronomers say a third of all Sun-like stars may host the brawny planets.

But could they host life? "There's no reason why the different chemical cycles that are important for life on our planet wouldn't work on super-Earths," says Lisa Kaltenegger of the Harvard-Smithsonian Center for Astrophysics in Massachusetts, US.

Kaltenegger helped organise a recent conference session on the topic, and she says the consensus of attendees was similarly positive – even for those planets once dismissed as being too harsh for life.

Fire and ice

Super-Earths orbiting close to their stars, for example, experience gravitational tugs that keep them 'tidally locked' to their hosts. That means one side of such a planet always faces its star, the way the Moon always shows the same side to Earth.

Astronomers previously assumed such planets would be two-faced worlds of fire and ice, with one half molten and the other frozen.

Early models suggested the atmospheres of such worlds would quickly vanish, as water vapour and other atmospheric molecules on the planet's dark side would turn to ice and plunge to the ground. "It was thought that

after the atmosphere on the dark side was completely iced out, then it would suck atmosphere from the hot side, freezing that out as well," Kaltenegger told New Scientist.

But new models show that if a tidally locked super-Earth has an atmosphere at least as dense as Earth's, strong winds could transport heat from its hot side to its cold side. Similarly, if the planet has a global ocean, its currents could help spread the warmth.

This effect still wouldn't offset the intense heat the planets would experience at close distances to Sun-like stars. But it means super-Earths could potentially host life as close as 0.05 astronomical units away from dim stars known as red dwarfs, which make up about 85% of the stars in the galaxy (for comparison, Mercury lies 0.38 AU away from the Sun).

Shifting plates

And in some ways, super-Earths might even be more likely to support life than their Earth-sized cousins, scientists say.

Recent research suggests that super-Earths will experience more plate tectonic activity than smaller rocky worlds.

On Earth, plate tectonics – the shifting and colliding of continental plates – is necessary for life.

It plays a crucial role in the carbon-silicate cycle, which releases carbon dioxide into the atmosphere, warming the planet. Plate tectonics also locks the greenhouse gas in surface rocks and sequesters it in Earth's interior so that the planet doesn't heat up too much.

"The way we have experienced life on Earth is enabled by plate tectonics," says Diana Valencia, a graduate student at Harvard.

Super-Earths should have larger molten cores and should generate more heat than Earth-sized worlds, Valencia told New Scientist. This could cause more vigorous convection in the planets' mantles and create thinner plates that slip and slide more easily.

Eventually, missions such as NASA's upcoming Kepler space telescope could find an Earth-sized planet in our galaxy. "But there's going to be a lot of super-Earths discovered before that," Valencia says. "If we're concerned about finding life, those are the planets we should be investigating right now."