http://www.eurekalert.org/pub_releases/2011-12/uocm-ass120711.php

A small step for lungfish, a big step for the evolution of walking

Ancient fish use thin limbs to walk and lift body, important steps for terrestriality

The eel-like body and scrawny "limbs" of the African lungfish would appear to make it an unlikely innovator for locomotion. But its improbable walking behavior, newly described by University of Chicago scientists, redraws the evolutionary route of life on Earth from water to land.

Extensive video analysis, published in the Proceedings of the National Academy of Sciences, reveal that the African lungfish can use its thin pelvic limbs to not only lift its body off the bottom surface but also propel itself forward. Both abilities were previously thought to originate in early tetrapods, the limbed original land-dwellers that appeared later than the lungfish's ancestors.

The observation reshuffles the order of evolutionary events leading up to terrestriality, the adaptation to living on land. It also suggests that fossil tracks long believed to be the work of early tetrapods could have been produced instead by lobe-finned ancestors of the lungfish.

"In a number of these trackways, the animals alternate their limbs, which suggested that they must have been made by tetrapods walking on a solid substrate," said Melina Hale, PhD, associate professor of Organismal Biology and Anatomy. "We've found that aquatic animals with fundamentally different morphologies and that aren't tetrapods could potentially make very similar track patterns."

Lungfish are a popular pet in the paleontological community, treasured for their unique evolutionary heritage.

"The lungfish is in a really great and unique position in terms of how it is related to fishes and to tetrapods," said Heather King, a graduate student and lead author of the study. "Lungfish are very closely related to the animals that were able to evolve and come out of the water and onto land, but that was so long ago that almost everything except the lungfish has gone extinct." While anecdotes and rumors circulated within the scientific community about the alleged walking behavior of these strange fish, nobody looked systematically at the biomechanics of their locomotion. An African lungfish (Protopterus annectens) kept in the laboratory of study co-author Michael Coates inspired King to study the species' ability to walk on its unusually thin limbs.

King and her colleagues designed a special tank in which the motions of lungfish could be videotaped from the side and below for in-depth analysis. The videos revealed that lungfish commonly use their hind, or pelvic, limbs to elevate their body off the surface and propel themselves forward. Though the forelimbs look similar to the hindlimbs, they were not involved in locomotion, the authors found.

"This is all information we can only get from a living animal," King said. "Because if you were just to look at the bones, like you would with a fossil, you might not ever know these motions could occur."

Lungfish also demonstrated both "bounding" motions, where both limbs moved at once, and "walking," marked by alternating limbs. Coupled with the ability of the lungfish to fully rotate the limb and place each subsequent footfall in front of the joint, the motion suggests that similar creatures would have been capable of producing some of the fossil tracks credited to tetrapods. "It's tempting to attribute alternating impressions to something like the footfalls of an early tetrapod with digits, and yet here we've got good evidence that living lungfish can leave similar sequences of similar gait," said Coates, PhD, professor of Organismal Biology and Anatomy. "The fin or limb use thought to be unique to tetrapods is actually more general."

The lungfish's ability to use its thin limbs to support its body may be helped by the reduced demands of gravity underwater, the authors proposed. By filling its lungs with air, the lungfish may increase the buoyancy of its front end, enabling the scrawny hindlimbs to lift the entire body off the ground.

"If you showed me the skeleton of this creature and asked me to make a bet on whether it walks or not, I would have bet it couldn't," said co-author Neil Shubin, PhD, Robert R. Bensley Professor of Organismal Biology and Anatomy. "Their fins seem like the furthest thing from walking appendages possible. But it shows what's possible in an aquatic medium where you don't have to support yourself with gravity."

The discovery suggests that many of the developments necessary for the transition from water to land could have occurred long before early tetrapods, such as Tiktaalik, took their first steps on shore. Lobe-finned ancestors of the lungfishes as well as tetrapods could have evolved hindlimb propulsion and the ability to walk on the substrate at the bottom of a lake or marsh millions of years before limbs with digits and land-dwelling animals appeared. "This shows us - pardon the pun - the steps that are involved in the origin of walking," Shubin said. "What we're seeing in lungfish is a very nice example of how bottom-walking in fish living in water can easily come about in a very tetrapod-like pattern."

The paper, "Behavioral evidence for the evolution of walking and bounding before terrestriality in sarcopterygian fishes," will be published in the online Early Edition of Proceedings of National Academy of Sciences the week of December 12, 2011. Funding for this work was provided by the National Science Foundation.

http://www.eurekalert.org/pub_releases/2011-12/uow-sdm120911.php

Study debunks myths about gender and math performance

A major study of recent international data on school mathematics performance casts doubt on some common assumptions about gender and math achievement - in particular, the idea that girls and women have less ability due to a difference in biology.

MADISON - "We tested some recently proposed hypotheses that try to explain a supposed gender gap in math performance and found they were not supported by the data," says Janet Mertz, senior author of the study and a professor of oncology at the University of Wisconsin-Madison. Instead, the Wisconsin researchers linked differences in math performance to social and cultural factors. The new study, by Mertz and Jonathan Kane, a professor of mathematical and computer sciences at the University of Wisconsin-Whitewater, was published today (Dec. 12, 2011) in Notices of the American Mathematical Society.

The study looked at data from 86 countries, which the authors used to test the "greater male variability hypothesis" famously expounded in 2005 by Lawrence Summers, then president of Harvard, as the primary reason for the scarcity of outstanding women mathematicians. That hypothesis holds that males diverge more from the mean at both ends of the spectrum and, hence, are more represented in the highest-performing sector. But, using the international data, the Wisconsin authors observed that greater male variation in math achievement is not present in some countries, and is mostly due to boys with low scores in some other countries, indicating that it relates much more to culture than to biology.

The new study relied on data from the 2007 Trends in International Mathematics and Science Study and the 2009 Programme in International Student Assessment. "People have looked at international data sets for many years", Mertz says. "What has changed is that many more non-Western countries are now participating in these studies, enabling much better cross-cultural analysis."

The Wisconsin study also debunked the idea proposed by Steven Levitt of "Freakonomics" fame that gender inequity does not hamper girls' math performance in Muslim countries, where most students attend single-sex schools. Levitt claimed to have disproved a prior conclusion of others that gender inequity limits girls' mathematics performance. He suggested, instead, that Muslim culture or single-sex classrooms benefit girls' ability to learn mathematics.

By examining the data in detail, the Wisconsin authors noted other factors at work. "The girls living in some Middle Eastern countries, such as Bahrain and Oman, had, in fact, not scored very well, but their boys had scored even worse, a result found to be unrelated to either Muslim culture or schooling in single-gender classrooms," says Kane. He suggests that Bahraini boys may have low average math scores because some attend religious schools whose curricula include little mathematics. Also, some low-performing girls drop out of school, making the tested sample of eighth graders unrepresentative of the whole population. "For these reasons, we believe it is much more reasonable to attribute differences in math performance primarily to country-specific social factors," Kane says.

To measure the status of females relative to males within each country, the authors relied on a gender-gap index, which compares the genders in terms of income, education, health and political participation. Relating these indices to math scores, they concluded that math achievement at the low, average and high end for both boys and girls tends to be higher in countries where gender equity is better. In addition, in wealthier countries, women's participation and salary in the paid labor force was the main factor linked to higher math scores for both genders.

"We found that boys - as well as girls - tend to do better in math when raised in countries where females have better equality, and that's new and important," says Kane. "It makes sense that when women are well-educated and earn a good income, the math scores of their children of both genders benefit."

Mertz adds, "Many folks believe gender equity is a win-lose zero-sum game: If females are given more, males end up with less. Our results indicate that, at least for math achievement, gender equity is a win-win situation."

U.S. students ranked only 31st on the 2009 Programme in International Student Assessment, below most Western and East-Asian countries. One proposed solution, creating single-sex classrooms, is not supported by the data. Instead, Mertz and Kane recommend increasing the number of math-certified teachers in middle and high schools, decreasing the number of children living in poverty and ensuring gender equality.

"These changes would help give all children an optimal chance to succeed," says Mertz. "This is not a matter of biology: None of our findings suggest that an innate biological difference between the sexes is the primary reason for a gender gap in math performance at any level. Rather, these major international studies strongly suggest that the math-gender gap, where it occurs, is due to sociocultural factors that differ among countries, and that these factors can be changed."

http://www.eurekalert.org/pub_releases/2011-12/uops-wba121211.php

Widespread brain atrophy detected in Parkinson's disease with newly developed structural pattern

Hippocampal atrophy seen with early cognitive decline in Parkinson's disease, Penn study shows

PHILADELPHIA – Atrophy in the hippocampus, the region of the brain known for memory formation and storage, is evident in Parkinson's disease (PD) patients with cognitive impairment, including early decline known as mild cognitive impairment (MCI), according to a study by researchers in the Perelman School of Medicine at the University of Pennsylvania. The study is published in the December issue of the Archives of Neurology, one of the JAMA/Archives journals.

First, using traditional imaging analyses, researchers found that Parkinson's patients with MCI had more atrophy in the hippocampus, basal ganglia, amygdala, and insula compared with Parkinson's patients with normal cognition, whereas Parkinson's patients with normal cognition showed no significant loss of brain volume compared with healthy controls. For Parkinson's patients with full-blown dementia, atrophy was present not only in the hippocampus but also the surrounding medial temporal lobe, also crucial to memory and other cognitive abilities.

Then researchers generated the first structural pattern of classifying brain atrophy associated with dementia in Parkinson's disease by analyzing the scans of PD with either dementia or normal cognition.

"When we layer different information gathered from structural MRIs and generate a structural pattern that weighs different brain regions on their ability to distinguish PD with dementia from those with normal cognition, we can see a pattern of diffuse gray matter and white matter atrophy in the brains of Parkinson's patients with cognitive decline," explains the study's lead author, Daniel Weintraub, MD, associate professor of Geriatric Psychiatry with Penn's Perelman School of Medicine and the Philadelphia Veterans Affairs Medical Center. "This complex analysis of brain imaging data suggests that it is possible to detect a wide range of brain atrophy at the initial stages of cognitive decline in patients with Parkinson's disease, which has not been reported previously."

As Parkinson's-related mild cognitive impairment (PD-MCI) is increasingly recognized as an important clinical syndrome of possible precursor of Parkinson's dementia, biomarkers with good screening or diagnostic validity can help categorize levels of cognitive impairment, may predict future cognitive decline, and may ultimately help inform treatment decisions.

The neurodegeneration that contributes to cognitive decline seen in Parkinson's, particularly in regions of the brain known to play a role in Alzheimer's disease, such as the hippocampus, is likely due to a "complex interaction of different disease pathologies," the researchers said. Approximately 80 percent of Parkinson's disease patients ultimately develop dementia.

Parkinson's patients with normal cognition showed no atrophy and had similar brain volumes to healthy controls without Parkinson's or cognitive impairment. Therefore, researchers believe that significant brain atrophy in areas subserving cognition does not occur in Parkinson's disease without a comorbid cognitive impairment.

Eighty-four Parkinson's patients from the Penn Parkinson's Disease and Movement Disorders Center and 23 healthy controls received MRIs of the brain. Of the 84 Parkinson's patients, 61 had normal cognition, 12 were classified as having mild cognitive impairment, and 11 were diagnosed with Parkinson's disease dementia.

The research team included Dr. Weintraub, Jimit Doshi, MS, Deepthi Koka, MS, Christos Davatzikos, PhD, Andrew Siderowf, MD, MSCE, John Duda, MD, David Wolk, MD, Paul Moberg, PhD, Sharon Xie, PhD, and Christopher Clark, MD, representing the Penn Udall Center for Parkinson's Research and the Perelman School of Medicine's departments of Psychiatry, Neurology, Radiology, Biostatistics and Epidemiology. Dr. Weintraub and Dr. Duda are also with Philadelphia Veterans Affairs Medical Center. Dr. Clark is with Avid Radiopharmaceuticals.

The study was funded by grants from the National Institutes of Health's National Institute of Neurological Disorders and Strokes and National Institute of Aging, as well as a grant awarded by Department of Health of the Commonwealth of Pennsylvania from the Tobacco Master Settlement Agreement.

http://www.eurekalert.org/pub_releases/2011-12/vt-tpo121211.php

The paradox of gift giving: More not better, says new study

Holiday shoppers, take note. Marketing and psychology researchers have found that in gift giving, bundling together an expensive "big" gift and a smaller "stocking stuffer" reduces the perceived value of the overall package for the recipient.

Suppose you're trying to impress a loved one with a generous gift this holiday season, says Kimberlee Weaver, assistant professor of marketing in the Pamplin College of Business. One option is to buy them a luxury cashmere sweater. A second option is to add in a $10 gift card.

If their budget allows, most gift givers would choose the second option, as it comprises two gifts - one big, one small, Weaver says. Ironically, however, the gift recipient is likely to perceive the cashmere sweater alone as more generous than the combination of the same sweater and gift card. "The gift giver or presenter does not anticipate this difference in perspectives and has just cheapened the gift package by spending an extra $10 on it." Weaver is part of a research team that recently discovered, through a series of studies, what the team has called the "Presenter's Paradox." The paradox arises because gift givers and gift recipients have different perspectives, Weaver says. Gift givers follow a "more-is-better" logic; recipients evaluate the overall package.

"People who evaluate a bundle, such as a gift package, follow an averaging strategy, which leads to less favorable judgments when mildly favorable pieces (the gift card) are added to highly favorable pieces (the sweater). The luxury sweater represents a generous 'big' gift. Adding on a 'little' gift makes the total package seems less big."

The same contradictory effect can be found in other situations, says Weaver, whose research article, "The Presenter's Paradox," co-authored with Stephen Garcia and Norbert Schwarz of the University of Michigan, has been accepted for publication in the Journal of Consumer Research.

"People who present a bundle of information assume that every favorable piece adds to their overall case and include it in the bundle they present," she says. However, notes Garcia, associate professor of psychology and organizational studies at the University of Michigan, "this strategy backfires, because the addition of mildly favorable information dilutes the impact of highly favorable information in the eyes of evaluators. Hence, presenters of information would be better off if they limited their presentation to their most favorable information - just as gift givers would be better off to limit their present to their most favorite gift."

Weaver and her co-authors found that the paradox was strongly evident in seven studies across many product domains, from bundles of music to hotel advertisements, scholarships, and even "negative" items such as penalty structures.

When asked to design a penalty for littering, for example, those who were put in charge preferred a penalty that comprised a $750 fine plus 2 hours of community service over a penalty that comprised only the $750 fine. However, perceivers evaluated the former penalty as less severe than the latter, Weaver says. "Adding a couple of hours of community service made the overall penalty appear less harsh and undermined its deterrence value."

The discovery of the Presenter's Paradox sheds new light on how to best present information, says Weaver. "Whether it is a public relations expert pondering which reviews to include on a book jacket, a music producer considering which songs to include in a music album, or a legal team building up arguments for a case, they all face the important task of deciding what information to include in their presentations. So do consumers who apply for a job and homeowners who try to sell their house."

All of them, she says, run the risk of inadvertently diluting the very message they seek to convey by their efforts to strengthen it. "Fortunately, there is a simple remedy: take the perspective of the evaluator and ask yourself how the bundle will appear to someone who will average across its components. Doing so will alert you to the fact that others will not always share your sense that more is better."

"Prompting consumers to consider the overall picture entices them to adopt a holistic perspective, which allows them to correctly anticipate evaluators' judgments," says Schwarz, professor of marketing and psychology at the University of Michigan. "But when left to their own devices, presenters are unlikely to notice that evaluators do not share their more-is-better rule."

http://www.eurekalert.org/pub_releases/2011-12/afot-tdo121211.php

The disappearance of the elephant caused the rise of modern man

Dietary change led to the appearance of modern humans in the Middle East 400,000 years ago, say Tel Aviv University researchers

Elephants have long been known to be part of the Homo erectus diet. But the significance of this specific food source, in relation to both the survival of Homo erectus and the evolution of modern humans, has never been understood - until now.

When Tel Aviv University researchers Dr. Ran Barkai, Miki Ben-Dor, and Prof. Avi Gopher of TAU's Department of Archaeology and Ancient Near Eastern Studies examined the published data describing animal bones associated with Homo erectus at the Acheulian site of Gesher Benot Ya'aqov in Israel, they found that elephant bones made up only two to three percent the total. But these low numbers are misleading, they say. While the six-ton animal may have only been represented by a tiny percentage of bones at the site, it actually provided as much as 60 percent of animal-sourced calories.

The elephant, a huge package of food that is easy to hunt, disappeared from the Middle East 400,000 years ago - an event that must have imposed considerable nutritional stress on Homo erectus. Working with Prof.

Israel Hershkovitz of TAU's Sackler Faculty of Medicine, the researchers connected this evidence about diet with other cultural and anatomical clues and concluded that the new hominids recently discovered at Qesem Cave in Israel - who had to be more agile and knowledgeable to satisfy their dietary needs with smaller and faster prey - took over the Middle Eastern landscape and eventually replaced Homo erectus.

The findings, which have been reported in the journal PLoS One, suggest that the disappearance of elephants 400,000 years ago was the reason that modern humans first appeared in the Middle East. In Africa, elephants disappeared from archaeological sites and Homo sapiens emerged much later - only 200,000 years ago.

The perfect food package

Unlike other primates, humans' ability to extract energy from plant fiber and convert protein to energy is limited. So in the absence of fire for cooking, the Homo erectus diet could only consist of a finite amount of plant and protein and would have needed to be supplemented by animal fat. For this reason, elephants were the ultimate prize in hunting - slower than other sources of prey and large enough to feed groups, the giant animals had an ideal fat-to-protein ratio that remained constant regardless of the season. In short, says Ben-Dor, they were the ideal food package for Homo erectus.

When elephants began to die out, Homo erectus "needed to hunt many smaller, more evasive animals. Energy requirements increased, but with plant and protein intake limited, the source had to come from fat. He had to become calculated about hunting," Ben-Dor says, noting that this change is evident in the physical appearance of modern humans, lighter than Homo erectus and with larger brains.

To confirm these findings, the researchers compared archaeological evidence from two sites in Israel: Gesher B'not Yaakov, dating back nearly 800,000 years and associated with Homo erectus; and Qesem Cave, dated 400,000 to 200,000 years ago. Gesher B'not Yaakov contains elephant bones, but at Qesem Cave, which is bereft of elephant bones, the researchers discovered signs of post-erectus hominins, with blades and sophisticated behaviors such as food sharing and the habitual use of fire.

Evolution in the Middle East

Modern humans evolved in Africa 200,000 years ago, says Dr. Barkai, and the ruling paradigm is that this was their first worldwide appearance. Archaeological records tell us that elephants in Africa disappeared alongside the Acheulian culture with the emergence of modern humans there. Though elephants can be found today in Africa, few species survived and no evidence of the animal can be found in archaeological sites after 200,000 years ago. The similarity to the circumstances of the Middle East 400,000 years ago is no coincidence, claim the researchers. Not only do their findings on elephants and the Homo erectus diet give a long-awaited explanation for the evolution of modern humans, but they also call what scientists know about the "birth-place" of modern man into question.

Evidence from the Qesem Cave corroborates this revolutionary timeline. Findings from the site dated from as long as 400,000 years ago, clearly indicate the presence of new and innovative human behavior and a new human type. This sets the stage for a new understanding of the human story, says Prof. Gopher.

http://news.discovery.com/space/mars-life-habitability-regions-111212.html

Life Possible On 'Large Regions' of Mars

With higher pressures and warmer temperatures beneath the Martian surface, Earth-like microorganisms could thrive.

Australian scientists who modeled conditions on Mars to examine how much of the Red Planet was habitable said that "large regions" could sustain life. Charley Lineweaver's team, from the Australian National University, compared models of temperature and pressure conditions on Earth with those on Mars to estimate how much of the distant planet was livable for Earth-like organisms.

While just one percent of Earth's volume - from core to upper atmosphere - was occupied by life, Lineweaver said their world-first modeling showed three percent of Mars was habitable, though most of it was underground.

"What we tried to do, simply, was take almost all of the information we could and put it together and say 'is the big picture consistent with there being life on Mars?'," the astrobiologist told AFP on Monday. "And the simple answer is yes... There are large regions of Mars that are compatible with terrestrial life."

Where previous studies had taken a "piecemeal" approach by examining particular sites on Mars for signs of life, Lineweaver said his research was a "comprehensive compilation" of the entire planet using decades of data.

Frozen water has been found at the poles on Mars and the ANU study examined how much of the planet could sustain water "that could be habitable by Earth-like standards by Earth-like microbes".

The low-pressure environment of Mars means water cannot exist as a liquid and will vaporize on the surface, but Lineweaver said the conditions are right underground, where the weight of the soil gives the added pressure

required. It would also be warm enough, at certain depths, for bacteria and other micro-organisms to thrive due to heat from the planet's core. The average surface temperature on Mars, Earth's nearest neighbor, is minus 63 degrees Celsius (minus 81 Fahrenheit).

Lineweaver said his study was "the best estimate yet published of how habitable Mars is to terrestrial microbes" and a significant finding given mankind had evolved from microbial life. "It's not important if you want to figure out what the laws of physics are and you want to talk to some intelligent aliens who could build spaceships," he said. "If you're interested in the origin of life and how likely life is to get started on other planets, that's what relevant here."

NASA's Curiosity Rover, the largest, most sophisticated robotic explorer ever built, is en route to Mars and due to land in August 2012. It has a laser for zapping rocks and a tool kit to analyze their contents as well as a robotic arm, drill, cameras and sensors to enable it to report back on the Martian weather and atmospheric radiation. Curiosity is scheduled to land at the Gale Crater, near Mars' equator, chosen for its five kilometer (three mile) high sediment mountain which will hopefully reveal clues about the planet's wetter past.

Lineweaver said the NASA mission "sadly" did not have the capability to dig deep enough to find the life his study had modeled but Curiosity would be able to examine "at least the edges" of what was once the Martian depths at the crater. "But these have been exposed for a long time and therefore are probably devoid of volatiles and they are not warm like they used to be," he said.

Lineweaver's paper was published Monday in the scientific journal Astrobiology.

http://www.sciencedaily.com/releases/2011/12/111212100227.htm

Star Explosion Leaves Behind a Rose

In a new image from NASA's Wide-field Infrared Survey Explorer, Puppis A looks less like the remains of a supernova explosion and more like a red rose.

ScienceDaily - About 3,700 years ago, people on Earth would have seen a brand-new bright star in the sky. It slowly dimmed out of sight and was eventually forgotten, until modern astronomers later found its remains, called Puppis A. In this new image from NASA's Wide-field Infrared Survey Explorer (WISE), Puppis A looks less like the remains of a supernova explosion and more like a red rose.

Puppis A (pronounced PUP-pis) was formed when a massive star ended its life in a supernova, the most brilliant and powerful form of an explosion in the known universe. The expanding shock waves from that explosion are heating up the dust and gas clouds surrounding the supernova, causing them to glow and appear red in this infrared view. While much of the material from that original star was violently thrown out into space, some of it remained in an incredibly dense object called a neutron star. This particular neutron star (too faint to be seen in this image) is moving inexplicably fast: over 3 million miles per hour! Astronomers are perplexed over its absurd speed, and have nicknamed the object the "Cosmic Cannonball."

Some of the green-colored gas and dust in the image is from yet another ancient supernova - the Vela supernova remnant. That explosion happened around 12,000 years ago and was four times closer to us than Puppis A. The colors in this image represent different wavelengths of infrared light that humans can't see with their eyes.

About 3,700 years ago people on Earth would have seen a brand-new bright star in the sky. As it slowly dimmed out of sight, it was eventually forgotten, until modern astronomers found its remains -- called Puppis A. **Credit: NASA/JPL-Caltech/UCLA**

JPL manages and operates the Wide-field Infrared Survey Explorer for NASA's Science Mission Directorate, Washington. The principal investigator, Edward Wright, is at UCLA. The mission was competitively selected under NASA's Explorers Program managed by the Goddard Space Flight Center, Greenbelt, Md. The science instrument was built by the Space Dynamics Laboratory, Logan, Utah, and the spacecraft was built by Ball Aerospace & Technologies Corp., Boulder, Colo. Science operations and data processing take place at the Infrared Processing and Analysis Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.

More information is online at http://www.nasa.gov/wise and http://wise.astro.ucla.edu and http://www.jpl.nasa.gov/wise .

http://www.sciencedaily.com/releases/2011/12/111212124608.htm

Bloodstream Malaria Infections in Mice Successfully Cleared

A research team was able to cure mice of bloodstream malaria

ScienceDaily - University of Iowa researchers and colleagues have discovered how malaria manipulates the immune system to allow the parasite to persist in the bloodstream. By rescuing this immune system pathway, the research team was able to cure mice of bloodstream malaria infections.

The findings, which were published Dec. 11 in the Advance Online Publication of the journal Nature Immunology, could point the way to a new approach for treating malaria that does not rely on vaccination and is not susceptible to the parasite's notorious ability to develop drug resistance.

"Malaria is chronic, prolonged infection and the host immune defense has a tough time clearing it and sometimes it never clears it," says Noah Butler, PhD, UI postdoctoral research scholar and lead study author. "We've determined that this prolonged infection actually drives dysfunction of the immune cells that are supposed to be fighting the infection, which in essence allows further persistence of the parasite infection."

More specifically, the study showed that the malaria parasite stimulate these key immune cells (known as CD4+ T cells) so that they continuously express molecules called inhibitory receptors. Under normal circumstances, these molecules help to "apply the brakes" to the immune response and prevent over-activation that can be harmful. However, by keeping the mechanism turned on, the malaria parasite damps down the immune response significantly, reducing the T cells' ability to fight the parasite and allowing it to persist.

Importantly, the team also showed that blocking the action of the inhibitory receptor molecules resulted in immediate and complete clearance of the malaria parasite. "When we blocked the function of these molecules, we took the brakes off the host's immune response and everything got better - the overall immune response was dramatically improved and there was immediate control and accelerated clearance of the parasite," says John Harty, PhD, professor of microbiology and pathology at the UI Carver College of Medicine and senior study author. "These findings suggest an alternative approach for the treatment of existing malaria infection."

200 Million Malaria Cases

More than half the world's population is at risk of malaria, a mosquito-borne parasite that causes anemia and high fever and which can persist for weeks or months. There are more than 200 million cases of malaria each year and an estimated 800,000 children die from malaria annually.

Harty notes that the current study was done in mice and it is not yet known if the same approach will work in humans. However, two factors suggest the strategy may have potential. First, drugs that block inhibitory receptor molecules are available and currently being tested as cancer therapies. And second, the UI team found that malaria infection in humans does lead to increased expression of inhibitory receptors on CD4+ T cells suggesting that these molecules could represent a viable target for human therapies.

The human findings were the product of an important collaboration between the UI team and malaria researchers working in the sub-Saharan country of Mali. The Mali team based at the University of Bamako works in a sophisticated lab set up by the National Institutes of Health. In Mali's dry season there are no mosquitoes, so there's no malaria; in the wet season, the mosquitoes come out and malaria appears.

"Workers in the NIH lab obtained blood samples from malaria-free children at the end of the dry season, and then when some of the children returned to the clinic with malaria at the beginning of the next wet season they were treated immediately and the workers also took a second blood sample," Harty explains. "This allowed us to analyze the blood for expression of this inhibitory molecule before and after infection and we found that the molecule went up after infection."

Malaria Further Compromises Immune System

A second collaboration, born closer to home, allowed Harty's team to prove that it is the CD4+ T cells that are disrupted by the malaria infection.

Using a new technique that was developed in the lab of UI microbiologist Steve Varga, PhD, the researchers were able to track the behavior of the responding T cells during malaria infection. They found that chronic malaria infection led to sustained expression of the inhibitory receptor molecules on the surfaces of this type of T cell and also showed that the T cells' ability to fight the parasite was significantly reduced.

The study also found that as the parasite persists the inhibitory receptor molecules remain upregulated and the immune system became more and more compromised.

"The T-cells are so over-stimulated that they eventually lose their function or even die -- this is known as T-cell exhaustion," Butler explains.

The concept that prolonged persistence of an "insult" to the immune system, such as cancer or chronic viral infections like HIV, disrupts and exhausts the immune response is well established. However, this study is the

first time it has been shown for malaria. The study finding suggests that rescuing CD4+ T cells from exhaustion could be an effective strategy to control and clear bloodstream malaria infections.

In addition to Harty and Butler, UI researchers Lecia Pewe, Lorraine Tygrett, and Thomas Waldschmidt, PhD, also were involved in the study. The team also included Jacqueline Moebius and Peter Crompton from the National Institute of Allergy and Infectious Diseases in Rockville, Maryland, and Boubacar Traore and Ogobara Doumbo from the Malaria Research and Training Center, University of Bamako in Mali.

The study was funded in part by grants from the NIH and the UI Department of Microbiology.

http://news.discovery.com/tech/vapor-disinfects-111212.html

Vapor Disinfects Hospitals, Kills Bed Bugs

An infectious disease expert from Queen's University has helped develop a disinfection system that could revolutionize methods for sterilizing hospitals all over the world.

By Nic Halverson | Mon Dec 12, 2011 03:11 PM ET

"This is the future, because many hospital deaths are preventable with better cleaning methods," said Quinte Health Care's new Chief of Staff, Dr. Dick Zoutman, in a university press release. "It has been reported that more than 100,000 people in North America die every year due to hospital-acquired infections at a cost of $30 billion. That's 100,000 people every year who are dying from largely preventable infections." Zoutman's new method involves pumping a vapor mixture of ozone and hydrogen peroxide into a room to completely sterilize it. Everything from the floors, walls and drapes to mattresses, chairs and other surfaces are left disinfected.

The technique was inspired by how Mother Nature kills bacteria in humans. For example, when an antibody attacks a germ, it produces an ozone and a small amount of hydrogen peroxide, generating a highly reactive compound that kills bacteria, viruses and mold. "It works well for Mother Nature and is working very well for us," said Dr. Zoutman. Besides being more effective than simply wiping down a hospital room, this new technology has other advantages, too. It can be used to sterilize instruments, it leaves behind a pleasant smell and the whole process takes less than one hour.

On top of that, Dr. Zoutman also demonstrated the technique effectively kills bed bugs. As well, he says the technology could also be used to disinfect areas of food preparation, processing plants and cruise ships.

Dr. Zoutman collaborated with Dr. Michael Shannon of Medizone International at Queen's University laboratories. Medizone is commercializing the new technology, with first deliveries scheduled for early 2012.

[Via Science Daily]

http://medicalxpress.com/news/2011-12-surgeons-vivo-lung-transplants.html

Surgeons perform first 'ex vivo' lung transplants

Two patients were among the first in the United States to receive transplanted lungs that were assessed and reconditioned in the operating room - a technique that has the potential to dramatically increase the availability of lungs for transplant

A 59-year-old woman from upstate New York and a 60-year-old woman from the New York metro area were the first patients in New York state and among the first in the United States to receive transplanted lungs that were assessed and reconditioned in the operating room -- a technique that has the potential to dramatically increase the availability of lungs for transplant. The experimental procedure was performed by Dr. Frank D'Ovidio at NewYork-Presbyterian Hospital/Columbia University Medical Center.

The "ex vivo" or outside-the-body approach involved removing lungs from a deceased donor, then enclosing them inside a transparent dome and connecting them to a cardiopulmonary pump and a ventilator. For four hours, the lungs were infused with nutrients and antibiotics. They were gradually warmed to body temperature, ventilated and oxygenated -- a process that resembles breathing, with the lungs inflating and deflating. Once determined to be viable, the lungs were immediately transplanted into the patients.

"Assessing lungs this way gives us a much more precise picture of how they should perform after transplant, and the reconditioning process may actually improve the chances of success," says Dr. D'Ovidio, associate surgical director of the lung transplant program at NewYork-Presbyterian Hospital/Columbia University Medical Center and assistant professor of surgery at Columbia University College of Physicians and Surgeons.

Traditionally, transplant surgeons have relied on a less sophisticated assessment. "Now with the ex vivo method, not only can we see the lungs inflate and deflate, but we also get hard data on how they function by monitoring multiple parameters and ultimately making sure that the gas exchange is happening at the level it needs to," continues Dr. D'Ovidio.

Going forward, the ex vivo procedure could significantly increase the availability of donor lungs, says Dr. D'Ovidio. "This has the potential to do for lung transplant what perfusion has done for kidney transplant. With the tool to better assess, recondition and possibly repair the organs, we can increase the number available to patients who desperately need them."

Currently, fewer than 30 percent of donor lungs are acceptable for transplantation, but physicians say ex vivo has the potential to double this figure as the reconditioning process is refined and improved.

The recent transplants at NewYork-Presbyterian/Columbia are part of an ongoing FDA investigational multicenter clinical research trial designed to compare outcomes from lung transplants using the ex vivo technique with those using the traditional method. This investigational trial, currently taking place in the United States, is coordinated and funded by Vitrolife, makers of the ex vivo perfusion system.

Provided by New York- Presbyterian Hospital

http://www.eurekalert.org/pub_releases/2011-12/ps-ias121311.php

Increased arm swing asymmetry is early sign of Parkinson's disease

People with Parkinson's disease swing their arms asymmetrically - one arm swings less than the other - when walking.

This unusual movement is easily detected early when drugs and other interventions may help slow the disease, according to Penn State researchers who used inexpensive accelerometers on the arms of Parkinson's disease patients to measure arm swing.

"Scientists have known for some time that people with Parkinson's disease exhibit reduced arm swing during the later stages of the disease, but no one had come up with an easy way to measure this," said Stephen Piazza, associate professor of kinesiology. "We found that not only do people with the disease exhibit reduced arm swing, but they also exhibit asymmetric arm swing, and this asymmetric arm swing can easily be detected early in the disease's progression."

No cure for Parkinson's disease exists, but according to Piazza, if taken early, certain drugs can improve some of the disease's symptoms and even reduce the likelihood of death, making early diagnosis important. Some people also believe that changes in nutrition and other lifestyle factors can modify the progression of the disease.

The researchers attached inexpensive accelerometers to the arms of eight Parkinson's disease patients who were in the early stages of the disease -- within three years of clinical diagnosis. They also attached the accelerometers to the arms of eight age- and sex-matched people who did not have the disease. The team asked the subjects to walk continuously for about eight minutes at a comfortable pace. The researchers downloaded the acceleration data and used software they developed -- that will be available free to interested doctors -- to analyze it. They published their results in the current issue of Gait & Posture.

The scientists found significantly higher acceleration asymmetry, lower cross-correlation between the arms and reduced synchronization of the arms in the early Parkinson's disease patients. According to Joseph Cusumano, professor of engineering science and mechanics, the lower cross-correlation and reduced synchronization suggest that the arm movements are poorly coordinated.

"In other words, if I measure the location of your right arm, it is difficult to use that measurement to predict the location of your left arm," he said. "It is well known that Parkinson's disease has an impact on how people move -- neurologists have been using this fact as the basis for clinical examinations for a very, very long time -- but here we are for the first time precisely quantifying how the disease not only affects the relative amount of limb movements, but also how well coordinated in time these movements are."

To diagnose patients with Parkinson's disease early, some doctors and scientists have proposed the use of a smell test, because people with the disease lose their ability to distinguish odors, according to Xuemei Huang, movement disorders physician, Penn State Milton S. Hershey Medical Center. "But conditions other than Parkinson's disease also can affect a person's ability to smell," she said.

The Penn State team's method of evaluating arm swing can be applied quickly and inexpensively by primary care physicians in their own offices when the smell test is inconclusive and before the application of an expensive brain scan.

"Measuring arm swing asymmetry and coordination with our method may be the cheapest and most effective way to detect Parkinson's disease early in patients' lives when it still is possible to treat the symptoms of the disease and to improve longevity," said Piazza.

The scientists plan to further investigate whether the arm swing evaluation in combination with a smell test can enhance early diagnosis even more. They also plan to further develop their technique so that the accelerometers give immediate readings, which, they said, would save the extra step of downloading the data to a computer and analyzing it, thereby making the arm swing assessments of Parkinson's disease even easier. Penn State graduate students Joseph Mahoney, Mechelle Lewis and Guangwei Du also worked on this project.

http://www.eurekalert.org/pub_releases/2011-12/dc-soo120811.php

Endangered orangutans offer a new evolutionary model for early humans

Orangutans under stress on Borneo yield new ideas about human evolution

Starving orangutans in Borneo may be teaching us new lessons about human evolution.

Nathaniel Dominy, an associate professor of anthropology at Dartmouth College, has been studying the dietary habits of these apes: what food they eat and how they digest it. "We are interested in how orangutans cope with food-limited environments because it may give us a glimpse into what early human ancestors were facing," Dominy explains. He and his colleagues report on a study of orangutans under dietary stress in Borneo in the December 14 online issue of Biology Letters, a journal of The Royal Society.

The apes that gave rise to the earliest human ancestors had teeth that are much like orangutan teeth. The resemblances are particularly strong between the teeth of the pre-human apes and those of the stressed animals living on Borneo. Dominy suggests that the orangutans' diet may have exerted a selective pressure on their molar teeth. If we understand the physical properties of their food, then we may have some idea of why humans evolved the teeth that we have.

The Borneo environment is stressful. The soil is not very fertile and plants crop unpredictably, only producing quantities of fruit every four or five years. When they do bear fruit, the whole forest produces at once. The animals gorge themselves, put on fat, and then live off these reserves for the next three to four years. Unchecked logging that is reducing orangutan habitat worsens this already inhospitable situation.

Orangutans prefer ripe, soft, juicy fruits but during the "off-years" on Borneo when nothing else is available, the orangs resort to eating very hard and tough foods. Dominy describes how they rip bark off trees and eat the starchy tissues behind the bark. They will also eat very hard seeds. This far less nutritious diet seems to supply just enough protein to get by.

The five-year study described in the Biology Letters paper documents the adaptive metabolism of these apes in these protein-deficient hard times. Orangutan urine was collected on Borneo and analyzed for dietary markers, such as ketones, which increase when the body breaks down fat for energy. When fruit abundance was lowest, the ketones surged, demonstrating that the animals were burning their fat reserves - using more energy than they were taking in. As long as the fat holds out, the situation is tolerable.

When body fat is depleted, the next stage is cannibalizing muscle tissue. Elevated nitrogen isotopes in the urine of some individuals indicate that muscle wasting was indeed a source of the protein that kept the animals alive.

Professor Dominy considers the lean years for orangutans on Borneo to be a selective pressure that led to evolutionary adaptations since the population became isolated 400,000 years ago. He argues that the larger molars and more robust jaws among the Borneo orangutans developed in response to the hard, tough foods they consumed during the periods between fruit availability - an enduring adaptation to an occasional situation.

Recent studies of wear patterns on the huge molars of early hominids suggest that they only ate a more physically challenging diet some of the time. These hominids may be displaying an adaptation that helped them to get through evolutionary pinch points, similar to what the orangs encounter.

Our ancestors experienced selective pressure favoring adaptations to hard objects, but it's possible that they didn't eat hard objects consistently.

"Perhaps the hard objects were things they ate only very occasionally under ecological duress," Dominy muses. "It is not what they ate regularly that matters. It is what they were eating during crunch times. Because they routinely go through these dire times, orangutans may be a good model for what happened to human ancestors in deep time."

http://www.newscientist.com/article/mg21228424.500-police-can-identify-suspects-eye-colour-from-dna.html

Police can identify suspect's eye colour from DNA

Police with no leads can now predict the eye colour of their suspect from DNA recovered at the crime scene. It's the first time such a tool has been available.

Manfred Kayser at Erasmus University Medical Centre in the Netherlands and colleagues have developed IrisPlex, which can predict with 94 per cent accuracy whether a person has blue or brown eyes from a sample of DNA. The Dutch Ministry of Security and Justice is expected to approve the kit in the coming weeks, while the UK could use it immediately.

It is the first validated tool to help police home in on a possible suspect by predicting a visible trait, says Kayser. This could be useful in cases where police have DNA from a crime scene, but can't find a match on a DNA database. It is not accurate enough to secure convictions in court, however.

IrisPlex examines six single-letter variations in DNA, known as single nucleotide polymorphisms (SNPs), which have been strongly linked to eye colour, and categorises them as blue, brown or "undefined" - an intermediate colour such as green, grey, or a mix of colours.

Tests of the kit, carried out on populations from seven different European countries, confirm that it can predict blue or brown eye colour with a high degree of accuracy (Forensic Science International: Genetics, DOI: 10.1016/j.fsigen.2011.07.009). The identification of three new SNPs may soon enable IrisPlex to predict the shade as well as colour. A different kit that combines both eye and hair colour is also being tested.

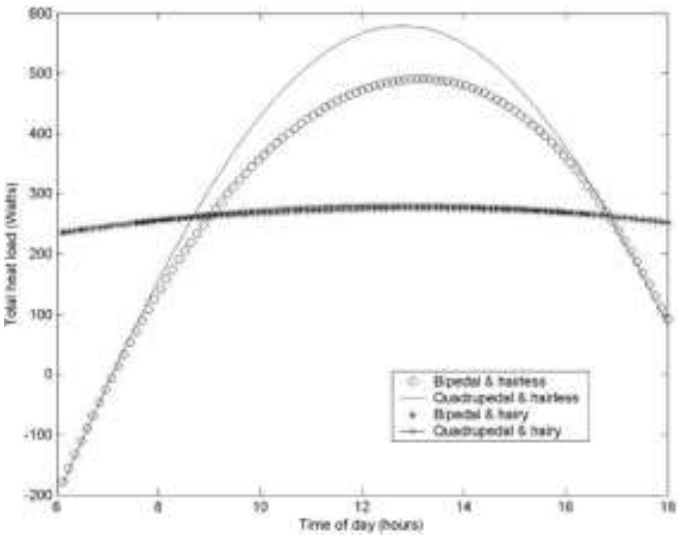
http://www.physorg.com/news/2011-12-early-humans-lost-fur-bipedalism.html

New model suggests early humans lost fur after developing bipedalism

Research shows that it was only after early humans began walking upright that they began to lose their fur coats.

PhysOrg.com - Two of the most basic questions in the study of human evolution revolve around why early people started walking around on two feet instead of four and why they lost their fur, especially in light of the fact that most other primates have kept their coats, and still make extensive use of their hands in walking and especially so, when running. Some have postulated that early hominins began walking upright as a means of helping them keep cooler.

A new model by Graeme Ruxton and David Wilkinson disagrees, writing in their paper published in the Proceedings of National Academy of Sciences, that research they've done shows that it was only after early humans began walking upright that they began to lose their fur coats.



Model predictions for the amount of heat that must be dissipated by sources other than normal respiration (such as sweating) to maintain heat balance, as a function of time of day for a gracile male hominin. We model four situations involving all combinations of quadrupedal versus bipedal stance and full body hair versus loss of hair to near-modern human levels. **Image (c) PNAS, doi:10.1073/pnas.1113915108**

Ruxton and Wilkinson don't offer any new theories as to why early humans started walking upright but they say after studying mathematical models that describe how humans or animals lose body heat based on different postures during different times of the day, that as expected, it appears a crouched posture does conserve body heat more so than does a fully erect one, especially in direct sunlight, suggesting that walking erect would indeed seem to be a way to keep cooler. Unfortunately, they say, that doesn't take into account the body heat that is created internally by the very act of moving around. Thus, they say, models that suggest humans started walking upright as a means to cool off aren't looking at the whole picture because in addition to the metabolic heat generated, the cooling effect gained in losing body hair would be much more profound in a person walking upright, than would be the case for one who remained crouching.

Thus, they argue, it was only after hominins started walking upright that they began losing their fur, though they do agree that the latter change came about as a means of keeping cooler.

No one really knows why hominins became bipedal, whether because it helped see threats and food options better, or because it helped them reach up into trees for fruit or whether as previous models suggest it helped in cooling down in the hot African climate, but, regardless, it seems models that seek to explain the change will be forever intricately linked with the reasons that they lost their fur as well.

More information: Avoidance of overheating and selection for both hair loss and bipedality in hominins, PNAS, Published online before print December 12, 2011, doi: 10.1073/pnas.1113915108

Abstract

Two frequently debated aspects of hominin evolution are the development of upright bipedal stance and reduction in body hair. It has long been argued, on the basis of heat-balance models, that thermoregulation might have been important in the evolution of both of these traits. Previous models were based on a stationary individual standing in direct sunlight; here we extend this approach to consider a walking hominin, having argued that walking is more thermally challenging than remaining still. Further, stationary activities may be more compatible with shade seeking than activities (such as foraging) involving travel across the landscape. Our model predictions suggest that upright stance probably evolved for nonthermoregulatory reasons. However, the thermoregulatory explanation for hair loss was supported. Specifically, we postulate progressive hair loss being selected and this allowing individuals to be active in hot, open environments

initially around dusk and dawn without overheating. Then, as our ancestors' hair loss increased and sweating ability improved over evolutionary time, the fraction of the day when they could remain active in such environments extended. Our model suggests that only when hair loss and sweating ability reach near-modern human levels could hominins have been active in the heat of the day in hot, open environments. © 2011 PhysOrg.com

http://medicalxpress.com/news/2011-12-third-degree-treatment-hydrogel-scar-free-skin.html

In third-degree burn treatment, hydrogel helps grow new, scar-free skin

Johns Hopkins researchers have developed a jelly-like material and wound treatment method that, in early experiments on skin damaged by severe burns, appeared to regenerate healthy, scar-free tissue.

In the Dec. 12-16 online Early Edition of Proceedings of the National Academy of Sciences, the researchers reported their promising results from mouse tissue tests. The new treatment has not yet been tested on human patients. But the researchers say the procedure, which promotes the formation of new blood vessels and skin, including hair follicles, could lead to greatly improved healing for injured soldiers, home fire victims and other people with third-degree burns.

The treatment involved a simple wound dressing that included a specially designed hydrogel - a water-based, three-dimensional framework of polymers. This material was developed by researchers at Johns Hopkins' Whiting School of Engineering, working with clinicians at the Johns Hopkins Bayview Medical Center Burn Center and the Department of Pathology at the university's School of Medicine.

Third-degree burns typically destroy the top layers of skin down to the muscle. They require complex medical care and leave behind ugly scarring. But in the journal article, the Johns Hopkins team reported that their hydrogel method yielded better results. "This treatment promoted the development of new blood vessels and the regeneration of complex layers of skin, including hair follicles and the glands that produce skin oil," said Sharon Gerecht, an assistant professor of chemical and biomolecular engineering who was principal investigator on the study.

Gerecht said the hydrogel could form the basis of an inexpensive burn wound treatment that works better than currently available clinical therapies, adding that it would be easy to manufacture on a large scale. Gerecht suggested that because the hydrogel contains no drugs or biological components to make it work, the Food and Drug Administration would most likely to classify it as a device. Further animal testing is planned before trials on human patients begin. But Gerecht said, "It could be approved for clinical use after just a few years of testing."

In third-degree burn treatment, hydrogel helps grow new, scar-free skin

John Harmon, a professor of surgery at the Johns Hopkins School of Medicine and director of surgical research at Bayview, described the mouse study results as "absolutely remarkable. We got complete skin regeneration, which never happens in typical burn wound treatment."

If the treatment succeeds in human patients, it could address a serious form of injury. Harmon, a coauthor of the PNAS journal article, pointed out that 100,000 third-degree burns are treated every year in U. S. burn centers like Bayview's. A burn wound dressing using the new hydrogel could have enormous potential for use in applications beyond common burns, including treatment of diabetic patients with foot ulcers, Harmon said.

Guoming Sun, a Maryland Stem Cell Research Postdoctoral Fellow in Gerecht's lab and lead author on the paper, has been working with these hydrogels for the past three years, developing ways to improve the growth of blood vessels, a process called angiogenesis. "Our goal was to induce the growth of functional new blood vessels within the hydrogel to treat wounds and ischemic disease, which reduces blood flow to organs like the heart," Sun said. "These tests on burn injuries just proved its potential."

Gerecht says the hydrogel is constructed in such a way that it allows tissue regeneration and blood vessel formation to occur very quickly. "Inflammatory cells are able to easily penetrate and degrade the hydrogel, enabling blood vessels to fill in and support wound healing and the growth of new tissue," she said. For burns, the faster this process occurs, Gerecht added, the less there is a chance for scarring.

Originally, her team intended to load the gel with stem cells and infuse it with growth factors to trigger and direct the tissue development. Instead, they tested the gel alone. "We were surprised to see such complete regeneration in the absence of any added biological signals," Gerecht said.

Sun added, "Complete skin regeneration is desired for various wound injuries. With further fine-tuning of these kinds of biomaterial frameworks, we may restore normal skin structures for other injuries such as skin ulcers."

Gerecht and Harmon say they don't fully understand how the hydrogel dressing is working. After it is applied, the tissue progresses through the various stages of wound repair, Gerecht said. After 21 days, the gel has been harmlessly absorbed, and the tissue continues to return to the appearance of normal skin.

The hydrogel is mainly made of water with dissolved dextran, a polysaccharide (sugar molecule chains). "It also could be that the physical structure of the hydrogel guides the repair," Gerecht said. Harmon speculates that the hydrogel may recruit circulating bone marrow stem cells in the bloodstream. Stem cells are special cells that can grow into practically any sort of tissue if provided with the right chemical cue. "It's possible the gel is somehow signaling the stem cells to become new skin and blood vessels," Harmon said.

More information: Sharon Gerecht's Lab: http://www.jhu.edu ... mbe/gerecht/

http://nyti.ms/vDoZ2X

Patterns: Coffee May Help Cut Cancer Risk in Women

More good news for coffee drinkers: A large new study has found that women who drink four or more cups of coffee a day are at reduced risk of endometrial cancer.

By NICHOLAS BAKALAR

Endometrial cancer is the most common uterine cancer. According to the National Cancer Institute, there are about 46,000 new cases and 8,000 deaths yearly from the disease.

Researchers followed 67,470 women aged 34 to 59 at the start of the study from 1980 to 2006. The women recorded dietary details, lifestyle information and medical history. The study was published online Nov. 22 in Cancer Epidemiology, Biomarkers & Prevention.

After controlling for dozens of other factors, the scientists found that compared with women who drank less than one cup of coffee a day, those who drank four or more cups had a 25 percent lower risk of endometrial cancer. Neither decaffeinated coffee nor tea drinking was associated with a risk reduction, and the authors drew no conclusions about whether caffeine or some other ingredient in coffee causes the effect.

The lead author, Youjin Je, a doctoral student at the Harvard School of Public Health, said that for healthy non-pregnant women, drinking four cups of coffee a day has no known negative effects. But, she said, "a substantial amount of sugar, cream or milk added to coffee can negate the potential benefits."

http://www.physorg.com/news/2011-12-good-evolutionary-advantage-neanderthals.html

Did a good sense of smell give us an evolutionary advantage?

Our sense of smell may have been as important as language in helping to give us, modern humans, an evolutionary advantage over other human relatives such as the Neanderthals

PhysOrg.com - Our sense of smell may have been as important as language in helping to give us, modern humans, an evolutionary advantage over other human relatives such as the Neanderthals, scientists report in the journal Nature Communications today.

Scientists have found that areas of the brain, the temporal lobes that correspond to cognition (for example language, memory and social function) and the olfactory bulbs that correspond to sense of smell, are larger in Homo sapiens compared to other human species. They are about 12% larger than those of Neanderthals, Homo neanderthalensis. This suggests that these two areas work together and are more important in the evolution of the modern human brain than previously thought.

The research team was led by Markus Bastir and Antonio Rosas of the Spanish Natural Science Museum (CSIC) and included Chris Stringer and Robert Kruszynski at the Natural History Museum.

They analysed fossil skulls of hominins (ancient human relatives) including Homo sapiens, Homo neanderthalensis and Homo erectus. 'We used a new and very precise way to measure and compare the volumes of areas inside hominin skulls dating up to nearly 2 million years ago,' says Kruszynski. They produced 3D models that helped reveal the detail of the internal structures. Kruszynski says, 'Those of Homo sapiens - our own species - showed a surprising change of internal architecture compared with their predecessors, in the area housing the olfactory and temporal regions.

Areas of the brain (Neanderthals on the left and modern humans on the right) that show differences in the sizes of temporal lobes (important for cognitive functions like language) and olfactory bulbs (for sense of smell).

'Such changes were not so evident in the Neanderthal skulls that were studied. The different evolutionary pathways that these two species took may be part of the process that led to the distinct patterns found in Homo neanderthalensis and Homo sapiens.'

Until now, sense of smell has been thought of as less significant for humans compared to our other senses. Stringer explains, 'It has been traditional to believe that we have reduced olfactory (smell) senses compared with other primates, and by implication, earlier humans. However, the data in this study suggest the opposite - that modern humans actually have an enhanced sense of smell.

'This might be because of the greater range of environments in which we live and the greater range of foods modern humans exploit, and/or an increased social role for olfaction in our more complex social interactions.'

Links between smell and cognition

Scientists know that smells are processed in the same brain regions responsible for processing emotion, motivation, fear, memory, pleasure and attraction, making them an important aspect of social interactions. And olfaction is among the oldest sense in vertebrates, 'the only one that establishes a direct connection between the brain and its environment,' says Bastir.

The links between cognition and olfaction have caused neuroscientists to use the term 'higher olfactory functions' to describe those brain functions that combine the two.

The team says that the larger olfactory bulbs and temporal lobes of Homo sapiens would have made evolutionary sense in a social context. They would have contributed to kinship recognition, enhanced family relations, group cohesion and social learning, all crucial factors that scientists believe allowed modern humans to progress and become the only surviving human species.

More information: The paper 'Evolution of the base of the brain in highly encephalized human species' is published today in the journal Nature Communications. http://www.nature. … s/index.html Provided by American Museum of Natural History

http://www.scientificamerican.com/podcast/episode.cfm?id=body-hair-senses-parasites-while-sl-11-12-13

Body Hair Senses Parasites While Slowing Their Blood Quest

Volunteers detected bedbugs more quickly on unshaven versus shaved arms. And the bugs took longer to find a feeding spot among the forest of hair. Christopher Intagliata reports

Listen to this Podcast

We "naked apes" aren't as hirsute as our primate cousins. We still have an ape-like density of hair follicles—but we sprout out peach fuzz, instead of a thick coat. Those downy hairs may be more than an evolutionary leftover, though. They may be "hair-trigger" sensors for bedbugs and other parasites. So says a study in the journal Biology Letters. [Isabelle Dean and Michael T. Siva-Jothy, Human fine body hair enhances ectoparasite detection, link to come.]

Researchers shaved one forearm on each of 29 student volunteers, and placed a hungry bedbug there. Without looking, the students counted each time they felt something. The researchers repeated the experiment on each victim's unshaven arm as a control. And don't worry - in each case they plucked off bedbugs just as they prepared to dine.

Turns out students were significantly more likely to sense bedbugs crawling on their unshaven arms. And those tangles of hair slowed down the bug's search for a place to snack, too. The authors say our fine human hair may thus be perfectly evolved: thin enough to eliminate hiding spots for bugs, but thick enough to act as an alarm system for bloodsuckers in the night - enough to make anyone's hair stand on end. *Christopher Intagliata*

http://medicalxpress.com/news/2011-12-antioxidant-potential-alzheimer.html

Antioxidant has potential in the Alzheimer's fight, researchers find

When you cut an apple and leave it out, it turns brown. Squeeze the apple with lemon juice, an antioxidant, and the process slows down.

Medical Xpress - Simply put, that same "browning" process-known as oxidative stress-happens in the brain as Alzheimer's disease sets in. The underlying cause is believed to be improper processing of a protein associated with the creation of free radicals that cause oxidative stress. Now, a study by researchers in the University of Georgia College of Pharmacy has shown that an antioxidant can delay the onset of all the indicators of Alzheimer's disease, including cognitive decline. The results of their study were published in the Nov. 2 issue of the Journal of Neuroscience.

The researchers administered an antioxidant compound called MitoQ to mice genetically engineered to develop Alzheimer's. According to the Alzheimer's Society, more than 5 million Americans currently suffer from the neurodegenerative disease. Without successful prevention, almost 14 million Americans will have Alzheimer's by 2050, accounting for healthcare costs of more than $1 trillion a year.

Oxidative stress is believed to cause neurons in the brain to die, resulting in Alzheimer's. Study author James Franklin, an associate professor of pharmaceutical and biomedical sciences, has studied neuronal cell death and oxidative stress at UGA since 2004.

"The brain consumes 20 percent of the oxygen in the body even though it only makes up 5 percent of the volume, so it's particularly susceptible to oxidative stress," said Franklin, coauthor of the study along with Meagan McManus, who received her Ph.D. in neuroscience from UGA in 2010.

The UGA researchers hypothesized that antioxidants administered unsuccessfully by other researchers to treat Alzheimer's were not concentrated enough in the mitochondria of cells. Mitochondria are structures within cells that have many functions, including producing oxidative molecules that damage the brain and cause cell death.

"MitoQ selectively accumulates in the mitochondria," said McManus, who is now studying mitochondrial genetics and dysfunction as a postdoctoral researcher at Children's Hospital of Philadelphia. "It is more effective for the treatment to go straight to the mitochondria, rather than being present in the cell in general," she said. Although he had not previously conducted research on Alzheimer's disease, Franklin was moved to approve McManus' research proposal to take his laboratory research in a more clinical direction in part because of her family's history with the disease.

"Two of my grandparents had Alzheimer's disease, but they presented with it very differently. While my granddad often couldn't remember who we were, he was still the same soulful funnyman I'd always loved. But the disease changed my grandmother's mind in a different way, and turned her into someone we'd never known," said McManus. "So the complexity of the disease was most intriguing to me. I wanted to know how and why it was happening, and more importantly, how to stop it from happening to other people," she said.

In their study, mice engineered to carry three genes associated with familial Alzheimer's were tested for cognitive impairment using the Morris Water Maze, a common test for memory retention. The mice that had received MitoQ in their drinking water performed significantly better than those that didn't. Additionally, the treated mice tested negative for the oxidative stress, amyloid burden, neural death and synaptic loss associated with Alzheimer's.

More information: *The full paper is available online at http://www.jneuros ... 4/15703.full Provided by University of Georgia*

http://www.eurekalert.org/pub_releases/2011-12/si-adc121411.php

Alzheimer's drug candidate may be first to prevent disease progression

Salk scientists develop new drug that improves memory and prevents brain damage in mice

A new drug candidate may be the first capable of halting the devastating mental decline of Alzheimer's disease, based on the findings of a study published today in PLoS one.

When given to mice with Alzheimer's, the drug, known as J147, improved memory and prevented brain damage caused by the disease. The new compound, developed by scientists at the Salk Institute for Biological Studies, could be tested for treatment of the disease in humans in the near future.

"J147 enhances memory in both normal and Alzheimer's mice and also protects the brain from the loss of synaptic connections," says David Schubert, the head of Salk's Cellular Neurobiology Laboratory, whose team developed the new drug. "No drugs on the market for Alzheimer's have both of these properties."

Although it is yet unknown whether the compound will prove safe and effective in humans, the Salk researchers' say their results suggest the drug may hold potential for treatment of people with Alzheimer's.

As many as 5.4 million Americans suffer from Alzheimer's, according to the National Institutes of Health. More than 16 million will have the disease by 2050, according to Alzheimer's Association estimates, resulting in medical costs of over $1 trillion per year.

The disease causes a steady, irreversible decline in brain function, erasing a person's memory and ability to think clearly until they are unable to perform simple tasks such as eating and talking, and it is ultimately fatal. Alzheimer's is linked to aging and typically appears after age 60, although a small percentage of families carry a genetic risk for earlier onset. Among the top ten causes of death, Alzheimer's is the only one without a way to prevent, cure or slow disease progression. Scientists are unclear what causes Alzheimer's, which appears to emerge from a complex mix of genetics, environment and lifestyle factors. So far, the drugs developed to treat the disease, such as Aricept, Razadyne and Exelon, only produce fleeting memory improvements and do nothing to slow the overall course of the disease.

To find a new type of drug, Schubert and his colleagues bucked the trend within the pharmaceutical industry of focusing exclusively on the biological pathways involved in the formation of amyloid plaques, the dense deposits of protein that characterize the disease. To date, Schubert says, all amyloid-based drugs have failed in clinical trials.

Instead, the Salk team developed methods for using living neurons grown in laboratory dishes to test whether or not new synthetic compounds were effective at protecting the brain cells against several pathologies associated with brain aging. Based on the test results from each chemical iteration of the lead compound, which was originally developed for treatment of stroke and traumatic brain injury, they were able to alter its chemical structure to make a much more potent Alzheimer's drug.

"Alzheimer's is a complex disease, but most drug development in the pharmaceutical world has focused on a single aspect of the disease--the amyloid pathway," says Marguerite Prior, a research associate in Schubert's lab, who led the project along with Qi Chen, a former Salk postdoctoral researcher. "In contrast, by testing these compounds in living cell cultures, we can determine what they do against a range of age-related problems and select the best candidate that addresses multiple aspects of the disease, not just one."

With a promising compound in hand, the researchers shifted to testing J147 as an oral medication in mice. Working with Amanda Roberts, a professor of molecular neurosciences at The Scripps Research Institute, they conducted a range of behavioral tests that showed that the drug improved memory in normal rodents.

The Salk researchers went on to show that it prevented cognitive decline in animals with Alzheimer's and that mice and rats treated with the drug produced more of a protein called brain-derived neurotrophic factor (BDNF), a molecule that protects neurons from toxic insults, helps new neurons grow and connect with other brain cells, and is involved in memory formation.

Because of the broad ability of J147 to protect nerve cells, the researchers believe that it may also be effective for treating other neurological disorders, such as Parkinson's disease, Huntington's disease and amyotrophic lateral sclerosis (ALS), as well as stroke.

The research was funded by the Fritz B. Burns Foundation, the National Institutes of Health, the Bundy Foundation and the Alzheimer's Association.

http://www.eurekalert.org/pub_releases/2011-12/uok-wsn121311.php

Work sheds new light on medicinal benefits of plants

Scientists from institutions around the nation and the world have collaborated to develop new resources poised to unlock yet another door in the hidden garden of medicinally important compounds found in plants.

LEXINGTON, Ky. - The resources were developed by the Medicinal Plant Consortium (MPC) led by Joe Chappell, professor of plant biochemistry at the University of Kentucky, Dean DellaPenna, professor of biochemistry at Michigan State University and Sarah O'Connor, professor of chemistry at Massachusetts Institute of Technology and now at the John Innes Centre in Norwich, England. They grew out of a $6 million initiative from the National Institutes of Health (NIH) to study how plants produce the rich diversity of chemical compounds, some of which are medicinally important.

"Our major goal in this project has been to capture the genetic blueprints of medicinal plants for the advancement of drug discovery and development," said Chappell, project coordinator for the MPC.

"Most people are familiar with the natural products we derive from plants," Chappell added. "These include the delightful fragrances that go into perfumes, soaps, household cleaning products and more. Just as the sensory properties of plants interact with and trigger your sense of smell, plants' natural compounds can target and cause a reaction within your body. This gives them tremendous pharmaceutical potential."

The MPC project includes participants from Michigan State, Iowa State University, the University of Mississippi, Purdue University, Texas A&M University, MIT, and the John Innes Centre, in addition to UK. The associated researchers represent a broad spectrum of expertise from plant biology and systematics to analytical chemistry, genetics and molecular biology, and drug development from natural products.

DellaPenna, MPC co-project coordinator, said, "Thanks to the funding received for these projects, the talents and skills of experts from all of these institutions have been brought together with the goal of forging a new model in drug discovery."

Some well-known medicines have come from plants. For instance, the foxglove plant gives us the cardiac muscle stimulant digoxin, and the periwinkle plant offers a source for the widely used chemotherapy drugs vincristine and vinblastine. These and many other medicinal plants, often commonly found in household gardens and flower boxes, represent cornucopias of compounds ripe for discovering and developing diverse medicinal applications.

"The current understanding of the molecules and genes involved in the formation of plant-derived medicinal compounds is very incomplete. However, the ability to conduct genome-wide studies of model plant species has resulted in an explosive increase in our knowledge of and capacity to understand the biological processes," added O'Connor, also an MPC co-project coordinator.

During this two-year project funded through the American Recovery and Reinvestment Act (ARRA), researchers from two consortia set out to develop a collection of data that would aid in understanding how plants make chemicals, a process called biosynthesis. This knowledge ultimately could make it possible to engineer plants to produce larger quantities of medicinally useful compounds as well as different versions with other therapeutic potential.

To develop the resources, the researchers studied the genes and chemical composition of 14 plants known for their medicinal properties or compounds with biological activity. These included plants such as foxglove, ginseng, and periwinkle. Altogether, these efforts are now providing a rich toolbox for researchers to discover the means for how nature's chemical diversity is created, thus empowering efforts to uncover new drug candidates and increase the efficacy of existing ones.

The work of the MPC included obtaining materials for all the medicinal plants used in this study. The MPC then determined the plants' chemical profiles and obtained their genetic blueprints to study how genes control the various chemical compositions.

"This work offers a valuable data resource for understanding the genes, enzymes and complex processes responsible for the biosynthesis of important plant-derived drugs," said Warren Jones, who manages this and other research grants in biotechnology at NIH's National Institute of General Medical Sciences, through which the ARRA funds were provided. "The collaborative effort should greatly contribute to our ability to understand and exploit the rich biochemistry found in plants."

More information about the MPC and the resources provided are available at the following websites: http://medicinalplantgenomics.msu.edu; http://metnetdb.org/mpmr_public/.

The second consortium, the Medicinal Plants/Human Health Consortium (MP/HHC) led by Norman Lewis, Regents Professor and Director of the Institute of Biological Chemistry at Washington State University, was funded under the same program at the NIH to apply similar technology to other medicinal plants. More information about the MP/HHC can be found at http://uic.edu/pharmacy/MedPlTranscriptome/.

http://www.eurekalert.org/pub_releases/2011-12/fsu-prf121511.php

Psychology researcher finds that second-guessing one's decisions leads to unhappiness

Research from Florida State University may shed some light on your inability to make a decision that you'll be happy with.

You're in search of a new coffee maker, and the simple quest becomes, well, an ordeal. After doing copious amounts of research and reading dozens of consumer reviews, you finally make a purchase, only to wonder: "Was this the right choice? Could I do better? What is the return policy?" Reality check: Is this you?

If so, new research from Florida State University may shed some light on your inability to make a decision that you'll be happy with.

Joyce Ehrlinger, an assistant professor of psychology, has long been fascinated with individuals identified among psychologists as "maximizers." Maximizers tend to obsess over decisions — big or small — and then fret about their choices later. "Satisficers," on the other hand, tend to make a decision and then live with it.

Happily. Of course, there are shades of gray. In fact, there's a whole continuum of ways people avoid commitment without really avoiding it.

Ehrlinger's latest research on decision making was published in the peer-reviewed journal Personality and Individual Differences. The paper, "Failing to Commit: Maximizers Avoid Commitment in a Way That Contributes to Reduced Satisfaction," was co-authored with her graduate student, doctoral candidate Erin Sparks, and colleague Richard Eibach, a psychology assistant professor at the University of Waterloo in Ontario, Canada. It examines whether "maximizers show less commitment to their choices than satisficers in a way that leaves them less satisfied with their choices."

The paper, based on two studies of Florida State undergraduate volunteers, finds that the maximizers' focus on finding the best option ultimately undermines their commitment to their final choices. As a result, the authors argue, "maximizers miss out on the psychological benefits of commitment," leaving them less satisfied than their more contented counterparts, the satisficers.

Past research into the differences between maximizers and satisficers looked at how the two groups made choices differently and, more importantly, how the process itself varied. Ehrlinger's research, however, looked at something else entirely: What happened after a choice was made?

"Because maximizers want to be certain they have made the right choice," the authors contend, "they are less likely to fully commit to a decision." And most likely, they are less happy in their everyday lives.

Whether being a maximizer is a central and stable part of the personality or simply a frame of mind remains unclear, but Ehrlinger hopes to isolate the cause of the behavior in future research.

"Current research is trying to understand whether they can change," she said. "High-level maximizers certainly cause themselves a lot of grief."

Over the years, Ehrlinger's scholarly research has led her to study self-perception and accuracy and error in self-judgment. Her latest research into the ways maximizers avoid commitment is important for several reasons.

First, the differences between maximizers and satisficers may play a bigger role than previously thought in consumer decision making and purchasing. For example: "Maximizers get nervous when they see an 'All Sales Are Final' sign because it forces them to commit," Ehrlinger said.

Also, a maximizer's lack of contentment creates a lot of stress, so the trait could potentially have an enormous effect on health, Ehrlinger explained. It's not just coffee-maker purchases they stress over - and second-guess themselves about - it's also the big life decisions such as choosing a mate, buying a house or applying for a job.

Even after considerable deliberation before choosing a mate or a house, a high-level maximizer may still feel unhappy, even depressed, with his or her final decision.

"Identifying the 'right' choice can be a never-ending task (for a maximizer)," Ehrlinger and her co-authors write. "Feelings about which option is best can always change in the face of new information. Maximizers might be unable to fully embrace a choice because they cannot be absolutely certain they chose the best possible option."

http://www.eurekalert.org/pub_releases/2011-12/osu-sfm121511.php

Scientists find microbes in lava tube living in conditions like those on Mars

A team of scientists from Oregon has collected microbes from ice within a lava tube in the Cascade Mountains and found that they thrive in cold, Mars-like conditions.

CORVALLIS, Ore. – The microbes tolerate temperatures near freezing and low levels of oxygen, and they can grow in the absence of organic food. Under these conditions their metabolism is driven by the oxidation of iron from olivine, a common volcanic mineral found in the rocks of the lava tube. These factors make the microbes capable of living in the subsurface of Mars and other planetary bodies, the scientists say.

The findings, supported by a grant from the National Aeronautics and Space Administration (NASA), are detailed in the journal Astrobiology.

"This microbe is from one of the most common genera of bacteria on Earth," said Amy Smith, a doctoral student at Oregon State University and one of the authors of the study. "You can find its cousins in caves, on your skin, at the bottom of the ocean and just about anywhere. What is different, in this case, is its unique qualities that allow it to grow in Mars-like conditions."

In a laboratory setting at room temperature and with normal oxygen levels, the scientists demonstrated that the microbes can consume organic material (sugar). But when the researchers removed the organic material, reduced the temperature to near-freezing, and lowered the oxygen levels, the microbes began to use the iron within olivine – a common silicate material found in volcanic rocks on Earth and on Mars – as its energy source.

"This reaction involving a common mineral from volcanic rocks just hasn't been documented before," said Martin Fisk, a professor in OSU's College of Earth, Ocean, and Atmospheric Sciences and an author on the study. "In volcanic rocks directly exposed to air and at warmer temperatures, the oxygen in the atmosphere oxidizes the iron before the microbes can use it. But in the lava tube, where the bacteria are covered in ice and thus sheltered from the atmosphere, they out-compete the oxygen for the iron.

"By mimicking those conditions, we got the microbes to repeat that behavior in the laboratory," Fisk added.

The microbes were collected from a lava tube near Newberry Crater in Oregon's Cascades Mountains, at an elevation of about 5,000 feet. They were within the ice on rocks some 100 feet inside the lava tube, in a low-oxygen, near-freezing environment. Scientists, including Fisk, have said that the subsurface of Mars could have similar conditions and harbor bacteria.

In fact, Fisk has examined a meteorite originating from Mars that contained tracks – which could indicate consumption by microbes – though no living material was discovered. Similar tracks were found on the rocks from the Newberry Crater lava tube, he said.

"Conditions in the lava tube are not as harsh as on Mars," Fisk said. "On Mars, temperatures rarely get to the freezing point, oxygen levels are lower and at the surface, liquid water is not present. But water is hypothesized to be present in the warmer subsurface of Mars. Although this study does not exactly duplicate what you would find on Mars, it does show that bacteria can live in similar conditions.

"We know from direct examination, as well as satellite imagery, that olivine is in Martian rocks," Fisk added. "And now we know that olivine can sustain microbial life."

The idea for exploring the lava tube came from Radu Popa, an assistant professor at Portland State University and lead author on the paper. Popa used to explore caves in his native Romania and was familiar with the environmental conditions. Because lava tubes are a sheltered environment and exist on both Earth and Mars, Popa proposed the idea of studying microbes from them to see if life may exist – or could have existed – on the Red Planet.

"When temperatures and atmospheric pressure on Mars are higher, as they have been in the past, ecosystems based on this type of bacteria could flourish," Popa said. "The fingerprints left by such bacteria on mineral surfaces can be used by scientists as tools to analyze whether life ever existed on Mars."

Note to Editors: Photos to illustrate this story are available at the links below:

Lava tube near Newberry Crater *Two of the authors collecting samples of basalt from ice within the crater*

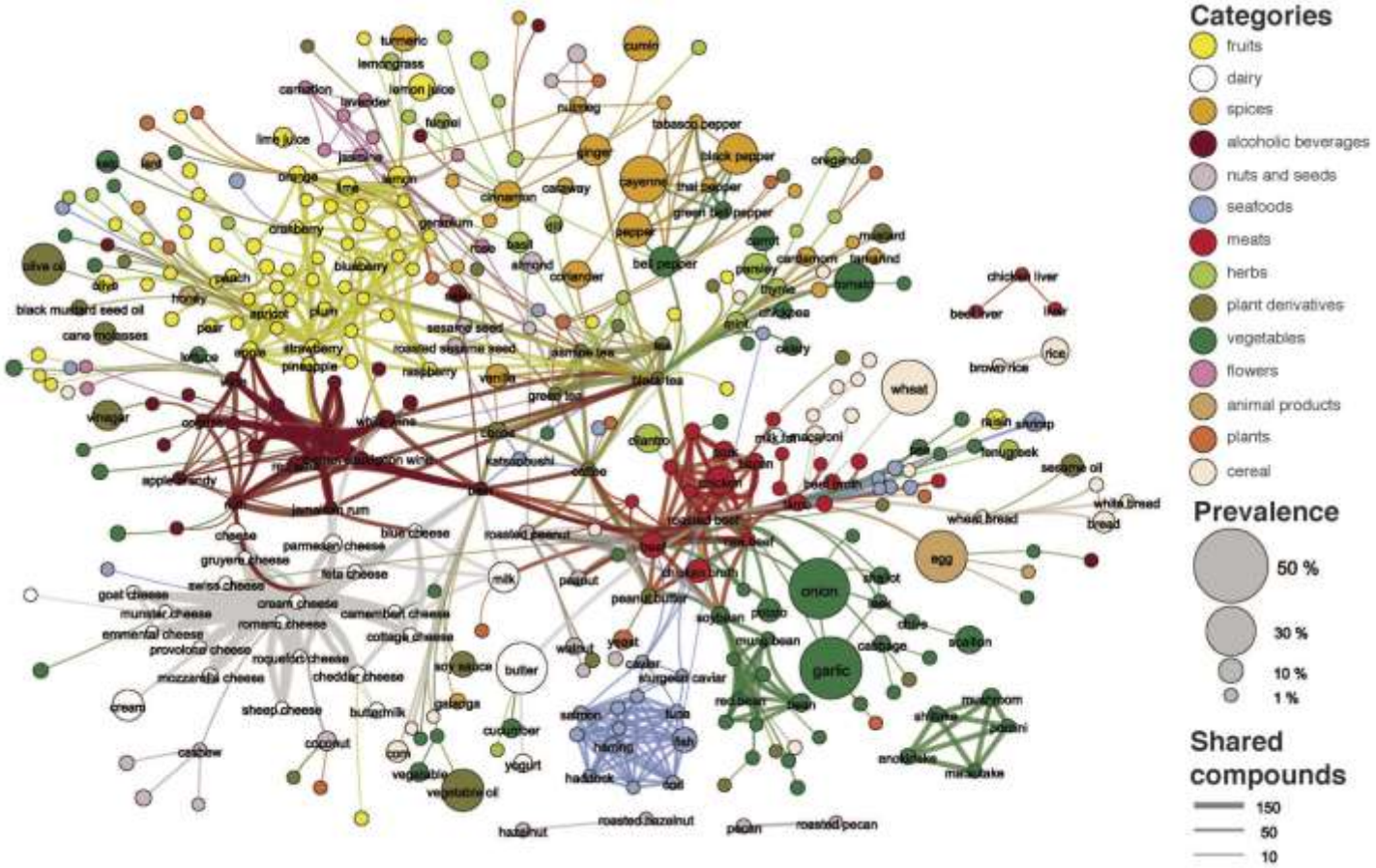
The journal article this release is based on is available

http://www.eurekalert.org/pub_releases/2011-12/iu-sfc121511.php

Shared flavor compounds show up on US menus, rare in Asian cuisines

Computing Assistant Professor Yong-Yeol Ahn looked at the key ingredients of 56,498 online recipes and then analyzed those ingredients for shared flavor compounds.

BLOOMINGTON, Ind. - The recipes came from three online recipe repositories: epicurious.com and allrecipes.com from the U.S. and the Korean menupan.com. North Americans and Western Europeans love a good mix of alpha-terpineol, 4-methylpentanoic acid and ethyl propionate for dinner, flavor compounds shared in popular ingredients like tomatoes, parmesan cheese and white wine. Authentic East Asian recipes, on the other hand, tend to avoid mixing ingredients with many shared flavor compounds, according to new complex networks research from Indiana, Harvard, Cambridge and Northeastern universities.



Each node denotes an ingredient, the node color indicates food category, and node size reflects the ingredient prevalence in recipes. Two ingredients are connected if they share a significant number of flavor compounds, link thickness representing the number of shared compounds between the two ingredients. Adjacent links are bundled to reduce clutter.

In a search to uncover the patterns and principles people use in choosing ingredient combinations beyond individual taste and recipes, a team that included Indiana University Bloomington School of Informatics and Computing Assistant Professor Yong-Yeol Ahn looked at the key ingredients of 56,498 online recipes and then analyzed those ingredients for shared flavor compounds. The recipes came from three online recipe repositories: epicurious.com and allrecipes.com from the U.S. and the Korean menupan.com.

Over the past decades, some food scientists and chefs have developed a food pairing hypothesis which states that ingredients sharing flavor compounds are more likely to taste good together than ingredients that do not. Some application of this can be found at contemporary restaurants that successfully pair white chocolate and caviar, ingredients that both contain trimethylamine and other flavor compounds, or chocolate and blue cheese, which share at least 73 flavor compounds.

Ahn, who is also affiliated with the Center for Complex Networks and Systems Research operated by SOIC and IU's Pervasive Technology Institute, said that by creating a flavor network that captures the flavor compounds shared by culinary ingredients, the team could reformulate the food pairing hypothesis into a hypothesis on the graph-topological properties of recipes in the flavor network. Statistical tests can then be used to unveil the connectedness, or the lack thereof, of ingredients and flavor compounds.

In this case, they took 381 ingredients from the group of recipes, along with an associated 1,021 flavor compounds that contributed flavor to those ingredients, and created a flavor network where ingredients are connected if they share at least one flavor compound.

"What we showed was that the recipes in North American cuisine tend to share more flavor compounds than expected. The most authentic ingredient pairs and triplets in North American cuisine also tend to share multiple flavor compounds, while compound-sharing links are rare among the most authentic combinations in East Asian cuisine," Ahn said.

Their analysis also referenced that the number of actual recipes in use, on the order of about 106, was tiny when compared to the large number of potential recipes (over 1,015).

"We identified frequently used ingredients that contributed positively to the food pairing effect in North American cuisine, like milk, butter, cocoa, vanilla, cream and eggs," Ahn said. "These played a disproportionate role, as 13 key ingredients that contributed to a shared compound effect were found in 74.4 percent of North American recipes."

There were also ingredients in East Asian cuisine - beef, ginger, pork, cayenne, chicken and onion -- that were the top contributors to an overall negative shared compound effect on food pairing.

One future goal of the research would be to build an accessible infrastructure using more detailed datasets that incorporate the quantity information of flavor compounds, again advancing the use of data-driven network analysis methods that have transformed biology and the social sciences to yield new insights into food science.

Another interesting venue of research is studying the evolution of recipes. A recently published recipe-evolution model suggested that the staple ingredients consist of old ingredients (founders) and highly "fit" ingredients. "Among highly prevalent ingredients, we can see old ingredients that have been used in the same geographic region for thousands of years," Ahn said. "Yet there are also relatively new ingredients like tomatoes, potatoes and peppers that were introduced to Europe and Asia just a few hundred years ago. Though new, they are now staple ingredients."

http://www.eurekalert.org/pub_releases/2011-12/bmj-otg121411.php

Outwit the Grim Reaper by walking faster

How fast does the Grim Reaper walk? Receiver operating characteristics curve analysis in healthy men aged 70 and over

Men aged 70 and older can elude the Grim Reaper by walking at speeds of at least 3 miles (or 5km) an hour, finds a study in the Christmas issue published on bmj.com today.

The authors say that for the first time they have estimated the speed at which the Grim Reaper usually walked: about 1.8 miles per hour. He never walked faster than 3 miles per hour.

The Grim Reaper is a well known mythological and literary figure who personifies death. To assess his role in mortality and walking speed, a team of researchers based at Concord Hospital in Sydney, Australia analysed the walking patterns of 1,705 men aged 70 and over who were participating in The Concord Health and Ageing in Men Project (CHAMP).

The men lived in the inner city and suburbs of Sydney and they were recruited from January 2005 to June 2007. The CHAMP study included a high proportion of immigrants and only 50% of the participants were born in Australia, 20% were born in Italy and the other main countries of birth were Great Britain, Greece and China.

The researchers assessed participants' walking speed at baseline and survival over the five-year study period.

A total of 266 deaths were observed during the follow-up. The results show that their average walking speed was 0.88 metres per second (m/s). No men with walking speeds of 1.36 m/s (3 miles or 5km per hour) or above had contact with the Grim Reaper.

The authors conclude that the results support their theory "that faster speeds are protective against mortality because fast walkers can maintain a safe distance from the Grim Reaper."

http://www.physorg.com/news/2011-12-methanol-hydrogen-gas-fuel-future.html

Methanol replacing hydrogen gas as the fuel of the future

Rather than releasing carbon dioxide into the air, it can be used to produce methanol – which is an excellent fuel for cars and airplanes – using solar energy.

PhysOrg.com - The technology already exists, and a major Nordic research initiative has now been launched that will make the process inexpensive and simple enough to be used on a large scale. Chalmers is heading the initiative.

Producing methanol using solar energy offers several important advantages compared to other energy systems. Methanol is easy to store, as opposed to electricity. As a vehicle fuel, it is ready to be used in the current infrastructure. Solar energy is the most effective form of generation compared to other renewable sources of energy. This is the point of departure for a four-year cooperation project headed by Dinko Chakarov, professor of physics at Chalmers. "We have worked to produce hydrogen gas using solar energy for many years, for example by studying how different surfaces affect reactions. However, hydrogen gas is still difficult to store and distribute. It is for this reason we have targeted producing methanol, which is easy to use as a fuel."

Hydrogen gas has been considered the vehicle fuel of the future for a long time, but achieving a functioning infrastructure for the gas has turned out to be more difficult than anticipated. Many researchers across the globe have thus redirected their research the past few years – as a result, for example, of the U.S Department of Energy's decision to stop funding hydrogen gas research from 2010, after many years of massive investments in hydrogen economy–related projects.

The hydrogen gas production results produced by Chalmers researchers, however, will be useful when the researchers make the move to methanol. Hydrogen gas is the first step in producing methanol, and both steps are basically catalysed with the same method. First the water molecules are split so that hydrogen and oxygen are formed. The hydrogen then reacts with carbon dioxide, and methanol is formed. Both of the reactions are forced through photocatalysis, which means that solar energy is directly transformed into chemical energy.

Methanol production also means that carbon dioxide becomes a resource – instead of a waste product that is released into the atmosphere as a greenhouse gas.

"Carbon dioxide currently comes from carbon dioxide separation during carbon combustion, for example," says Dinko Chakarov. "In the future, we hope it will be possible to condense carbon dioxide from the air, which would result in an entirely carbon dioxide neutral cycle." The process for producing methanol with carbon dioxide must become less expensive, more stable and easier to use for it to achieve a commercial breakthrough. However, there are already plants in place that produce methanol with the method or use parts of it, and the new research project will combine the different parts by involving seven research groups and companies.

"I do believe a large-scale breakthrough for the method is not that far down the road – perhaps ten years from now," says Dinko Chakarov. "I am convinced that we are going to improve the process, and it yields very effective usage of solar energy. For example, it is at least 50 times more effective than the 'shortcut' that involves producing methanol from biomass."

The Chalmers researchers' part involves, amongst other things, creating a photocatalytic system that is selective for methanol. They are also working to improve materials that capture sunlight, both in terms of absorbing the light more effectively and absorbing a broader area of the light spectrum. The Chalmers group builds on many years of research within nanotechnology. By using nanostructures in the material, they have previously been able to increase light absorption by over 50 per cent for some systems.

Facts on methanol*Methanol or methyl alcohol is the simplest of all alcohols, and its chemical name is CH3OH. Methanol can be mixed in petrol or, if slightly modified, be used alone in modern petrol engines. It can easily be transformed into DME or biodiesel and be used in modern diesel engines. It can also be used in fuel cells and be burned in existing power generation plants. Methanol can also be used as a raw material for many of the products that we currently obtain from oil, for example plastics. Provided by Chalmers University of Technology*

http://www.sciencedaily.com/releases/2011/12/111215094921.htm

Ultraviolet Rays Believed to Prevent Chickenpox Spreading

Ultraviolet rays help prevent the spread of chickenpox, meaning people in milder climates are more at risk of catching the disease, according to new research.

ScienceDaily - The discovery could lead to new ways of preventing chickenpox and its more severe relative, shingles. A researcher at St George's, University of London has found that chickenpox is much less common in places with high UV ray levels, compared with those with low levels.

It has long been known that UV rays can inactivate viruses. However, virologist Dr Phil Rice believes his findings indicate that UV rays could inactivate the varicella-zoster virus -- the herpes virus responsible for

chickenpox and shingles - on the skin before it transmits to another person. This explains why there is less transmission in the tropics, where chickenpox is much less frequent than in temperate countries. It would also explain why chickenpox peaks in temperate zones - where it is seasonal - in winter and spring, when UV rays are lowest.

Previously, it was thought that geographical differences in chickenpox incidence were related to heat, humidity, population density, or infection with other viruses that protect against it.

Dr Rice examined data from 25 studies on varicella-zoster virus prevalence patterns in both temperate and tropical areas across the globe. He plotted the data against a range of climatic factors, to examine what might be the most likely causes of increased prevalence. The data showed that -- once other factors were ruled out -- UV rays were the only factor to match the infection patterns in each country studied.

Dr Rice, whose study has been published in Virology Journal, said: "No one had considered UV as a factor before, but when I looked at the epidemiological studies they showed a good correlation between global latitude and the presence of the virus.

"One convincing factor of the hypothesis is that there was an explanation for every anomaly. For example, the peak incidence of chickenpox in India and Sri Lanka is during the hot, dry, sunny season. You would expect chickenpox to be at its lowest at this time, so at first this didn't fit the theory. However, this was explained because UV rays are actually much lower in the dry season compared with the monsoon period. In the dry season, the pollution in the atmosphere reflects the UV rays back into space before they reach us. But in monsoon season, the rains wash away the pollution, meaning the UV rays can get through."

Dr Rice also believes his findings show why two distinct genetic types of the virus have formed -- a temperate type and a tropical one. He found that the temperate genotype only transmitted in the tropics when UV radiation was either reduced or negated. It was found to transmit in the home, for example, but not outside. The tropical genotype, however, was found to transmit in the tropics in the presence of UV rays, suggesting it has some resistance. Dr Rice believes this is because the temperate virus line -- which broke off from the original tropical genotype -- has lost the UV resistance still present in the tropical line.

"For the temperate virus line to have lost the selective advantage of resistance to UV rays as it broke off from the original tropical virus, it must have gained an advantage in the virus life cycle as an evolutionary trade off. An obvious advantage would be an ability to reactivate more easily, as shingles. The virus can only have one of these survival advantages, not both. This might explain why shingles appears to be so much less common in people from the tropics, and why the temperate virus reactivates much more readily than the tropical type."

When the existing chickenpox vaccine was created in the 1970s, it was not known that there were two types of the virus. Dr Rice believes his findings could aid the development of new treatments for chickenpox and shingles, which causes considerable pain and discomfort in later life. He says further studies are needed to fully examine the effect of UV rays on the virus.

http://www.sciencedaily.com/releases/2011/12/111215094919.htm

Research On Solubility Yields Promise for Pharmaceutical, Other Industries

A method for increasing solubility has yielded promising commercial benefits for pharmaceuticals, cosmetics and agriculture.

ScienceDaily - A method for increasing solubility (the ability of one substance to dissolve into another), developed by a graduate student at the Hebrew University of Jerusalem Casali Institute of Applied Chemistry, has yielded promising commercial benefits for industry, particularly in pharmaceuticals, cosmetics and agriculture.

The method, developed by Katy Margulis-Goshen, a Ph.D. student of Prof. Shlomo Magdassi, produces a rapid conversion of oil-in-water microemulsions, containing an insoluble substance, into a dry powder composed of nanoparticles which can easily be dissolved in water or other biological fluids.

For her work, Marguis-Goshen, who immigrated to Israel from the Ukraine in 1990, was chosen as one of the winners of this year's Kaye Innovation Awards at the university.

The process she developed is of unique industrial importance, since it leads to a significant increase in solubility and dissolution properties of almost any active ingredient, without a high energy investment.

Enhancing such solubility is especially important in the field of pharmaceutics, where nearly 50% of the newly discovered drugs cannot be administered or are very poorly absorbed due to their low solubility. Increasing solubility is also important in the field of agriculture, since the majority of insecticides are highly hydrophobic (resistant to mixing with water), and their regular application therefore requires the use of organic solvents, which are harmful to the farmer and the environment.

In cosmetics, active cosmetic ingredients for dermal delivery are usually also water resistant, so that incorporating them into non-greasy, water-based formulations is of great importance.

The new process invented by Margulis-Goshen can be also applied in many other fields, such as nutrition and the manufacture of printing ink and paint.

If the active ingredient, for example, is a water-resistant drug, the powder developed in her method may be injected or incorporated into capsules, tablets and other fast-dissolving drug formulations. Such dosage forms have shown a tremendous increase in dissolution rate in water and biological fluids. They are expected to improve bioavailability of the drug, minimize its side effects by reducing the total dose needed, and allow drug targeting. A very significant improvement in drug dissolution has been shown in this way in tests with three drugs.

Similar beneficial results have been shown in applying the invention to the conversion of hydrophobic pesticides into a powder, allowing a reduction of at least six times in the effective concentration of the pesticide with utilization of water instead of organic solvents as the dispersing medium. In cosmetics, the powder containing active cosmetic ingredient may be incorporated into new, stable, water-based formulations.

http://www.nzherald.co.nz/world/news/article.cfm?c_id=2&objectid=10773020

Rapid rise in Arctic methane shocks scientists

Unprecedented plumes of methane have been seen bubbling to the surface of the Arctic Ocean by scientists

By Steve Connor

Dramatic and unprecedented plumes of methane - a greenhouse gas 20 times more potent than carbon dioxide - have been seen bubbling to the surface of the Arctic Ocean by scientists undertaking an extensive survey of the region. The scale and volume of the methane release has astonished the head of the Russian research team who has been surveying the seabed of the East Siberian Arctic Shelf off northern Russia for nearly 20 years.

In an exclusive interview with the Independent, Dr Igor Semiletov, of the Far Eastern branch of the Russian Academy of Sciences, said that he had never before witnessed the scale and force of the methane being released from beneath the Arctic seabed. "Earlier, we found torch-like structures like this but they were only tens of metres in diameter. This is the first time that we've found continuous, powerful and impressive seeping structures, more than 1000m in diameter. It's amazing," Semiletov said. "I was most impressed by the sheer scale and high density of the plumes. Over a relatively small area, we found more than 100 but, over a wider area, there should be thousands."

Scientists estimate that there are hundreds of millions of tonnes of methane gas locked away beneath the Arctic permafrost, which extends from the mainland into the seabed of the relatively shallow sea of the East Siberian Arctic Shelf. One of the greatest fears is that with the disappearance of the Arctic sea-ice in summer, and rapidly rising temperatures across the entire region, which are already melting the Siberian permafrost, the trapped methane could be suddenly released into the atmosphere, leading to rapid and severe climate change.

Semiletov's team published a study last year estimating that the methane emissions from this region were about 8 million tonnes a year, but the latest expedition suggests this is a significant underestimate of the phenomenon. In late northern summer, the Russian research vessel Academician Lavrentiev conducted an extensive survey of about 25,900sq km of sea off the East Siberian coast. Scientists deployed four highly sensitive instruments, seismic and acoustic, to monitor the "fountains" - or plumes - of methane bubbles rising to the sea surface from beneath the seabed.

"In a very small area, less than [25,900sq km], we have counted more than 100 fountains, or torch-like structures, bubbling through the water column and injected directly into the atmosphere from the seabed," Semiletov said. "We carried out checks at about 115 stationary points and discovered methane fields of a fantastic scale - I think on a scale not seen before. Some plumes were 1km or more wide and the emissions went directly into the atmosphere - the concentration was 100 times higher than normal." Semiletov released his findings for the first time last week at the American Geophysical Union meeting in San Francisco.

http://www.bbc.co.uk/newsbeat/16198157

'A few extra' paracetamol kills a young mum after op

The family of a young woman who died after accidentally taking "a few extra" paracetamol, are warning others about taking the painkiller.

Desiree Phillips, 20, from south Wales, took the over the counter drug to cope with pain after an operation to remove non-cancerous lumps from her breast. The single mum died from severe liver damage after taking extra paracetamol tablets over two weeks. Her family say they now want to prevent further tragedies.

Her grandad, Des Phillips, said: "I think she must have been taking a few extra tablets than the recommended eight a day. "She seemed fine to us, then out of the blue her boyfriend found her stretched out on the sofa and he rang an ambulance. We never thought she would die."

Desiree, from Llanelli, was rushed to hospital where surgeons gave her a liver transplant but she died at Birmingham Queen Elizabeth hospital on 26 August.

Desiree Phillips Desiree Phillips leaves behind her one-year-old son, Jayden

"People don't realise. They think an extra two [paracetamol] won't harm you. An extra two over a period of time can harm your liver if you keep taking that over two to three weeks," Mr Phillips added.

New medical research published in the British Journal of Clinical Pharmacology last month found that taking just a couple extra of paracetamol a day over the recommended amount could be fatal.

Dr Kenneth Simpson, of the University of Edinburgh, led the research and found that a dangerous dose "might just be a few pills too many taken regularly over days, weeks or months". "Those who've taken a 'staggered overdose' do worse than the people who've tried to kill themselves," Dr Simpson added.

Correct dosage

The advice from the Medicines and Healthcare products Regulatory Agency says: "Paracetamol is a safe and effective painkiller for a range of conditions when used correctly and when the dosage recommendations are followed. The labelling with every pack includes details of what the product is for, how to use it and any warnings and precautions. "This includes a warning about paracetamol overdose and instructions not to take more than eight tablets in any 24-hour period." Dr Kenneth Simpson said people should always stick to the recommended daily amount. "The drug is dose-related so liver damage will affect everyone if they've had enough of it," he said. An inquest is going to be held into Desiree Phillips' death. Her family is keen for action to be taken to try to prevent further tragedies.

Des Phillips said: "I have had a big shock. If a painkiller is that dangerous, it should be prescribed. You should not be able to buy them over the counter. "Paracetamol can be fatal. But when you look at the packets, they don't look dangerous." Desiree Phillips had a one-year-old son, Jayden, who is now being cared for by his dad.

http://bit.ly/tmkhar

A Simple Clip Could Increase Quality of Life for Thousands of Patients With a Common Heart Problem

A team at the Montreal Heart Institute conducted the first procedure in Canada using the MitraClip system, to treat patients suffering from mitral valve failure

ScienceDaily - The interventional cardiology team at the Montreal Heart Institute (MHI) recently conducted the first clinical procedure in Canada using the MitraClip system, which is designed to treat patients suffering from mitral valve failure, a very common heart defect that affects an estimated 1 out 5 people to various extents starting at the age of 55. The MHI has implemented a treatment program for this condition and so far is the centre that has performed the most procedures in Canada with the MitraClip system.

An effective treatment with few complications

This innovative and minimally invasive procedure is an alternative to heart surgery. Until now, mitral valve failure has been treated with medication or open-heart surgery depending on the degree of severity. The MitraClip system was designed by Abbott Vascular for inoperable or very high-risk surgical patients and can provide lasting treatment for acute mitral regurgitation. The risk of complications is low compared to traditional surgery, and patients are discharged from the hospital within 48 hours of the procedure. The procedure consists of using a catheter to guide the MitraClip, a simple clip device, through the femoral vein to the left atrium of the heart and then pushing it into the ventricle. The clip is then positioned so that it holds the anterior and posterior flaps of the mitral valve together.

This creates a double orifice opening that allows blood to flow on both sides of the clip, which mechanically restricts regurgitation. The first procedure was performed by a multidisciplinary team made up of cardiologists Anita Asgar, Anique Ducharme, Raoul Bonan and Arsène Basmadjian along with anesthesiologists Jennifer Cogan and Baqir Qizilbash. " All initial cases went well, and we believe that the long- term outcomes for this procedure will be favourable," stated Dr. Anita Asgar, interventional cardiologist and Assistant Professor in the Faculty of Medicine at Université de Montréal. "Since it allows patients to regain autonomy and quality of life, we believe that this treatment will reduce the number of hospital admissions and visits to emergency due to symptom recurrence."

About mitral valve failure

Mitral valve failure (or mitral valve regurgitation) is the most common type of heart valve disease. This condition occurs when the anterior and posterior flaps of the valve do not close completely, which causes abnormal blood backflow from the left ventricle to the left atrium. The bigger the leak, the more blood the left ventricle has to pump to maintain adequate cardiac output. In the long term, mitral valve failure can lead to many complications, such as left ventricle dilation, atrial fibrillation and heart failure. In most cases, someone with mitral valve failure has no symptoms. Rarely, and at a generally advanced stage, the person can experience breathlessness, mild chest pain or general fatigue. In most cases, mitral valve failure is discovered by a doctor during a clinical exam.

www.sciencedaily.com/releases/2011/12/111215113521.htm

Oral Bacteria Enables Breaking Bond On Blood Vessels to Allow Invaders in

A common oral bacteria acts like a key to open a door in human blood vessels and leads the way for it and other bacteria to invade the body through the blood

ScienceDaily - A common oral bacteria, Fusobacterium nucleatum, acts like a key to open a door in human blood vessels and leads the way for it and other bacteria like Escherichia coli to invade the body through the blood and make people sick, according to dental researchers at Case Western Reserve University.

Yiping Han, professor of periodontics at the Case Western Reserve School of Dental Medicine, made the discovery in her continued work with the Fusobacterium nucleatum bacterium, one of the most prevalent of the more than 700 bacteria in the mouth. She found the gram-negative anaerobe has a novel adhesin or bonding agent she's named FadA that triggers a cascade of signals that break the junctures in an interlocking sheath of endothelial cells on blood vessel's surface just enough to allow F. nucleatum and other bacteria into the blood.

A description of bond-breaking process was described in the Molecular Microbiology article, "Fusobacterium nucleatum adhesin FadA binds vascular endothelial cadherin and alters endothelial integrity."

The microbiologist at the dental school has studied the oral bacteria over the past decade and was the first to find direct evidence that linked it to preterm labor and fetal death. But its presence is found in other infections and abscesses in the brain, lungs, liver, spleen and joints. After finding and genetically matching the oral bacteria in the fetal death, she began to unravel the mystery of how an oral bacterium can be found throughout the body and jumps the blood-brain and placental barriers that usually block disease-causing agents.

Through years of lab work, her research led to the vascular endothelial (VE)-cadherin, cell-cell junctures that link the endothelial vascular cells together on the blood vessels. These junctures are like a hook and loop connection, but for some unknown reason when F. nucleatum invades the body through breaks in the mucous membranes of the mouth, due to injuries or periodontal disease, this particular bacterium triggers a cascade of signals that causes the hook to recede back into the endothelial cell. The oral bacterium leads the way with any other harmful invaders following along.

This "deceding" was observed by confocal microscopy when Han used cells from human umbilical cord. The researchers introduced F. nucleatum and demonstrated the VE-cadherins break on bonds on the endothelial cells and creating enough space in the endothelium for the invaders to move in.

Lab tests included introducing F. nucleatum with and without other bacteria. When E. coli alone was introduced, the bond did not break. But when F. nucleatum was introduced first, the bond broke, and the E. coli bacteria were able to move through the otherwise intact cell layers. "This cascade knocks out the guard on duty and allows the bacteria to enter the blood and travel like a bus loaded with riders throughout the system. Whenever the F. nucleatum wants to get off the bus at the liver, brain, spleen, or another place, it does," Han said.

When it disembarks from its ride through the blood, it begins to colonize. The colony of bacteria induces an inflammatory reaction that has a range of consequences from necrosis of tissue to fetal death.

Journal Reference: *Yann Fardini, Xiaowei Wang, Stéphanie Témoin, Stanley Nithianantham, David Lee, Menachem Shoham, Yiping W. Han. Fusobacterium nucleatum adhesin FadA binds vascular endothelial cadherin and alters endothelial integrity. Molecular Microbiology, 2011; 82 (6): 1468 DOI: 10.1111/j.1365-2958.2011.07905.x*

http://www.eurekalert.org/pub_releases/2011-12/ats-lid121311.php

Long-term inhaled dry powder mannitol improves lung function in CF

Adding inhaled dry powder mannitol to standard therapy for cystic fibrosis produced sustained improvement in lung function for up to 52 weeks, according to a new study.

Along with the treatment's efficacy and good safety profile, the convenience and ease of administration of mannitol treatment may improve adherence with therapy in these patients.

In the double-blind study, which was supported by Pharmaxis Limited, 318 patients were randomized to treatment with 400 mg bid inhaled mannitol or 50 mg bid inhaled mannitol (control group) for 26 weeks,

followed by an additional 26 weeks of open-label active treatment. A 50 mg dose was chosen as the control because it was felt it would not be clinically effective, based on an earlier dose escalation study. Mannitol was given on top of a background of typical concomitant therapy such as recombinant human deoxyribonuclease and inhaled antibiotics.

The findings were published online ahead of print publication in the American Thoracic Society's American Journal of Respiratory and Critical Care Medicine.

"Patients in the treatment group showed a 106.5 mL mean improvement in forced expiratory volume in one second (FEV1), an 8.22 percent improvement from baseline, compared with a 52.4 mL improvement (4.47 percent) in the control group," said lead author Moira L. Aitken, MD, professor of pulmonary and critical care medicine at the University of Washington Medical Center. "Forced vital capacity increased 136.3 mL in the treatment group, compared with 65.0 mL in the control group. Treated patients also experienced fewer pulmonary exacerbations than controls."

The difference in absolute FEV1 between the study and control groups approached statistical significance (p=0.059), while the difference in relative change from baseline FEV1 between groups reached significance (p=0.029). Improvements in FEV1 were maintained in the treatment group during the 26-week open-label extension phase of the study. In the control group, mean FEV1 improved 84.0 mL (6.3 percent) from baseline during the open-label phase.

Patients in the treatment and control groups experienced similar rates of adverse events. Given a possible influence of mannitol on lung microbiology, qualitative sputum microbiology was performed for Staphylococcus aureus and Pseudomonas aeruginosa during the double-blind study period. No qualitative changes in microbiology results from baseline were observed in either group.

Compliance was good in both groups, with 85.2 percent of patients in the treatment group and 88.7 percent of controls using 60 percent or more of the drug dispensed.

Although the primary end point for the study, the difference in absolute FEV1 between the treatment and control groups, did not reach significance, this may have been due to use of a single baseline visit to establish baseline FEV1 values. When baseline FEV1 values were calculated as an average of FEV1 values over two baseline visits, as in prior clinical intervention studies, the overall increase in absolute FEV1 was significantly (p=0.0008) greater in the treatment group. The 50 mg dose of mannitol used in the control group may also have had some benefit, which limited the absolute difference between groups.

"In our patients with cystic fibrosis, treatment with inhaled mannitol resulted in sustained improvements in lung function over 12 months, with a favorable safety profile," concluded Dr. Aitken. "In addition, the dry-powder inhaler used to administer mannitol is small, portable, easy to use and doesn't require thorough cleaning and disinfection after each use, which may help patients better adhere to treatment. Our results support the use of inhaled mannitol for the daily management of cystic fibrosis."

http://medicalxpress.com/news/2011-12-antibody-diabetes-obesity.html

Antibody injection promising for diabetes and obesity

Researchers have discovered that a single injection of antibodies into obese diabetic mice provided a marked and sustained improvement in their condition and a reduction in their weight

Medical Xpress - Researchers at Genetech Inc. in South San Francisco, California, led by molecular biologist Junichiro Sonoda, have discovered that a single injection of antibodies into obese diabetic mice provided a marked and sustained improvement in their condition and a reduction in their weight. he research by Genetech, which is part of the Roche Group, targeted "brown fat," and the injections resulted in greater energy expenditure, lowered blood sugar, and reduced fat in the livers of the mice. Researcher Dr. Sonoda said the results were unprecedented, with the drug removing liver fat, which improves the disease conditions.

Brown fat is a specialized kind of fat (adipose tissue) that burns energy to keep the body warm, rather than storing it for future energy needs. Independent studies by three groups of scientists in 2009 found that adult bodies have small amounts of brown fat, primarily around the shoulder blades, the spine, and in the neck. Until this research it had been assumed that brown fat was only found in babies.

The finding of brown adipose tissue in adults led to the idea that if the brown fat could be activated, people might lose weight through burning more calories, and this could reduce the levels of obesity and associated conditions such as type 2 diabetes. Studies have shown that the hormone fibroblast growth factor 21 (FGF21) activates brown fat, and it has been shown to reduce blood triglycerides and to normalize blood sugar levels in mice. Early attempts to use recombinant FGF21 as a drug failed because it is cleared from the bloodstream in only a few hours, giving it little chance to operate.

The new study began by making antibodies to bind to the FGF21 receptors. Dr Sonoda said that one of these receptors was FGFR1, which increased the expression of a number of genes involved in energy expenditure. FGFR1 is found in fat tissues and in the pancreas.

In other cases where antibodies are used as drugs they inhibit the receptors, but in this case the aim was to stimulate the receptors instead to make them mimic the effects of FGF21. Dr Sonoda said the results obtained in mice were better than expected, with one injection into the diabetic, obese mice normalizing blood sugar levels after a week, and the levels remained low for up to a month, with no apparent side effects. The mice also lost around 10% of their body weight during the period.

In type 2 diabetes there is insufficient insulin in the bloodstream to extract sugar and deliver it to cells where its energy is required. This leads to increased blood sugar levels, which can damage various organs in the body. A link between the fibroblast growth factor and diabetes had been identified in mice previously, but so far tests in humans have been unsuccessful.

A drug based on the research is not expected to be available for many years, and no date has been announced for the beginning of clinical trials.

The paper was published in the journal Science Translational Medicine on December 14th.
More information: Amelioration of Type 2 Diabetes by Antibody-Mediated Activation of Fibroblast Growth Factor Receptor 1, Sci Transl Med 14 December 2011: Vol. 3, Issue 113, p. 113ra126, DOI:10.1126/scitranslmed.3002669

ABSTRACT

Clinical use of recombinant fibroblast growth factor 21 (FGF21) for the treatment of type 2 diabetes and other disorders linked to obesity has been proposed; however, its clinical development has been challenging owing to its poor pharmacokinetics. Here, we describe an alternative antidiabetic strategy using agonistic anti-FGFR1 (FGF receptor 1) antibodies (R1MAbs) that mimic the metabolic effects of FGF21. A single injection of R1MAb into obese diabetic mice induced acute and sustained amelioration of hyperglycemia, along with marked improvement in hyperinsulinemia, hyperlipidemia, and hepatosteatosis. R1MAb activated the mitogen-activated protein kinase pathway in adipose tissues, but not in liver, and neither FGF21 nor R1MAb improved glucose clearance in lipoatrophic mice, which suggests that adipose tissues played a central role in the observed metabolic effects. In brown adipose tissues, both FGF21 and R1MAb induced phosphorylation of CREB (cyclic adenosine 5′ -monophosphate response element–binding protein), and mRNA expression of PGC-1α (peroxisome proliferator–activated receptor-γ coactivator 1α) and the downstream genes associated with oxidative metabolism. Collectively, we propose FGFR1 in adipose tissues as a major functional receptor for FGF21, as an upstream regulator of PGC-1α, and as a compelling target for antibody-based therapy for type 2 diabetes and other obesity-associated disorders.

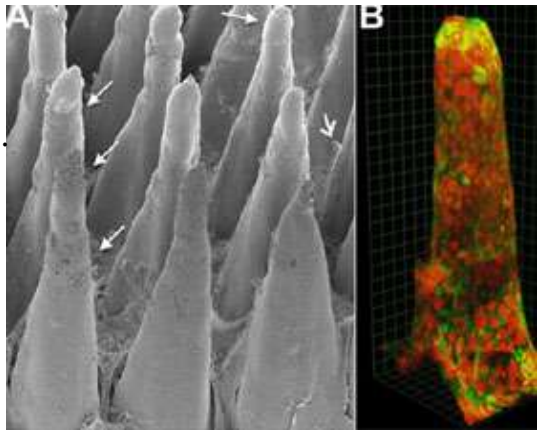
http://news.discovery.com/tech/artificial-intestine-111216.html

Artificial Intestines Near Reality

A new artificial intestine developed in the lab could help people missing a piece of their gut.

By Alyssa Danigelis | Fri Dec 16, 2011 07:00 AM ET

Science has given us working artificial hearts, hips, limbs and bladders, and even a trachea. But no one has successfully created an artificial intestine, until now. A team of researchers has created a tiny one in the lab made from collagen and stem cells. They plan to scale the tube up within three years so it can be tested in human trials.



A scan showing the tiny artificial intestine developed in the lab (right) and a close-up of the engineered bio-scaffold (left). Click to enlarge this image. **Donna Beer Stolz and Jiajie Yu**

"We're going to be taking these and inserting them into animals to see if it actually works," said John March, an assistant professor of biological and environmental engineering at Cornell University who developed the artificial intestine structure. March is developing the artificial intestine with Dr. David Hackam, a pediatric surgeon and scientist at Children's Hospital of Pittsburgh, and the University of Pittsburgh School of Medicine who specializes in treating bowel disorders.

The artificial intestines could be used to help treat those with severe bowel disorders, including approximately 25,000 children worldwide born with a condition called short bowel syndrome who are missing a piece of intestine. These patients require feeding tubes, and the rate of rejection for an intestinal transplant from another human is nearly 40% after one year, according to Dr. Hackam. "Death from rejection as well as overwhelming infection remain unacceptably high," he said.

The small artificial intestine that they have produced is based on a tissue matrix that March originally constructed to see bio-engineered bacteria working in real time without having to kill a mouse. March said he's used several different biomaterials for the matrix. Most recently he used collagen, which he says is readily available and affordable.

Special molds were used to carefully produce the tube structure, including the tiny fingerlike projections found in real intestine lining called "villi." The scientists plan to grow stem cells removed from a gut and seed them onto the tube. Eventually they envision using human cells so that a patient's cells would fill the open spaces in the "gut tube reactor," which should help prevent rejection. "Basically the whole thing is built out of the patient's own body," March said. "We're just giving it a place to grow."

Since the tiny artificial intestine works in a test tube, the focus now is making one to test in mice, and then larger animals like pigs. It won't be easy. Replicating soft structure of the intestine as well as the numerous villi present significant challenges. "These finger-like projections are really quite tall and have a high aspect ratio meaning that they have a curve, and then they're much higher than they are wide," March said.

The projections also have an orientation, so they need to be put on a shape that guides the cells into the right place. Nanotechnology centers can produce nano-sized structures, but human villi are measured in millimeters, which requires an "in-between" engineering technology, March said.

The artificial intestine project is funded with a half-a-million dollar grant from the Hartwell foundation, an organization that funds biomedical research to benefit children. At the end of three years, the two scientists hope to have an artificial intestine ready for large animals. From there, Dr. Hackam said, they will secure additional funding for human trials.

Dr. Daniel Teitelbaum, a pediatric surgeon who teaches at the University of Michigan and directs the Intestinal Failure Program, calls Dr. Hackam and John March's bioengineering approach unique compared to other research efforts that include stretching the intestine and growth hormone experimentation. The challenges to making a viable artificial intestine significant, but Dr. Teitelbaum said he's confident that the team will overcome them. "They're bright investigators," he said. "I'm following their work very closely."

"People are trying to build every single organ artificially," Teitelbaum said. "If one could really build a fully competent intestine, I think what would be incredible about it would be that this could treat thousands of patients."

Dr. Hackam said that they have two possible approaches to make sure blood gets to the artificial intestine. One is to simulate blood vessels by modifying the tube structure. Another is to try enveloping the artificial intestine in a fatty section covering the abdominal organs that has been proven to supply blood to implants there.

http://www.eurekalert.org/pub_releases/2011-12/bu-ndr121611.php

Novel device removes heavy metals from water

Engineers at Brown describe a novel method that collates trace heavy metals in water by increasing their concentration so that a proven metal-removal technique can take over

PROVIDENCE, R.I. - An unfortunate consequence of many industrial and manufacturing practices, from textile factories to metalworking operations, is the release of heavy metals in waterways. Those metals can remain for decades, even centuries, in low but still dangerous concentrations.

Ridding water of trace metals "is really hard to do," said Joseph Calo, professor emeritus of engineering who maintains an active laboratory at Brown. He noted the cost, inefficiency, and time needed for such efforts. "It's like trying to put the genie back in the bottle."

That may be changing. Calo and other engineers at Brown describe a novel method that collates trace heavy metals in water by increasing their concentration so that a proven metal-removal technique can take over. In a series of experiments, the engineers report the method, called the cyclic electrowinning/precipitation (CEP) system, removes up to 99 percent of copper, cadmium, and nickel, returning the contaminated water to federally accepted standards of cleanliness. The automated CEP system is scalable as well, Calo said, so it has viable commercial potential, especially in the environmental remediation and metal recovery fields. The system's mechanics and results are described in a paper published in the Chemical Engineering Journal.

A proven technique for removing heavy metals from water is through the reduction of heavy metal ions from an electrolyte. While the technique has various names, such as electrowinning, electrolytic removal/recovery or electroextraction, it all works the same way, by using an electrical current to transform positively charged metal ions (cations) into a stable, solid state where they can be easily separated from the water and removed. The main drawback to this technique is that there must be a high-enough concentration of metal cations in the water for it to be effective; if the cation concentration is too low — roughly less than 100 parts per million — the current efficiency becomes too low and the current acts on more than the heavy metal ions.

Another way to remove metals is through simple chemistry. The technique involves using hydroxides and sulfides to precipitate the metal ions from the water, so they form solids. The solids, however, constitute a toxic sludge, and there is no good way to deal with it. Landfills generally won't take it, and letting it sit in settling ponds is toxic and environmentally unsound. "Nobody wants it, because it's a huge liability," Calo said.

The dilemma, then, is how to remove the metals efficiently without creating an unhealthy byproduct. Calo and his co-authors, postdoctoral researcher Pengpeng Grimshaw and George Hradil, who earned his doctorate at Brown and is now an adjunct professor, combined the two techniques to form a closed-loop system. "We said, 'Let's use the attractive features of both methods by combining them in a cyclic process,'" Calo said.

It took a few years to build and develop the system. In the paper, the authors describe how it works. The CEP system involves two main units, one to concentrate the cations and another to turn them into stable, solid-state metals and remove them. In the first stage, the metal-laden water is fed into a tank in which an acid (sulfuric acid) or base (sodium hydroxide) is added to change the water's pH, effectively separating the water molecules from the metal precipitate, which settles at the bottom. The "clear" water is siphoned off, and more contaminated water is brought in. The pH swing is applied again, first redissolving the precipitate and then reprecipitating all the metal, increasing the metal concentration each time. This process is repeated until the concentration of the metal cations in the solution has reached a point at which electrowinning can be efficiently employed.

When that point is reached, the solution is sent to a second device, called a spouted particulate electrode (SPE). This is where the electrowinning takes place, and the metal cations are chemically changed to stable metal solids so they can be easily removed. The engineers used an SPE developed by Hradil, a senior research engineer at Technic Inc., located in Cranston, R.I. The cleaner water is returned to the precipitation tank, where metal ions can be precipitated once again. Further cleaned, the supernatant water is sent to another reservoir, where additional processes may be employed to further lower the metal ion concentration levels. These processes can be repeated in an automated, cyclic fashion as many times as necessary to achieve the desired performance, such as to federal drinking water standards.

In experiments, the engineers tested the CEP system with cadmium, copper, and nickel, individually and with water containing all three metals. The results showed cadmium, copper, and nickel were lowered to 1.50, 0.23 and 0.37 parts per million (ppm), respectively — near or below maximum contaminant levels established by the Environmental Protection Agency. The sludge is continuously formed and redissolved within the system so that none is left as an environmental contaminant.

"This approach produces very large volume reductions from the original contaminated water by electrochemical reduction of the ions to zero-valent metal on the surfaces of the cathodic particles," the authors write. "For an initial 10 ppm ion concentration of the metals considered, the volume reduction is on the order of 106."

Calo said the approach can be used for other heavy metals, such as lead, mercury, and tin. The researchers are currently testing the system with samples contaminated with heavy metals and other substances, such as sediment, to confirm its operation.

The research was funded by the National Institute of Environmental Health Sciences, a branch of the National Institutes of Health, through the Brown University Superfund Research Program.

http://www.eurekalert.org/pub_releases/2011-12/vumc-cdm121611.php

Cholesterol-lowering drugs may reduce mortality for influenza patients

Statins may reduce mortality among patients hospitalized with influenza

Statins, traditionally known as cholesterol-lowering drugs, may reduce mortality among patients hospitalized with influenza, according to a new study released online by the Journal of Infectious Diseases.

It is the first published observational study to evaluate the relationship between statin use and mortality in hospitalized patients with laboratory-confirmed influenza virus infection, according to Vanderbilt's William Schaffner, M.D., professor and chair of Preventive Medicine.

"We may be able to combine statins with antiviral drugs to provide better treatment for patients seriously ill with influenza," said Schaffner, who co-authored the study led by Meredith Vandermeer, MPH, of the Oregon Public Health Division.

Researchers studied adults who were hospitalized with laboratory-confirmed influenza from 2007-2008 to evaluate the association between patients who were prescribed statins and influenza-related deaths.

Among 3,043 hospitalized patients with laboratory-confirmed influenza, 33 percent were given statin medications prior to or during hospitalization. After adjusting for various factors, researchers found that patients not receiving statins were almost twice as likely to die from influenza as those who received the medication.

Schaffner stressed that receiving the influenza vaccine each year is still the best defense against influenza. The Centers for Disease Control and Prevention (CDC) estimates that between 5 percent and 20 percent of U.S. residents get the flu each year, and more than 20,000 persons are hospitalized for flu-related complications.

http://blogs.scientificamerican.com/observations/2011/12/16/malaria-deaths-falling-slowly-who-report-says/

Malaria Deaths Falling Slowly, WHO Report Says

In the long fight against malaria, progress finally seems to be coming, if incrementally.

By Katherine Harmon | December 16, 2011

The number of people who died from malaria in 2010 fell 5 percent from the previous year and has dropped 26 percent from 2000 levels, according to a new World Health Organization (WHO) report.

The decline might seem modest given the $2 billion that has been given to fight the disease in the past year. But even this small most recent dip suggests that "investment in malaria control brings results," Margaret Chan, director-general of the WHO, said in a statement. The parasitic disease killed approximately 655,000 people in 2010, most of whom were children under the age of 5. The preponderance of malaria cases is still in Africa, where people are also more likely to succumb to the disease.

Although treatment via artemisinin-based combination therapies (ACTs) has greatly helped to bring the number of deaths down worldwide, Chen and others are worried by cases of artemisinin resistance reported in the past few years. With quick and cheap diagnostic tests now more widespread, the WHO recommends that no one receive malaria drugs without a test. And because the parasite can quickly develop resistance to a single drug, Chan says all monotherapies should be taken off the market.

"The estimated yearly number of malaria cases, though declining, is still 223 million," she said. "That would be a huge and totally unacceptable number of people to be left with no effective treatment." Even with effective available therapies, the WHO failed to meet the goal of 50 percent decline in deaths between 2000 and 2010. And it seems to have a battle ahead if it hopes to meet the target of ending all deaths from malaria by 2015.

http://www.rawstory.com/rs/2011/12/19/scientific-community-abuzz-cancer-breakthroug/

Scientific community abuzz regarding potential cancer breakthrough

US researchers said Monday they have discovered how to keep tumor cells alive in a lab, a potential breakthrough that could transform cancer treatment.

By Agence France-Presse

US researchers said Monday they have discovered how to keep tumor cells alive in a lab, generating buzz in the scientific community about a potential breakthrough that could transform cancer treatment.

Until now, scientists have been unable to make cancer cells thrive for very long, or in a condition that resembles the way they act in the body. Doctors diagnose and recommend treatment largely based on biopsied tissue that is frozen or set in wax.

The advance has sparked new hope that someday doctors may be able to test a host of cancer-killing drugs on a person's own tumor cells in the lab, before returning to the patient with a therapy that is a proven to be a good match. "This would really be the ultimate in personalized medicine," said lead author Richard Schlegel, chairman of the department of pathology at Georgetown University's Lombardi Comprehensive Cancer Center.

"The therapies would be exactly from their tissues. We would get normal tissue and tumor tissue from a particular patient and specifically match up their therapies," he told AFP.

"We are really excited about the possibilities of testing we can do with this."

The method, described in the online edition of the American Journal of Pathology, borrows from a simple method used in stem cell research, experts said.

Lung, breast, prostate and colon cancers were kept alive for up to two years using the technique, which combines fibroblast feeder cells to keep cells alive and a Rho kinase (ROCK) inhibitor that allows them to reproduce.

When treated with the duo, both cancer and normal cells reverted to a "stem-like state," Schlegel said, allowing researchers to compare the living cells directly for the first time.

If other scientists can replicate the technique — and three labs in the United States are already working on it — the advance could herald a long-awaited transformation in the way cancer cells are studied.

"A tumor from one patient is different from a cancer from another patient, and really that is one important reason why so many clinical trials fail," said Marc Symons, investigator at the Center for Oncology and Cell Biology at The Feinstein Institute for Medical Research in Manhasset, New York. "I think it is fair to say this revolutionizes the way we think of cancer treatment," added Symons, who was not involved in the study.

Cancer is the leading cause of death in the world, killing 7.6 million people in 2008, according to the latest data from the World Health Organization.