Green Tea Extract Appears to Keep Cancer in Check in Majority of CLL Patients

ScienceDaily (June 4, 2010) — An extract of green tea appears to have clinical activity with low toxicity in chronic lymphocytic leukemia (CLL) patients who used it in a phase II clinical trial, say researchers at Mayo Clinic.

The findings were presented June 7 during the annual meeting of the American Society of Clinical Oncology (ASCO). They are the latest in a series of Mayo studies to show promise for use of the chemical epigallocatechin gallate (EGCG) - the major component of green tea - in reducing the number of leukemia cells in patients with CLL. Mayo first tested EGCG in a variety of laboratory assays about eight years ago, and it was found to reduce the survival of CLL leukemic cells. This laboratory finding was followed by a successful phase I clinical trial - the first time green tea extract had been studied in CLL patients.

"Although only a comparative phase III trial can determine whether EGCG can delay progression of CLL, the benefits we have seen in most CLL patients who use the chemical suggest that it has modest clinical activity and may be useful for stabilizing this form of leukemia, potentially slowing it down," says Tait Shanafelt, M.D., a Mayo Clinic hematologist and lead author of the study.

"These studies advance the notion that a nutraceutical like EGCG can and should be studied as cancer preventives," says Neil Kay, M.D., a hematology researcher whose laboratory first tested the green tea extract in leukemic blood cells from CLL patients. "Using nontoxic chemicals to push back cancer growth to delay the need for toxic therapies is a worthy goal in oncology research - particularly for forms of cancer initially managed by observation such as CLL."

Drs. Shanafelt and Kay caution that EGCG is not a substitute for chemotherapy. All of the patients Mayo tested with EGCG were early stage, asymptomatic CLL patients who would not otherwise be treated until their disease progressed. The extract was supplied by the National Cancer Institute (NCI) and Polyphenon E International for these initial clinical trials.

CLL is a blood cancer that is a hybrid between leukemia and lymphoma. Progression of the disease is measured by the quantity of leukemia cells in the blood and bone marrow as well as enlargement of lymph nodes due to infiltration by the leukemia cells. In the phase I study, published in May 2009 in the Journal of Clinical Oncology, researchers found that the blood lymphocyte (leukemia cell) count was reduced in one-third of participants, and that the majority of patients who entered the study with enlarged lymph nodes due to involvement by CLL saw a 50 percent or greater reduction in their lymph node size.

Using the highest dose tested in the phase I study, the researchers launched their phase II clinical trial in an additional 36 patients. The results presented at the ASCO meeting evaluate the effects in these 36 patients as well as the six patients from the phase I trial treated at the same dose (total 42 patients). Results from 41 patients who have completed the study show that 31 percent of patients had a 20 percent or greater sustained reduction in blood leukemia count, and 69 percent of patients with enlarged lymph nodes saw a reduction of node size of 50 percent or greater.

In all, 69 percent of CLL patients had a biological response to EGCG as evidenced by a 20 percent or greater sustained reduction in blood lymphocyte count and/or a 50 percent or greater reduction in lymph node size, the researchers say.

Because EGCG was being studied in patients who did not otherwise need treatment, the researchers took a rigorous approach toward studying side effects. Most clinical trials of therapeutic agents only report grade 3 and higher side effects, but the researchers looked at and reported grade 1 and grade 2 as well. While a number of patients had transient grade 1 or 2 side effects, only three of 42 experienced a grade 3 side effect during their six months of treatment.

"All in all, the treatment was well tolerated with very mild side effects in most patients," Dr. Shanafelt says.

The researchers say that the prior publications on the effects of EGCG on CLL leukemia cells in the laboratory and the data from the published phase I study have been widely disseminated via the Internet by patient advocacy groups. Based on information from patients and colleagues throughout the country, the Mayo researchers have become aware that many CLL patients nationwide have started to use EGCG supplements, which are readily available over the counter.

"Without a phase III clinical trial, we cannot make a recommendation that EGCG be used by CLL patients, but those who want to take supplements should consult with their oncologists and need to receive appropriate monitoring using laboratory tests," Dr. Kay says.

The study was funded by grants from the NCI, the Mayo Comprehensive Cancer Center and from donors and patient advocacy foundations.

Lethal Brain Tumor's Strength May Be a Weakness as Well

ScienceDaily (Aug. 14, 2010) — Malignant gliomas are the most common subtype of primary brain tumor - and one of the deadliest. Even as doctors make steady progress treating other types of solid tumor cancers, from breast to prostate, the most aggressive form of malignant glioma, called a glioblastoma multiforme or GBM, has steadfastly defied advances in neurosurgery, radiation therapy and various conventional or novel drugs.

But an international team of scientists, headed by researchers at the Ludwig Institute for Cancer Research (LICR) at the University of California, San Diego School of Medicine, reports in the August 15 issue of Genes & Development that they have discovered a new signaling pathway between GBM cells - one that, if ultimately blocked or disrupted, could significantly slow or reduce tumor growth and malignancy.

More than other types of cancer, GBMs are diverse assemblages of cell subtypes featuring great genetic variation. Anti-cancer therapies that target a specific mutation or cellular pathway tend to be less effective against such tumor heterogeneity.

"These myriad genetic alterations may be one of the primary reasons why GBMs are so lethal," said Frank Furnari, PhD, associate professor of medicine at the UCSD School of Medicine and an associate investigator at the San Diego branch of the LICR.

Even with maximum treatment effort, the median patient survival rate for a diagnosed GBM is nine to 12 months - a statistic that has not changed substantially in decades.

However, Furnari, along with postdoctoral fellows Maria-del-Mar Inda and Rudy Bonavia, and Webster Cavenee, PhD, professor of medicine and director of the San Diego LICR branch, and others noted that in GBMs only a minority of tumor cells possess a mutant form of the epidermal growth factor receptor (EGFR) gene. These cells drive the tumor's rapid, deadly growth. "Most GBM tumor cells express wild-type or normal EGFR," said Furnari. "Yet when expressed by itself, wild-type EGFR is a poor oncogene."

The scientists discovered that tumor cells with mutant EGFR secrete molecules that cause neighboring cells with wild-type EGFR to accelerate their tumorigenic growth. "The mutant cells are instructing other less malignant tumor cells to become more malignant," said Furnari.

This signaling pathway between GBM tumor cells was not known and presents a new and potentially promising chink in the armor of glioblastomas. "If we can inhibit or block this cellular communication, the tumor does not grow as quickly and may be more treatable," Furnari said. Researchers have already identified two molecules that appear to trigger EGFR activity on non-mutant tumor cells.

The findings may also provide clues in the bigger picture of how GBMs and other cancers survive and thrive. "There are other types of mutations and growth factor receptors in tumors," Furnari said. "We need to look at how they communicate. Historically, brain tumor research has focused upon the most abundantly expressed mutations, but this research suggests minority mutations play very important roles as well."

The researchers' next step will be to create a mouse model with mixed cell glioblastoma that can be used to test different therapeutics, inhibitors and blocking agents.

Co-authors of the study include Akitake Mukasa, LICR and Department of Neurosurgery, University of Tokyo; Yoshitaka Narita, LICR and Neurosurgery Division, National Cancer Center Hospital, Tokyo; Dinah W.Y. Sah, Alnylam Pharmaceuticals; Scott Vandenberg, UCSD Department of Pathology,; Cameron Brennan, Department of Neurosurgery, Memorial Sloan-Kettering Cancer Center; Terrance G. Johns, Monash Institute of Medical Research, Monash University; Robert Bachoo, Department of Neurology, University of Texas Southwestern Medical Center; Philipp Hadwiger and Pamela Tan, both at Alnylam Europe AG; and Ronald A. DePinho, Department of Medical Oncology, Belfer Institute for Applied Cancer Science, Dana-Farber Cancer Institute and Harvard Medical School.

Shape Matters: The Corkscrew Twist of H. Pylori Enables It to 'Set Up Shop' in the Stomach

ScienceDaily (Aug. 16, 2010) — The bacterium Helicobacter pylori, which lives in the human stomach and is associated with ulcers and gastric cancer, is shaped like a corkscrew, or helix. For years researchers have hypothesized that the bacterium's twisty shape is what enables it to survive -- and thrive -- within the stomach's acid-drenched environment, but until now they have had no proof.

For the first time, researchers at Fred Hutchinson Cancer Research Center have found that, at least when it comes to H. pylori's ability to colonize the stomach, shape indeed matters. Microbiologist Nina Salama, Ph.D., and colleagues report their findings May 28 in Cell.

Salama and colleagues are the first to demonstrate that the bug's helical shape helps it set up shop in the protective gelatin-like mucus that coats the stomach. Such bacterial colonization -- present in up to half of the world's population -- causes chronic inflammation that is linked to a variety of stomach disorders, from chronic gastritis and duodenitis to ulcers and cancer.

"By understanding how the bug colonizes the stomach, we can think about targeting therapy to prevent infection in the first place," said Salama, the paper's corresponding author and an associate member of the

Human Biology Division at the Hutchinson Center. The paper's first author, Laura K. Sycuro, Ph.D., conducted this work while a student in the University of Washington/Fred Hutchinson Cancer Research Center Molecular and Cellular Biology graduate program. She is now a postdoctoral research associate in the Hutchinson Center's Clinical Research Division.

Specifically, the researchers discovered a group of four proteins that are responsible for generating H. pylori's characteristic curvature. Using a mouse model, they found that laboratory-engineered mutant strains of H. pylori that are deficient in these proteins fail to twist properly and, consequently, are unable to colonize the stomach.

"Having these mutant strains in hand allowed us to test whether the helical shape is important for H. pylori infection, and it is," Salama said. "All of our mutants had trouble colonizing the stomach and were out-competed by normal, helical-shaped bugs." Interestingly and somewhat puzzlingly, the H. pylori mutants retained their ability to propel themselves through a thick, mucus-like gel in a petri dish even though they were unable to establish infection in stomach colonization experiments.

The researchers also discovered a novel mechanism by which these proteins drive the organism's shape, in essence acting like wire cutters on a chain-link fence to strategically snip certain sections, or crosslinks, of the bacterium's mesh-like cell wall. "The crosslinks preserve the structural integrity of the bacterial wall, but if certain links are cleaved or relaxed by these proteins, it allows the rod shape to twist into a helix," Salama said.

Mutant forms of H. pylori that lack these proteins are misshapen, ranging from rods to crescents, which hampers their ability to bore through or colonize the stomach lining.

"We found that the bacteria that lost their normal shape did not infect well, and so we know that if we inhibit normal shape we can slash infection rates," Salama said.

Other disease-inducing bacteria that have these proteins include Vibrio cholerae, a comma-shaped bug that causes cholera, and the curved to helical rod-shaped Campylobacter jejuni, which is the leading cause of bacterial diarrhea in developed countries.

"The fact that we found proteins that act on the cell wall of H. pylori that seem to be important for bacterial survival and that these proteins are found in other pathogens with similar shapes makes them a possible drug target for a number of bacterial diseases," she said.

H. pylori is contagious, but its exact transmission route is unknown. While more than 80 percent of those infected will remain asymptomatic, an estimated 10 percent to 15 percent will develop related diseases such as ulcers and/or stomach cancer. About 70 percent of stomach cancers are associated with H. pylori infection.

The current treatment for H. pylori infection in those diagnosed with peptic ulcers is a combination of proton-pump inhibitors to reduce gastric acid secretion paired with antibiotics to eradicate the bug. The treatment is not always effective, however, due to the prevalence of antibiotic resistance.

"H. pylori infection is hard to treat. There are no vaccines. Right now the only treatment is eradication therapy, and we are running out of tricks because of resistance to essentially all current antibiotics," Salama said.

The bug was first characterized in the early 1980s by Australian researchers Barry J. Marshall and Robin Warren, who in 2005 received the Nobel Prize in physiology or medicine for their discovery. Prior to their finding, the prevailing theory was that most stomach ulcers and gastritis were caused by spicy food or stress.

In addition to helical rods or spirals, bacterial species come in a wide variety of highly conserved shapes that range from spheres and rods to crescents and stars. They can be found on and within animals and plants -- and indeed wherever life exists, from deep in the Earth's crust to the oceans and forests -- and they play a key role in regulating the environment. In humans, which harbor 10 times more bacterial cells than human cells, bacteria not only cause diseases ranging from strep throat to pneumonia, but they also perform a host of helpful duties, from aiding digestion to making vitamins that the human body alone cannot produce.

"We are a consortium. We depend on them as they depend on us," Salama said.

The National Institutes of Health and the National Science Foundation funded this research, which also involved investigators from Yale University and Newcastle University (U.K.).

Bacteria can 'smell' their environment, research shows

By Jason Palmer Science and technology reporter, BBC News

Research has shown that bacteria - among the simplest life forms on Earth - have a sense of smell.

Scientists from Newcastle University in the UK have demonstrated that a bacterium commonly found in soil can sniff and react to ammonia in the air. It was previously thought that this "olfaction" was limited to more complex forms of life known as eukaryotes. The finding, published in Biotechnology Journal, means that bacteria have four of the five senses that humans enjoy.

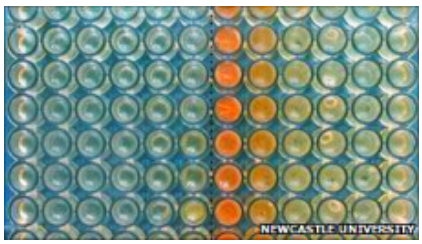
The discovery also has implications in the understanding and control of biofilms - the chemical coatings that bacteria can form on, for example, medical implants.

Bacteria have already demonstrated the ability to react to light, in analogy to sight, and to change the genes that they express when confronted with certain materials, in analogy to touch.

Sniff test

However, there is a distinction between an organism reacting to a chemical that it encounters directly (in analogy to the sense of taste) and a reaction to a chemical that is floating around in the air, says Reindert Nijland, lead author of the study. "The difference is both in the mechanism that does the sensing, as well as in the compounds that are sensed," Dr Nijland, now at University Medical Centre Utrecht in the Netherlands, told BBC News.

"The compounds detected by olfactory organs are generally much more volatile than things you can taste like 'sweet' or 'salt', and therefore can provide information about things that can be much further away; you can smell a barbecue from a few blocks away whereas you have to physically touch and eat the steak to be able to actually taste it."



Vials of bacterial culture (Newcastle Uni) Vials nearest "well-fed" bacteria responded to ammonia in the air

Bacteria are known to use their "senses" to detect chemicals that indicate the presence of other bacteria or competitors for food. In some cases, they can produce a slimy material that causes them to stick together in what is known as a biofilm. Such biofilms can cause complications in cases ranging from implants to oil pipelines, but a familiar example is the plaque that forms on teeth.

Dr Nijland and Grant Burgess put a number of separate cultures of a bacterium called B. licheniformis in cylinders containing different "growth media" to cause them to multiply. Some were in a rich broth of food that allowed the bacteria to multiply quickly, releasing ammonia gas in the process, while others were in a medium that allowed the growth of biofilms - which can be initiated if the bacteria are in contact with ammonia.

They were surprised to find that some of the isolated bacteria cultures began to form biofilms spontaneously, with those physically closest to the "well-fed" bacteria showing the highest biofilm production.

The only explanation is that the bacteria sensed the presence of ammonia directly from the air above the cultures.

Film rights

Dr Nijland explained that the biofilm provides both a barrier and a means of transportation for the bacteria that have "smelled" nearby ammonia. "It's tempting to speculate that [ammonia] provides the bacteria with information of a nearby nutrient source, since ammonia generally is a waste product of bacteria growing on a rich nutrient source," he said.

"The bacteria sense this, organise themselves in a biofilm which will prepare them for both competition with other species already feeding on the nutrient source, and enables swarming - migration via the matrix they have secreted to form the biofilm."

The surprise find has implications in our understanding of the difference between prokaryotes like bacteria, which have no neatly packaged parts within their cells, and the more advanced eukaryotes that include everything from yeast to humans. "If very simple organisms such as bacteria are capable of this that would imply that this ability evolved much earlier than expected," said Dr Nijland.

"Understanding this phenomenon... will help us to develop methods to potentially interfere with this process and potentially develop new ways of preventing biofilm-related bacterial infections."

Software Predicts Criminal Behavior

A computer program is helping law enforcement determine who is most likely to commit crime.

By Eric Bland Mon Aug 16, 2010 08:13 AM ET

THE GIST

**** A computer program is helping law enforcement officials make parole and probation recommendations.***
**** Philadelphia, Baltimore, and Washington, D.C. are using or will use the software.***
**** The program could be used to determine sentencing and bail recommendations.***

New crime prediction software being rolled out in the nation's capital should reduce not only the murder rate, but the rate of many other crimes as well. Developed by Richard Berk, a professor at the University of Pennsylvania, the software is already used in Baltimore and Philadelphia to predict which individuals on probation or parole are most likely to murder and to be murdered.

In his latest version, the one being implemented in D.C., Berk goes even further, identifying the individuals most likely to commit crimes other than murder. If the software proves successful, it could influence sentencing recommendations and bail amounts.

"When a person goes on probation or parole they are supervised by an officer. The question that officer has to answer is 'what level of supervision do you provide?' said Berk. It used to be that parole officers used the person's criminal record, and their good judgment, to determine that level.

"This research replaces those seat-of-the-pants calculations."

Murders, despite their frequent appearance on cop dramas and the evening news, are rare crimes. On average there is one murder for every 100,000 people. Even among high risk groups the murder rate is 1 in 100. Trying to predict such a rare event is very difficult, so difficult that many researchers deemed it impossible.

"It's like trying to find the needle in the haystack," said Berk. New advances in computer technology, however, can shift through that haystack faster and more accurately than ever.

Beginning several years ago they assembled a data set of more than 60,000 various crimes, including homicides. Using an algorithm they developed, they found a subset of people much more likely to commit homicide when paroled or probated. Instead of finding one murderer in 100, the UPenn researchers could identify eight future murderers out of 100.

Berk's software examines roughly two dozen variables, from a person's criminal record to their geographic location. The type of crime, and more importantly, the age at which that crime was committed were two of the most predictive variables.

"People assume that if someone murdered then they will murder in the future," said Berk. "But what really matters is what that person did as a young individual. If they committed armed robbery at age 14 that's a good predictor. If they committed the same crime at age 30, that doesn't predict very much."

Baltimore and Philadelphia are already using Berk's software to help determine how much supervision parolees should have. Washington, D.C. is now set to use the algorithm to help determine lesser crimes as well. If those tests go well, Berk says the program could help set bail amounts and suggest sentencing recommendations.

Predicting future crimes does sound, well, futuristic, said Berk. Even his students at the University of Pennsylvania compare his research to the Tom Cruise movie "Minority Report." Nevertheless, he said, "We aren't anywhere near being able to do that."

Scientifically, Berk's results are "very impressive," said Shawn Bushway, a professor of criminal justice at the State University of New York at Albany who is familiar with Berk's research. Predicting rare events like murder, even among high risk individuals, is extremely difficult, said Bushway, and Berk is doing a better job of it than anyone else.

But Berk's scientific answer leaves policy makers with difficult questions, said Bushway. By labeling one group of people as high risk, and monitoring them with increased vigilance, there should be fewer murders, which the potential victims should be happy about. It also means that those high-risk individuals will be monitored more aggressively. For inmate rights advocates, that is tantamount to harassment, "punishing people who, most likely, will not commit a crime in the future," said Bushway.

"It comes down to a question of whether you would rather make these errors or those errors," said Bushway.

Autism explosion half explained, half still a mystery

* 13:40 16 August 2010 **by Jim Giles**

Why have the numbers of autism diagnoses ballooned in recent decades? Researchers have long claimed that changes to the way the condition is diagnosed are the main cause. But now a series of a studies have shown that diagnostic changes alone cannot account for the increase. They suggest that other causes, perhaps environmental factors, are also contributing to the rise in cases.

"These studies give me the feeling that there must be a true increase in the number of children affected," says Tom Insel, director of the National Institute of Mental Health in Rockville, Maryland.

The studies are the work of sociologist Peter Bearman at Columbia University in New York and colleagues. They have spent three years trying to disentangle the causes of the roughly sevenfold increase in autism rates seen in many developed nations over the past 20 years. They have identified three factors that are driving up autism rates, but found that these account for only half of the observed increase.

Better diagnosis

Diagnostic changes are the most important influence. After 1987, the definition of autism used in California was broadened several times. Bearman and his colleague Marissa King examined the medical records of around 7000 Californian children with autism and found that one in ten had initially been diagnosed with mental retardation. Extrapolated to the state as a whole, they estimate that this change in diagnosis created almost 5000 extra cases of autism between 1993 and 2005, or 26 per cent of the increase of recorded over that period.

Greater awareness

Social influence accounts for another big chunk of the overall increase. Parents are more aware of the disorder than they used to be, and so those whose children who have mild forms of autism have become more likely to seek out diagnosis.

Bearman and his colleague Ka-Yuet Liu quantified this effect. They first estimated how the chances of a child being diagnosed with autism increase if he or she lives close to a child that has already been diagnosed.

They then plotted the addresses of children with and without autism in California to calculate the number of children who had grown up close to a child diagnosed with the condition. They were then able to calculate the fraction of extra cases that would have been diagnosed as a result of social interactions. They put this figure at 16 per cent.

Older parents

The final contribution to the rise in diagnoses comes from demographics. Couples in California are having children later in life, as they are in much of the rest of North America and Europe. That is pushing up autism rates, because autism is triggered by genetic mutations that older parents are more likely to pass on to their children

Bearman and King calculated that these older parents are responsible for 11 per cent of the extra autism cases.

Missing a piece of the puzzle

Autism experts say Bearman's work is notable because it provides a powerful overview of the potential causes. "Bearman is giving us the answers we've been looking for," says Michael Rosanoff at Autism Speaks, a New York-based charity that funds autism research.

Not all the answers, however. Together, the three effects account for roughly half the extra cases. So what is behind the other half? "I wish we knew," says Rosanoff. "There are many factors being explored, but not one leading theory." Childhood vaccines, which some parents blame for the increase, have been ruled out by epidemiological studies.

Insel says that environmental factors are most likely to be behind the rise, although research to pin down which are to blame will take years.

But other researchers caution against this assumption. Autism used to be highly stigmatised, in part because it was thought to be due to poor parenting. The removal of that stigma has made doctors and parents more willing to recognise the disease, which will have contributed to [some of] the extra cases, says Roy Grinker, an anthropologist at George Washington University in Washington DC.

This and other social causes, together with uncertainty in the number of cases that can be attributed to the factors already studied by Bearman, could account for much or all of the unexplained half, says Grinker.

Journal references: Bearman and King: International Journal of Epidemiology, DOI: 10.1093/ije/dyp261; Bearman and Lui: American Journal of Sociology, DOI: 10.1086/651448; Bearman and King: American Journal of Public Health, DOI: 10.2105/ajph.2008.149021

Medical treatment carries possible side effect of limiting homosexuality

A prenatal pill for congenital adrenal hyperplasia to prevent ambiguous genitalia may reduce the chance that a female with the disorder will be gay. Critics call it engineering for sexual orientation.

Each year in the United States, perhaps a few dozen pregnant women learn they are carrying a fetus at risk for a rare disorder known as congenital adrenal hyperplasia. The condition causes an accumulation of male hormones and can, in females, lead to genitals so masculinized that it can be difficult at birth to determine the baby's gender.

A hormonal treatment to prevent ambiguous genitalia can now be offered to women who may be carrying such infants. It's not without health risks, but to its critics those are of small consequence compared with this notable side effect: The treatment might reduce the likelihood that a female with the condition will be homosexual. Further, it seems to increase the chances that she will have what are considered more feminine behavioral traits.

That such a treatment would ever be considered, even to prevent genital abnormalities, has outraged gay and lesbian groups, troubled some doctors and fueled bioethicists' debate about the nature of human sexuality.

The treatment is a step toward "engineering in the womb for sexual orientation," said Alice Dreger, a professor of clinical medical humanities and bioethics at Northwestern University and an outspoken opponent of the treatment.

The ability to chemically steer a child's sexual orientation has become increasingly possible in recent years, with evidence building that homosexuality has biological roots and with advances in the treatment of babies in utero. Prenatal treatment for congenital adrenal hyperplasia is the first to test - unintentionally or not - that potential.

The hormonal treatment "theoretically can influence postnatal behavior, not just genital differentiation," said Ken Zucker, psychologist in chief of the Center for Addiction and Mental Health in Toronto, who studies gender identity. "Some people refer to girls with CAH as experiments of nature because you've got this condition and you can take advantage of studying it."

Complicating the situation is the fact that the daily hormone pill does nothing to treat or cure the underlying condition, caused in this case by a defective enzyme in the adrenal gland.

Dreger and critics — which include the National Center for Lesbian Rights, Advocates for Informed Choice (an organization that works to protect the rights of people with intersex conditions), and some pediatric endocrinologists and parents of children with the condition — say far too little is known about the safety of the hormone, the steroid dexamethasone, when used prenatally. They say it should be used sparingly, in closely monitored clinical trials, or not at all. They're even more concerned that some doctors might tell parents that a reduced chance of homosexuality is one of the therapy's benefits.

"Most clinicians speak about this treatment as ambiguous-genitalia prevention," said Dreger, who co-wrote an editorial about the treatment in a July publication of the Hastings Center, a bioethics organization. "Others suggest that you should prevent homosexuality if you can. But being gay or lesbian is not a disease and should not be treated as such."

To that end, in September, a consortium of medical groups led by the Endocrine Society will release updated guidelines on treatment of congenital adrenal hyperplasia that acknowledge the controversy. The guidelines are expected to describe prenatal dexamethasone therapy — first used about 20 years ago, but now with increasing frequency — as experimental and reiterate that the standard approach for cases of ambiguous genitalia is to perform corrective surgery.

But they're not expected to discourage research on the treatment.

Congenital adrenal hyperplasia, caused by a defect in an enzyme called 21-hydroxylase, affects about 1 in 15,000 infants, and almost all newborns are screened for it. Undetected, the abnormality can make both male and female infants critically ill within a few weeks of birth because of an associated salt loss through the urine. The defective enzyme also causes a deficiency of the hormone cortisol, which can affect heart function, and an increase in androgens produced by the adrenal glands.

The excess presence of the male hormone testosterone in the womb has little effect on a male fetus' genitalia. Even in females, the anatomical defect may be mild, involving nothing more obvious than a slightly enlarged clitoris. However, in severe cases, girls are born with male-like sexual organs although they usually have ovaries and a uterus.

The treatment of such disorders has long been the subject of debate. Early surgery to assign a child's gender is controversial, but prenatal treatment for congenital adrenal hyperplasia is even more alarming, said Anne Tamar-Mattis, executive director of Advocates for Informed Choice. She adds that the complicated surgery carries risks, including infection and nerve damage, and that parents may not be adequately counseled beforehand. The group favors allowing children born with intersex conditions to participate in decisions about their gender identity, including delaying a decision until adolescence.

Most couples don't know their offspring are at risk for the condition until one child is born with it; prenatal dexamethasone treatment is offered in subsequent pregnancies. The drug is an anti-inflammatory medication used most often for arthritis. Prenatal use is considered off-label.

In animal studies, the treatment appears to cause an increased risk of high blood pressure, plus changes in glucose metabolism, brain structure and brain function, leading to memory problems, for example. Long-term studies in humans are lacking.

"There is not a lot of information on its long-term safety," said Dr. Phyllis Speiser, a pediatric endocrinologist with the Cohen Children's Medical Center in New York who chaired the Endocrine Society task force writing the new treatment guidelines. "The efficacy has been demonstrated in case reports — a fairly sizable number of cases that used untreated siblings for comparison — but not in randomized, controlled clinical trials."

Carriers of the gene mutation that causes this form of hyperplasia have roughly a 12.5% chance of having a daughter with the condition. The hormone treatment must be started as soon as possible, before the gender of the child is determined, for it to have an effect on genital development.

"It would be much less of a controversy if the treatment was just given to CAH girls," said Heino Meyer-Bahlburg, professor of clinical psychology at Columbia University Medical Center and a prominent researcher on disorders of sexual development in children. But, he says, "to effectively treat one fetus, you have to treat seven others."

There have been only a few hundred cases of prenatal dexamethasone treatment in the world. But the emerging data on those cases have captured researchers' and activists' attention.

Dr. Maria New, a highly regarded pediatric endocrinologist at Mount Sinai Medical Center in New York, is among a handful of physicians worldwide who have studied the treatment. New does not offer the treatment in her position at Mount Sinai, but follows children she treated previously or who have had the treatment provided by other doctors. She declined to be interviewed for this report, but on her website and in publications, New says the data so far show that the treatment is safe and effective in preventing ambiguous genitalia.

However, New's more recent studies have caused more consternation, because — as she describes it — treated girls behave in ways that are considered more traditionally girlish.

In a 2008 study in the Archives of Sexual Behavior, New and her colleagues administered a sexual behavior assessment questionnaire to 143 women with congenital adrenal hyperplasia who were not treated prenatally. They found that most were heterosexual, but the rates of homosexual and bisexual women were markedly higher in women with the condition — especially those with the most severe conditions — compared with a control group of 24 female relatives without congenital adrenal hyperplasia.

And, in a paper published earlier this year in the Annals of the New York Academy of Sciences, New and her colleagues reported on data from 685 pregnancies in which the condition was diagnosed prenatally, acknowledging the potential effects of the treatment for reducing traditionally masculine behavior in girls. Prenatally treated girls were more likely to be shy, they wrote, while untreated girls were "more aggressive."

Moreover, the authors said, failure to provide prenatal therapy seems to lead to traditionally masculine gender-related preferences in childhood play, peer association and career and leisure choices.

"The majority, no matter how severe, are heterosexual," said Meyer-Bahlburg, who has collaborated with New on some of the studies. "But the rate of CAH women attracted to females increases with their degree of androgen exposure during prenatal life."

Studies have not yet been conducted to examine whether the hormone treatment would reduce the rate of lesbianism, Meyer-Bahlburg said. "I would never recommend treatment in order to take lesbianism away if that is someone's predisposition," he said. "Any treatment can be misused. That could happen here. But this is not the focus of the treatment. The focus is to make surgery unnecessary."

Dreams Make You Smarter, More Creative, Studies Suggest

REM sleep boosts memory, creativity, and more, experts announce.

Rachel Kaufman for National Geographic News

Here's more evidence that sleep, including napping, can make you smarter. Dreaming may improve memory, boost creativity, and help you better plan for the future, new research suggests.

In a recent study, people who took naps featuring REM sleep—in which dreams are most vivid—performed better on creativity-oriented word problems. That is, the REM, or rapid eye movement, sleep helped people combine ideas in new ways, according to psychiatrist Sara Mednick, who led the study.

Part of the experiment's morning round involved a word-analogy test, similar to some SAT problems. For example, given "chips: salty::candy:_____" the answer would have been "sweet."

At midday, after the first round, the subjects were given a 90-minute rest period, during which they were monitored. Some participants took naps with REM sleep, a deeper slumber that typically begins more than an hour after a person falls asleep. Others took an REM-less nap. A third group rested quietly but didn't sleep.

There was a second round of tests in the afternoon. In a typical second-round test, participants were asked to guess what single word is associated with three seemingly unrelated words. For example, given "cookie," "heart," and "sixteen," the answer would have been "sweet." The correct answers to many of the second-round questions were the same as the solutions to analogy questions from round one.

On the second-round questions whose answers matched first-round answers—for example, "sweet" and "sweet"—the REM nappers improved their performances by 40 percent. Non-REM nappers and the non-nappers showed no improvement on these problems, said Mednick, of the University of California, San Diego, who presented her findings Friday in San Diego at the American Psychological Association's annual convention.

That means that REM sleep improved participants' ability to see connections among seemingly unrelated things: the answers from the first-round analogy problems and the three words in each round-two association test, she said.

Mednick noted that all groups remembered the morning's answers equally well—proving that the second round wasn't just testing nappers' memorization abilities. Instead, REM "plays a role in helping people detach their memory of that word from being able to use that word in other contexts," she said.

Sleep Helps Turn Memories Into Predictions?

Boosted by deep sleep, an improved memory may have yet one more benefit: helping you imagine—and better plan for—the future. “When you imagine future events, you're recombining aspects of experiences that have actually occurred," Harvard psychiatrist Daniel Schacter, whose research was separate from Mednick's, told National Geographic News.

Schacter, who also presented Friday at the psychology convention, has found that the same areas in the brain that handle memory, such as the hippocampus, show increased activity when subjects are asked to imagine future events (interactive brain map).

Could REM sleep turn you into a crystal ball? "Nobody really knows," he said. "But I suspect there might be a connection. After all, dreams are a different way of recombining aspects of past experience."

Scientists Successfully Use Human Induced Pluripotent Stem Cells to Treat Parkinson's in Rodents

ScienceDaily (Aug. 16, 2010) — Researchers at the Buck Institute for Age Research have successfully used human induced pluripotent stem cells (iPSCs) to treat rodents afflicted with Parkinson's Disease (PD). The research, which validates a scalable protocol that the same group had previously developed, can be used to manufacture the type of neurons needed to treat the disease and paves the way for the use of iPSC's in various biomedical applications. Results of the research, from the laboratory of Buck faculty Xianmin Zeng, Ph.D., are published August 16, 2010 in the on-line edition of the journal Stem Cells.

Human iPSC's are a "hot" topic among scientists focused on regenerative medicine. "These cells are reprogrammed from existing cells and represent a promising unlimited source for generating patient-specific cells for biomedical research and personalized medicine," said Zeng, who is lead author of the study. "Human iPSCs may provide an end-run around immuno-rejection issues surrounding the use of human embryonic stem cells (hESCs) to treat disease," said Zeng. "They may also solve bioethical issues surrounding hESCs."

Researchers in the Zeng lab used human iPSCs that were derived from skin and blood cells and coaxed them to become dopamine-producing neurons. Dopamine is a neurotransmitter produced in the mid-brain which facilitates many critical functions, including motor skills. Patients with PD lack sufficient dopamine; the disease is a progressive, incurable neurodegenerative disorder that affects 1.5 million Americans and results in tremor, slowness of movement and rigidity.

Researchers transplanted the iPSC-derived neurons into rats that had mid-brain injury similar to that found in human PD. The cells became functional and the rats showed improvement in their motor skills. Zeng said this is the first time iPSC-derived cells have been shown to engraft and ameliorate behavioral deficits in animals with PD. Dopamine-producing neurons derived from hESCs have been demonstrated to survive and correct behavioral deficits in PD in the past. "Both our functional studies and genomic analyses suggest that overall iPSCs are largely similar to hESCs," said Zeng.

The research also addresses the current lack of a robust system for the efficient production of functional dopamine-producing neurons from human iPSCs, Zeng said. The protocol used to differentiate the iPSCs was similar to one developed by Zeng and colleagues for hESCs. "Our approach will facilitate the adoption of protocols to good manufacturing practice standards, which is a pre-requisite if we are to move iPSC's into clinical trials in humans," said Zeng.

"The studies are very encouraging for potential cell therapies for Parkinson's disease," said Alan Trounson, Ph.D., the President of the California Institute for Regenerative Medicine. "The researchers showed they could produce quantities of dopaminergic neurons necessary to improve the behavior of a rodent model of PD. We look forward to further work that could bring closer a new treatment for such a debilitating disease," Trounson said.

Other Buck Institute researchers involved in the study include Andrzej Swistowski, Jun Peng, Qiuyue Liu, and Mahendra Rao. Prashant Mali and Linzhao Cheng from the Johns Hopkins Institute for Cell Engineering, Johns Hopkins School of Medicine, Baltimore, MD also contributed to the work. The research was supported by grants from the California Institute for Regenerative Medicine, the Larry L. Hillblom Foundation, and the National Institutes of Health.

Proof of Aliens Could Come Within 25 Years, Scientist Says

By Clara Moskowitz, SPACE.com Senior Writer

SANTA CLARA, Calif. – Proof of extraterrestrial intelligence could come within 25 years, an astronomer who works on the search said Sunday.

"I actually think the chances that we'll find ET are pretty good," said Seth Shostak, senior astronomer at the Search for Extraterrestrial Intelligence Institute in Mountain View, Calif., here at the SETI con convention. "Young people in the audience, I think there's a really good chance you're going to see this happen."

Shostak bases this estimation on the Drake Equation, a formula conceived by SETI pioneer Frank Drake to calculate the number (N) of alien civilizations with whom we might be able to communicate. That equation takes into account a variety of factors, including the rate of star formation in the galaxy, the fraction of stars that have planets, the fraction of planets that are habitable, the percent of those that actually develop life, the percent of those that develop intelligent life, the fraction of civilizations that have a technology that can broadcast their presence into space, and the length of time those signals would be broadcasted.

Reliable figures for many of those factors are not known, but some of the leaders in the field of SETI have put together their best guesses. Late great astronomer Carl Sagan, another SETI pioneer, estimated that the Drake Equation amounted to N = 1 million. Scientist and science fiction writer Isaac Asimov calculated 670,000. Drake himself estimates a more conservative 10,000. But even if that lower value turns out to be correct, at the rate they're going, it wouldn't take scientists too long to discover an alien signal, Shostak said.

"This range, from Sagan's million down to 10,000 – that's the range of estimates from people who have started and worked on SETI," said Shostak. "These people may know what they're talking about. If they do, then the point is we trip across somebody in the next several dozen or two dozen years."

The SETI quest is set to take a leap forward when the Allen Telescope Array, a network of radio dishes under construction in northern California, is fully operational. By 2015, the array should be able to scan hundreds of thousands of stars for signs of extraterrestrial intelligence, Shostak said.

But while humans might be able to discover an alien signal within that timeframe, interpreting what ET is trying to tell us could take much, much longer.

Shostak admitted such a task would be very difficult. An alien civilization may be as technologically advanced compared to us as Homo sapiens are to our hominid relatives Neanderthals. "We could give our digital television signals to the Neanderthals, and they'll never figure it out. And they're not stupid," he said.

Yet simply having proof that we are not alone in the universe would likely be a world-changing achievement, Shostak added.

Accomplice in Breast Cancer Discovered

ScienceDaily (Aug. 17, 2010) — Scientists have discovered an accomplice in breast cancer -- a master control switch with the power to set off a cascade of reactions orchestrated by a cancer-causing gene (or oncogene) named Wnt1. This executive molecule and its modus operandi are reported in back-to-back papers featured on the cover of the August 15 issue of Cancer Research.

"These papers are about the regulation of a Wnt oncogene," explains lead author Rakesh Kumar, Ph.D., professor and the Catharine Birch & William McCormick Chair of the department of biochemistry and molecular biology at The George Washington University School of Medicine and Health Sciences. Now, Kumar and his team describe how a master switch sparks a type of Wnt signaling in breast cancer. Moreover, this master control switch may help explain why increased levels of a protein called MTA1 (metastasis-associated protein 1) are oncogenic in certain types of breast cancer.

Like many molecular pathways underlying cancer, Wnt pathways govern normal processes like embryonic development and the communication between cells in healthy people. For reasons little understood, however, certain types of Wnt proteins sometimes go awry, sending off cascades of signals that turn normal cells into cancerous ones. Researchers often find evidence of Wnt pathway activation when they analyze what genes are turned on in tumors. Although Wnt has been connected with breast cancer for nearly 30 years, however, the signals (other than mutations) that trigger it remain largely unknown.

Kumar and his team have implicated MTA1 and a shorter variation of the protein, MTA1s, in Wnt1 (a type of Wnt) pathway activation. MTA1 belongs to the MTA family of genes, which help a range of cancers progress in a variety of ways. Before this study, researchers knew that MTA1 levels were higher than normal in breast, ovarian, prostate, colorectal, gastric, liver tumors, and more. But they still didn't know everything about what MTA's were doing there.

In the current studies, funded by a grant from the National Cancer Institute, Kumar's team finds that MTA1 expression triggers cancer-causing signals from Wnt1 in human breast cancer cells. This Wnt1 signaling cascade leads to tumors, they demonstrate, by showing that 8.8 percent of mice bearing artificially elevated levels of MTA1s grew tumors in their mammary glands.

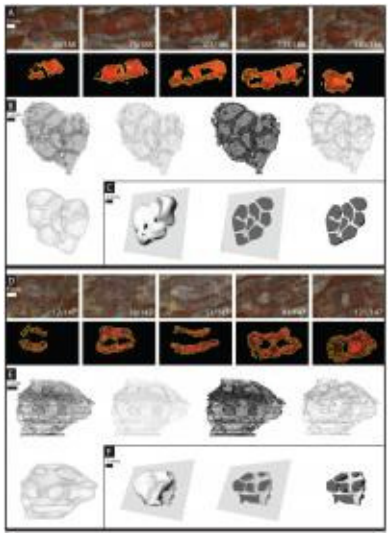
To get down to the details, Kumar and his fellow researchers show that MTA1 and MTA1s activate the cancer-causing pathway by reducing the levels of a protein known as Six3. This protein is known to inhibit Wnt1 in brain cells, but in their study involving breast cancer cells, it inhibited Wnt1 in a rather non-intuitive way. Six3 normally puts the brakes on Wnt signaling, and so when MTA1 obstructed Six3, Wnt1 signals let loose. In addition, the team found that MTA1s also promoted Wnt signaling directly and through another known Wnt-related pathway -- namely ERK-mediated GSK3ß.

Because inflammation may drive MTA1, and since inflammation is believed to drive certain forms of cancer, Kumar's work suggests one possible reason for why worsening cancer progression has been correlated with other inflammation-inducers. "We've raised the next level question," says Kumar, "and now we're going back into the lab to ask if this pathway plays a role in inflammation-related cancer."

Possible discovery of earliest animal life pushes back fossil record

In findings that push back the clock on the scientific world's thinking about when animal life appeared on Earth, Princeton scientists may have discovered the oldest fossils of animal bodies, suggesting that primitive sponge-like creatures were living in ocean reefs about 650 million years ago. The shelly fossils, found beneath a 635 million-year-old glacial deposit in South Australia, represent the earliest evidence of animal body forms in the current fossil record by at least 70 million years.

Previously, the oldest known fossils of hard-bodied animals were from two reef-dwelling organisms that lived about 550 million years ago -- Namacalathus, discovered in 2000 by John Grotzinger's group at the Massachusetts Institute of Technology, and Cloudina, first found in 1972 by Gerard Germs of the University of Cape Town, South Africa. Additionally, there are controversial fossils of soft-bodied animals that date to the latter part of the Ediacaran period between 577 and 542 million years ago. These fossils were first observed in the 1940s by Australian geologist Reginald Sprigg, and the oldest evidence to date of undisputed Ediacaran animals -- organisms called Kimberella -- was found in sediment about 555 million years old in Australia and Russia.



Princeton geosciences professor Adam Maloof and graduate student Catherine Rose happened upon the new fossils while working on a project focused on the severe ice age that marked the end of the Cryogenian period 635 million years ago. Their findings, published in the Aug. 17 issue of the journal Nature Geosciences, provide the first direct evidence that animal life existed before -- and probably survived -- the severe "snowball Earth" event known as the Marinoan glaciation that left much of the globe covered in ice at the end of the Cryogenian.

Princeton-led team of researchers, in conjunction with experts at Situ Studio, used a serial grinding and imaging process to analyze hundreds of slices through a single fossil.

"We were accustomed to finding rocks with embedded mud chips, and at first this is what we thought we were seeing," Maloof said. "But then we noticed these repeated shapes that we were finding everywhere -- wishbones, rings, perforated slabs and anvils. By the second year, we realized we had stumbled upon some sort of organism, and we decided to analyze the fossils. No one was expecting that we would find animals that lived before the ice age, and since animals probably did not evolve twice, we are suddenly confronted with the question of how some relative of these reef-dwelling animals survived the 'snowball Earth."

Find viewed as significant

"These scientists have found that animals may have appeared on Earth 90 million years earlier than previously known," said H. Richard Lane, program director for the Directorate for Geosciences of the National Science Foundation's Division of Earth Sciences, which funded the research. "This is comparable to resetting modern times to begin during the late Cretaceous."

Analyzing the fossils turned out to be easier said than done, as the composition and location of the fossils made it such that they could not be removed from the surrounding rock using conventional techniques, nor could they be imaged using X-ray scanning techniques. This is because X-rays are only able to distinguish between materials with different densities, which is why they can be used to image bones that are inside the human body or buried within a rock. But the most ancient skeletal fossils are made not of bone, but of calcite -- the same material that makes up the rock matrix in which they are embedded. Therefore X-rays could not be used to "illuminate" the newly discovered fossils and the researchers had to develop and refine another method.

Maloof, Rose and their collaborators teamed up with professionals at Situ Studio, a Brooklyn-based design and digital fabrication studio, to create three-dimensional digital models of two individual fossils that were embedded in the surrounding rock. As part of the process, team members shaved off 50 microns of sample at a time -- about half the width of a human hair -- and photographed the polished rock surface each time. The team ground and imaged nearly 500 slices of the rock.

Using specialized software techniques developed specifically for this project, the researchers then "stacked" the outlines on top of one another to create a complete three-dimensional model of the creature. The technique is similar to the way in which CAT scan technology combines a series of two-dimensional X-rays to create a three-dimensional image of the inside of the body. The technique that was developed served to automate the process -- turning a prohibitively time-consuming task into an efficient and effective method for fossil reconstruction.

Princeton geoscientist Adam Maloof holds a rock from South Australia that may contain the oldest fossils of animal bodies ever discovered. The fossils, visible here as red shapes, suggest that that primitive sponge-like creatures were living in ocean reefs about 650 million years ago

"For Situ Studio, the most exciting aspect of this collaboration is that we were able to successfully employ knowledge developed within an architectural practice to help solve problems in an entirely different field --

applying design tools to spatial problems on a completely different scale," said Bradley Samuels, a founding partner of Situ Studio. "It became an exercise in marrying disparate bodies of knowledge to address pressing questions in the geosciences."

When they began the digital reconstruction process, the shape of some of the two-dimensional slices made the researchers suspect they might be dealing with the previously discovered Namacalathus, a goblet-shaped creature featuring a long body stalk topped with a hollow ball. But their model revealed irregularly shaped, centimeter-scale animals with a network of internal canals.

These critters looked nothing like Namacalathus.

After considering a variety of alternatives, the researchers decided that the fossil organisms most closely resembled sponges -- simple filter-feeding animals that extract food from water as it flows through specialized body channels. Previously, the oldest known undisputed fossilized sponges were about 520 million years old, dating to the Cambrian Period.

But evidence has suggested that sponges appeared on the scene much earlier in Earth history. For example, scientists have conducted detailed analyses of genetic material in a wide range of organisms to create "molecular clocks" that suggest how long ago a given species evolved. According to these clocks, sponges existed millions of years before the Cambrian. This has been supported by the relatively recent discovery of lipid biomarkers -- essentially, traces of recalcitrant fats that resist degradation over millions of years -- in sedimentary rocks from Oman of nearly the same age as those studied by the Maloof group in Australia.

"For many years the great Marinoan ice age has formed a hard floor to the fossil record of animals, even though most molecular clocks suggest a deeper history, at least for sponges," said evolutionary biologist Andrew Knoll of Harvard University, who was not part of the research team." Adam and his students are digging deeper and finding that there is much to catch our attention in pre-glacial carbonate rocks … . I'm convinced that the structures Adam's group have found are not simply shards of material, formed and deposited by purely physical processes. That said, it isn't easy to be sure what they are. Adam's group has carefully spelled out the biological alternatives and built a reasonable case for interpreting the structures as sponge-like animals. At the very least, this should drive paleontologists back to the field to seek similar or better evidence in other rocks of comparable age."

In future research, Maloof and his collaborators intend to refine the three-dimensional digital reconstruction technique to automate and increase the speed of the process. This could have a significant impact on paleontology, enabling the analysis of myriad early fossils that are currently inaccessible to the tools of modern science.

In addition to Maloof and Rose, Princeton researchers on the team included geosciences professor Frederik Simons, former postdoctoral fellow Claire Calmet, Nan Yao, the director of the Imaging and Analysis Center in the Princeton Institute for the Science and Technology of Materials (PRISM), and PRISM senior research specialist Gerald Poirier. The team also included Douglas Erwin of the Smithsonian Institution and Samuels, Robert Beach, Basar Girit, Wesley Rozen, Sigfus Briedfjord and Aleksey Lukyanov of Situ Studio. The work was funded by the National Science Foundation.

Evolution may have pushed humans toward greater risk for type 1 diabetes, Stanford study shows

STANFORD, Calif. — Gene variants associated with an increased risk for type-1 diabetes and rheumatoid arthritis may confer previously unknown benefits to their human carriers, say researchers at the Stanford University School of Medicine. As a result, the human race may have been evolving in the recent past to be more susceptible, rather than less, to some complex diseases, they conclude.

"At first we were completely shocked because, without insulin treatment, type-1 diabetes will kill you as a child," said Atul Butte, MD, PhD, assistant professor of pediatric cancer biology and a bioinformatics expert. "Everything we've been taught about evolution would indicate that we should be evolving away from developing it. But instead, we've been evolving toward it. Why would we have a genetic variant that predisposes us to a deadly condition?"

The researchers speculate that at least some of the risky changes may protect carriers against certain viruses and bacteria — a trade-off that may have made evolutionary sense in the not-too-distant past when infectious diseases were devastating and largely untreatable. It's not clear, however, whether the beneficial effects arise from the disease-associated mutations themselves, or from neighboring genes that tag along when DNA is divvied up into sperm and eggs.

Butte, who directs the Center for Pediatric Bioinformatics at Lucile Packard Children's Hospital, is the senior author of the research, which will be published Aug. 17 in Public Library of Science ONE. Graduate student Erik Corona is the first author of the study and conducted the analysis.

The idea that disease-causing genes can be beneficial is not new. The most clear-cut case involves a gene variant that, when present in two copies, causes sickle cell anemia, which can result in severe pain, organ

damage and death. Although it seems that natural selection would work to eliminate the disorder, the variant remains prevalent in some areas of Africa because people with just a single copy are less susceptible to malaria. Evolutionarily the trade-off is worth it: Far more people are protected from malaria than ever develop sickle cell anemia even in today's environment.

Unlike sickle cell anemia, which is caused by a mutation in just one gene, many complex diseases are associated with several variants — specific locations in the DNA where the nucleotide "letters" vary between individuals. These locations are known as SNPs, for single nucleotide polymorphisms. Some of these SNPs are associated with an increased disease risk, while others protect against developing the disease. When calculating an individual's overall genetic risk, it's necessary to consider the net effect of all of his or her variants.

Corona picked seven well-known conditions to study: type-1 and type-2 diabetes, rheumatoid arthritis, hypertension, Crohn's disease, coronary artery disease and bipolar disorder. Previous genome wide association studies have identified several hundred SNPs associated with each disorder. Corona found that of the top SNPs associated with type-1 diabetes, 80 have been recently increasing in prevalence, meaning that they underwent positive selection. Of these, a surprising 58 are associated with an increased risk of the disorder, while 22 appear protective. Similarly, SNPs associated with an increased risk for rheumatoid arthritis were found to be positively selected. In contrast to type-1 diabetes and rheumatoid arthritis, Corona found that we're evolving away from a tendency to develop Crohn's disease (that is, more protective SNPs than risky SNPs have been positively selected).

Results for the other three disorders — type-2 diabetes, coronary artery disease and bipolar disorder — showed that protective and risky SNPs were positively selected in about equal proportions. "Now we're starting to see little hints as to why this might be the case," said Butte. For example, a recent study in another lab showed that genetic variations in an antiviral response gene called IFIH1 that improve its ability to protect against enterovirus infection (and the resulting severe, potentially deadly, abdominal distress) also increase a carrier's risk for type-1 diabetes. And scientists who study global disease patterns have long noted that the prevalence of tuberculosis varies inversely with that of rheumatoid arthritis.

"It's possible that, in areas of the world where associated triggers for some of these complex conditions are lacking, carriers would experience only the protective effect against some types of infectious disease," said Butte, who pointed out that the cumulative effect of many SNPs in a person's genome may buffer the effect of any one variant, even if it did raise a person's risk for a particular condition.

Regardless of the reason, some evolutionary tenets still apply. Healthier people are, presumably, more likely to reproduce and pass those same genes — be they protective or risky — to their offspring. When conditions changed because of differences in diet, exposures or location as populations move around the globe, carriers of the risky SNPs began to develop the conditions we struggle with today.

Corona and Butte are now expanding their investigation to include even more SNPs and diseases. They are also looking at the genetic profile of various types of tumors to see if there's evidence for positive evolutionary pressure there as well.

"Even though we've been finding more and more genetic contributions to disease risk," said Butte, "that's not really an appealing answer. There have got to be some other reasons why we have these conditions."

In addition to Corona and Butte, graduate student Joel Dudley participated in the research. The work was supported by the Lucile Packard Foundation for Children's Health, the Hewlett Packard Foundation, the Armin and Linda Miller Fellowship Fund, the National Library of Medicine, the National Institute of General Medical Sciences, the National Science Foundation and the Howard Hughes Medical Institute.

Risks: A Warning on Asthma and Acetaminophen

By RONI CARYN RABIN

Young teenagers who use acetaminophen even once a month develop asthma symptoms more than twice as often as those who never take it, a large international study has found. And frequent users also had more eczema and eye and sinus irritation.

Other studies have linked acetaminophen (often sold as Tylenol and in other over-the-counter remedies for pain, colds, fever and allergies) with an increased risk of asthma. But the new study's authors cautioned that the findings did not mean children should stop using it.

"Acetaminophen remains the preferred drug to relieve pain and fever in children," said the study's lead author, Dr. Richard W. Beasley, a professor of medicine at the Medical Research Institute of New Zealand. He noted that aspirin and ibuprofen should not be used in children with asthma, since they can bring on an attack.

Although the study does not prove that acetaminophen actually causes asthma, the authors speculated that the drug might have systemic inflammatory effects and result in greater allergic immune response.

The report, from the International Study of Asthma and Allergies in Childhood, or Isaac, was based on data from more than 322,000 children age 13 and 14 from 50 countries.

Mystery of Beer Goggles Solved

By Larry O'Hanlon

THE GIST

**** Drinking alcohol hurts our ability to detect asymmetrical faces.***

**** Symmetry is an important aspect of what makes a face attractive.***

**** Men appear to be less prone to losing this ability than women when drinking.***

Everyone looks better after you've tipped back a pint or two, and now we may know why.

It turns out that alcohol dulls our ability to recognize cockeyed, asymmetrical faces, according to researchers who tested the idea on both sober and inebriated college students in England.

"We tend to prefer faces that are symmetrical," explained Lewis Halsey of Roehampton University in London. That's well established by previous research, he said.

To find out if alcohol interfered with the ability to distinguish faces where the left and right sides were uneven, he and his colleagues designed an experiment involving images of faces that were tinkered with to make them perfectly symmetrical or subtly asymmetrical. The results of the study were published by Halsey, Joerg Huber, Richard Bufton and A.C. Little in a recent issue of the journal Alcohol.

"Over an evening Joerg, Richard and I went out to the university campus bars with a laptop and asked students to participate," Halsey said.

This included students taking a quick breathalyzer test to confirm their alcohol consumption. The students were classified as either sober or intoxicated, then examined the images.

Twenty images of a pair of faces -- one symmetrical, the other asymmetrical -- and then 20 images of a single face were shown, one at a time, to 64 students. Participants were asked to state which face of each of the pairs was most attractive. They also had to determine whether each of the single faces displayed was symmetrical.

The sober students had a greater preference for symmetrical faces than did the intoxicated students. And it turned out that the sober students were better at detecting whether a face was symmetrical.

What's more, the data suggest that men were less prone to losing their symmetry-detecting ability when intoxicated than women, which was unexpected, Halsey said. The difference probably has something to do with the tendency for men to be more visually oriented and more stimulated by what they see, he said.

"Men tend to ogle more than women do," Halsey ventured.

The results add a new twist to ongoing research in this area, according to psychologist Benedict Jones of the University of Aberdeen.

"People in the past have compared attractiveness judgments of faces... to show that small amounts of alcohol see subjects give faces higher attractive ratings," said Jones.

Some researchers have suggested that this might be because people become better at detecting beauty or simply become a bit less picky.

Halsey's findings come as a surprise, said Jones, because the difference in ability between males and females was not seen in other studies where people looked at symmetry detection.

"Those studies were conducted in the lab though," said Jones. "It's possible that these new data show this sex effect because people were tested out in the community, and men and women respond in slightly different ways to that."

Jones also said this new study suggests something different: People actually become worse at detecting an important component of attractiveness.

"It would be interesting in the future to test whether this effect is specific to symmetry or can also be seen for other facial cues," Jones told Discovery News.

Sensory hijack: rewiring brains to see with sound

* 17 August 2010 **by Bijal Trivedi**

A new device that restores a form of sight to the blind is turning our understanding of the senses upside down

CLAIRE CHESKIN used to live in a murky world of grey, her damaged eyes only seeing large objects if they were right next to her. She could detect the outlines of people but not their expressions, and could just about make out the silhouettes of buildings, but no details. Looking into the distance? Forget it.

Nowadays things are looking distinctly brighter for Cheskin. Using a device called vOICe, which translates visual images into "soundscapes", she has trained her brain to "see through her ears". When travelling, the device helps her identify points of interest; at home she uses it to find things she has put down, like coffee cups. "I've sailed across the English Channel and across the North Sea, sometimes using the vOICe to spot landmarks," she says. "The lights on the land were faint but the vOICe could pick them up."

As if the signposting of objects wasn't impressive and useful enough, some long-term users of the device like Cheskin eventually report complete images somewhat akin to normal sight, thanks to a long-term rewiring of

their brains. Sometimes these changes are so profound that it alters their perceptions even when they aren't using the device. As such, the vOICe (the "OIC" standing for "Oh, I See") is now proving invaluable as a research tool, providing insights into the brain's mind-boggling capacity for adaptation.

The idea of hijacking another sense to replace lost vision has a long history. One of the first "sensory substitution" devices was developed in 1969 by neuroscientist Paul Bach-y-Rita. He rigged up a television camera to a dentist's chair, on which was a 20-by-20 array of stimulators that translated images into tactile signals by vibrating against the participant's back. Despite the crudeness of the set-up, it allowed blind participants to detect the presence of horizontal, vertical and diagonal lines, while skilled users could even associate the physical sensations with faces and common objects.

By the time he died in 2006, Bach-y-Rita had developed more sophisticated devices which translated the camera's images into electrical pulses delivered by a postage-stamp-sized array of electrodes sitting on the tongue. Users found, after some practice, that these pulses gave them a sense of depth and "openness", a feeling that there was "something out there" (New Scientist, 29 July 2005, p 40).

This vague feeling of space, which we experience as part of normal sight, suggests the brain may be handling the information as if it had originated from the eyes. Would it be possible to get even closer to normal vision- perhaps even producing vivid and detailed images- by feeding in information using something other than tactile stimulation? To find out, physicist and inventor Peter Meijer, based in Eindhoven, the Netherlands, turned to hearing. The ears do not detect as much information as the eyes, but their capacity is nevertheless much greater than the skin's.

Meijer thought up the vOICe in 1982, though it took until 1991 for him to design and build a desktop prototype that would translate video into audio. By 1998 he had developed a portable, if still bulky, version using a webcam, notebook PC and stereo headphones, which allowed users to experiment with the device in daily life. The device is now more discreet, consisting of "spy" sunglasses which conceal a tiny camera connected to a netbook PC, and a pair of headphones. Alternatively, some users download the software to their smartphone, and its built-in camera acts as their eyes.

Every second the camera scans a scene from left to right. Software then converts the images into soundscapes transmitted to the headphones at a rate of roughly one per second (see diagram). Visual information from objects to the wearer's left and right are fed into the left and right ear respectively. Bright objects are louder, and frequency denotes whether an object is high up or low down in the visual field.

At first the soundscapes are reminiscent of the whirring, bleeping and hooting sound effects that would accompany an alien melting the brain of a human in a 1960s science-fiction movie. But by feeling the objects first, to learn to associate the accompanying sounds with their shapes, and by discovering how the soundscape of an object varies as the user moves, the experience becomes particularly "vision-like".

Pat Fletcher of Buffalo, New York, lost her sight at the age of 21 and had just a pinpoint of perception in her left eye, through which she could sometimes see red or green, before she started using the vOICe system in 2000. In the early stages, the pictures in her mind's eye were like "line drawings" and "simple holographic images", but after a decade of practice, she now sees complete images with depth and texture. "It is like looking at an old black-and-white movie from the early 30s or 40s. I can see the tree from top to bottom, and the cracked sidewalk that runs alongside the tree," she says.

It's like looking at a black-and-white movie from the 40s. I can see the tree from top to bottom, and the cracked sidewalk

"What's exciting to me," says Michael Proulx, a cognitive psychologist at Queen Mary, University of London, who has been using the vOICe for his own research, "is that not only can you use this device in a very deliberate fashion where you can think, 'okay, this sound corresponds with this object', but it is also possible, through extensive use, to go beyond that and actually have some sort of direct, qualitative experience that is similar to the vision they used to experience."

The US National Science Foundation is now funding the first controlled study to look at the benefits of the vOICe system while trying to find the optimal training protocol. "Some of the participants in the current trial have learned more in months than [Fletcher] learned in years of using the vOICe," says Meijer. The study, which will involve around 10 participants, may even answer the long-standing question of whether congenitally blind adults can benefit in the same way as Cheskin and Fletcher.

Intended to last about a year, the trial is being run by Luis Goncalves and Enrico Di Bernardo of MetaModal in Pasadena, California, a company that tests sensory substitution devices. The first two participants are a 66-year-old who has been blind from birth but has slight light perception, and a 40-year-old who lost his sight due to diabetes. Twice a week they attend two-hour training sessions, including tasks such as finding a target in a large room and making their way around an obstacle course. "They are empowered by this," says Goncalves,

adding that the 66-year-old "can now go to a restaurant and seat himself without asking for assistance and is teaching his wife, who is also blind, how to use the vOICe".

Not everyone is quite so impressed. For example, J. Kevin O'Regan, a psychologist at Descartes University in Paris, France, points out that the system needs time to scan an image and so lacks the immediacy of vision. "I think it's possible with resources and time to make something much better than the vOICe," he says.

Seeing ear to ear?

Nevertheless, vOICe is still of great interest to O'Regan and other researchers, who want to know what these people are experiencing. Are they really seeing? And if so, how?

The traditional view is that the brain takes data from the different sensory organs- in the case of sight, the retina- and, for each sense, processes it in separate regions to create a picture of the outside world. But that cannot explain how someone can have a visual experience from purely auditory information.

As such, O'Regan says our definition of what it means to see needs to change. Our senses, he argues, are defined by the way the incoming information changes as we interact with the environment. If the information obeys the laws of perspective as you move forward and backward, we will experience it as "seeing"- no matter how the information is being delivered. If you have a device that preserves these laws, then you should be able to see through your ears or your skin, he says.

If O'Regan is on the right track, we will have to reconsider long-held ideas of how the brain is organised to deal with incoming information. Traditionally, the brain is considered to be highly modular, with the occipital, temporal and parietal cortices handling inputs from the eyes, ears and from the skin and deep tissues, respectively. According to O'Regan, however, these regions may actually deal with certain types of information- shape or texture, for example- irrespective of which sense it comes from.

There is some evidence to support this view. In 2002, neuroscientist Amir Amedi, now at the Hebrew University of Jerusalem, Israel, published research showing that a specific part of the occipital cortex was activated by touch as well as visual information. He named it the lateral occipital tactile-visual (LOtv) region. Amedi and colleagues hypothesised that the area lit up because the occipital cortex is oriented around particular tasks- in this case, 3D-object recognition- rather than a single sense (Cerebral Cortex, vol 12, p 1202).

How does this tally with the vOICe experience? Amedi recently collaborated with Alvaro Pascual-Leone, director of the Berenson-Allen Center for Noninvasive Brain Stimulation in Boston, Massachusetts, to find out whether the vOICe system activates the LOtv when users perceive objects through soundscapes. They asked 12 people, including Fletcher, to examine certain objects such as a seashell, a bottle and a rubber spider using touch and the vOICe system. They were then asked to recognise the same objects using only the soundscapes delivered by vOICe. For comparison, they were also asked to identify objects based on a characteristic sound, such as the jingling of a set of keys.

During the trials, fMRI brain scans showed that the LOtv region was active when expert users like Fletcher were decoding the vOICe soundscapes, but significantly less active when they just heard characteristic sounds. For those using the vOICe for the first time, the LOtv region remained inactive, again suggesting that this area is important for the recognition of 3D objects regardless of which sense produces the information (Nature Neuroscience, vol 10, p 687).

Further evidence that this region is vital for decoding soundscapes came two years later, in 2009, from a study using repetitive transcranial magnetic stimulation (rTMS) - short bursts of a magnetic field that temporarily shut down the LOtv of subjects, including Fletcher. "It felt like someone tapping on the back of my head," she says. As the rTMS progressed, her vision with the vOICe deteriorated, and the "world started getting darker, like someone slowly turning down the lights".

As a magnetic field disrupted her visual cortex, the subject's vision with the vOICe device deteriorated. Her world got darker, like someone was slowly turning out the lights

When Fletcher attempted to use the vOICe after undergoing rTMS, the various test no longer made sense. "It was total confusion in my brain... I couldn't see anything." The result was terrifying: "I wanted to cry because I thought they broke my sight - it was like a hood over my head." The rTMS had a similar impact on other vOICe users (Neuroreport, vol 20, p 132).

"It turns upside down the way we think about the brain," says Pascual-Leone. Most of us think of our eyes as being like cameras that capture whatever is in front of them and transmit it directly to the brain, he says. But perhaps the brain is just looking for certain kinds of information and will sift through the inputs to find the best match, regardless of which sense it comes from.

Reconfiguring the brain

The question remains of how the vOICe users' brains reconfigured the LOtv region to deal with the new source of information. Amedi's preliminary fMRI scans show that in the early stages of training with vOICe,

the auditory cortex works hard to decode the soundscape, but after about 10 to 15 hours of training the information finds its way to the primary visual cortex, and then to the LOtv region, which becomes active. Around this time the individuals also become more adept at recognising objects with vOICe. "The brain is doing a quick transition and using connections that are already there," says Amedi. With further practice, the brain probably builds new connections too, he adds.

Eventually, such neural changes may mean that everyday sounds spontaneously trigger visual sensations, as Cheskin has experienced for herself. "The shape depends on the noise," she says. "There was kind of a spiky shape this morning when my pet cockatiel was shrieking, and [the warning beeps of] a reversing lorry produce little rectangles." Only loud noises trigger the sensations and, intriguingly, she perceives the shape before the sound that sparked it.

This phenomenon can be considered a type of synaesthesia, in which one sensation automatically triggers another, unrelated feeling. Some individuals, for example, associate numbers or letters with a particular colour: "R" may be seen as red while "P" is yellow. For others, certain sounds trigger the perception of shapes and colours, much as Cheskin has experienced.

Most synaesthetes first report such experiences in early childhood, and it is very rare for an adult to spontaneously develop synaesthesia, says Jamie Ward, a psychologist at the University of Sussex in Brighton, UK. He recently published a chronological log of Cheskin's and Fletcher's experiences, including the synaesthetic ones (Consciousness and Cognition, vol 19, p 492).

This capacity to rewire our sensory processing may even boost the learning abilities of sighted users, suggests Pascual-Leone. It might be possible to extract supplementary information by feeding a lot of different sensory inputs to the same brain areas. Art connoisseurs could learn to associate the style of a master's hand with a characteristic sound, and this may help them distinguish genuine work from a fake. Alternatively, it could compensate for low light levels by delivering visual information through our ears. "That's science fiction. But it's interesting science fiction," says Pascual-Leone.

For neuroscientists like Pascual-Leone and Amedi, the research is proof that the ability to learn as we grow old does not disappear. Pascual-Leone says the notion of a critical period during which the brain must be exposed to particular knowledge or never learn it appears "not universally true". "It gives us a reason for hope," he says, "and implies that we should be able to help people adjust to sensory losses with this type of substitution. The capacity to recover function could be much greater than realised."

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Acupuncture Not Superior to Sham Acupuncture in Knee Osteoarthritis

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Acupuncturists' Communication Style Has Greater "Placebo" Effect on Patients

Researchers from MD Anderson Cancer Center determined patients with osteoarthritis (OA) of the knee who are treated with traditional Chinese acupuncture (TCA) do not experience any more benefit than those receiving sham acupuncture (placebo). The team did find that the communication style of the acupuncturist could have a significant effect on pain reduction and satisfaction in patients. Full findings are now online and will publish in the September print issue of Arthritis Care & Research, a journal of the American College of Rheumatology.

The National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) cites OA as the most common type of arthritis—affecting 27 million Americans age 25 and older. With the aging population OA is expected to increase and NIAMS estimates that by 2030 roughly 72 million people in the U.S. will be older than 65 years and at high risk for OA. Individuals with OA experience pain, stiffness and swelling in one or more joints and some may notice a crunching sound as bones rub against one another. Many patients seek alternative treatments such as acupuncture to reduce OA symptoms.

According to the National Center for Complementary and Alternative Medicine NCCAM), acupuncture is a key part of traditional Chinese medicine where health is achieved by maintaining a “balanced state” in the body and disease is caused by an imbalance or blockage in the flow of Qi (vital energy) along pathways known as meridians. Acupuncture is used to stimulate specific points on the body in order to remove these blockages to restore and maintain health. A 2007 NCCAM survey (included with the National Health Interview Survey) estimated 3.1 million U.S. adults had used acupuncture in the prior year.

In the current study, Maria Suarez-Almazor, M.D., Ph.D., and colleagues compared the efficacy of TCA with sham acupuncture in OA of the knee. Additionally, researchers measured the effects of provider-patent interactions in the response to acupuncture. A total of 455 knee OA patients received either TCA or sham acupuncture treatments and 72 healthy controls were included. Acupuncturists were trained to interact in 1 of 2 communication styles—high (“I’ve had a lot of success with treating knee pain”) or neutral (“It may or may not work for you”) expectations. Patients were then randomized and nested within 1 of 3 style groups—waiting list, high, or neutral.

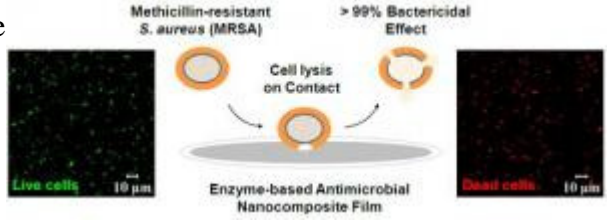
Researchers found no statistically significant differences between patients in the TCA and those in the sham acupuncture group. The TCA and sham groups had substantial reductions in the joint-specific multidimensional assessment of pain (J-MAP) at -1.1 and -1.0, respectively while the control group saw a reduction of -0.1. J-MAP measures the intensity, frequency, and quality of pain with response ranges from 1 to 7 where higher values indicate more pain.

"We found a small, but significant effect on pain and satisfaction with treatment, demonstrating a placebo effect related to the clinician's communications style," said Dr. Suarez-Almazor. The team found significant differences in J-MAP pain reduction (0.25) and satisfaction (0.22) for those patients in the high expectations group compared with the neutral group. "The improvement in pain and satisfaction suggests that the benefits of acupuncture may be partially mediated through placebo effects related to the behavior of the acupuncturist," concluded Dr. Suarez-Almazor.

Full bibliographic information"A Randomized Controlled Trial of Acupuncture for Osteoarthritis of the Knee: Effects of Patient-Provider Communication." Maria E. Suarez-Almazor, Carol Looney, Yanfang Liu, Vanessa Cox, Kenneth Pietz, Donald M. Marcus, and Richard l. Street, Jr. Arthritis Care and Research; Published Online: April 21, 2010 (DOI: 10.1002/acr.20225); Print Issue Date: September 2010.
http://onlinelibrary.wiley.com/doi/10.1002/acr.20225/abstract

MRSA-Killing Paint Created

ScienceDaily (Aug. 17, 2010) — Building on an enzyme found in nature researchers at Rensselaer Polytechnic Institute have created a nanoscale coating for surgical equipment, hospital walls, and other surfaces which safely eradicates methicillin resistant Staphylococcus aureus (MRSA), the bacteria responsible for antibiotic resistant infections.



Building on an enzyme found in nature, researchers at Rensselaer Polytechnic Institute have created a nanoscale coating for surgical equipment, hospital walls, and other surfaces which safely eradicates methicillin resistant Staphylococcus aureus (MRSA), the bacteria responsible for antibiotic resistant infections. (Credit: Rensselaer/Ravindra C.Pangule)

"We're building on nature," said Jonathan S. Dordick, the Howard P. Isermann Professor of Chemical and Biological Engineering, and director of Rensselaer's Center for Biotechnology & Interdisciplinary Studies. "Here we have a system where the surface contains an enzyme that is safe to handle, doesn't appear to lead to resistance, doesn't leach into the environment, and doesn't clog up with cell debris. The MRSA bacteria come in contact with the surface, and they're killed."

In tests, 100 percent of MRSA in solution were killed within 20 minutes of contact with a surface painted with latex paint laced with the coating.

The new coating marries carbon nanotubes with lysostaphin, a naturally occurring enzyme used by non-pathogenic strains of Staph bacteria to defend against Staphylococcus aureus, including MRSA. The resulting nanotube-enzyme "conjugate" can be mixed with any number of surface finishes -- in tests, it was mixed with ordinary latex house paint.

Unlike other antimicrobial coatings, it is toxic only to MRSA, does not rely on antibiotics, and does not leach chemicals into the environment or become clogged over time. It can be washed repeatedly without losing effectiveness and has a dry storage shelf life of up to six months.

The research, led by Dordick and Ravi Kane, a professor in the Department of Chemical and Biological Engineering at Rensselaer, along with collaboration from Dennis W. Metzger at Albany Medical College, and Ravi Pangule, a chemical engineering graduate student on the project, has been published in the July edition of the journal ACS Nano, published by the American Chemical Society.

Dordick said the nanotube-enzyme coating builds on several years of previous work embedding enzymes into polymers. In previous studies, Dordick and Kane discovered that enzymes attached to carbon nanotubes were more stable and more densely packed when embedded into polymers than enzymes alone.

"If we put an enzyme directly in a coating (such as paint) it will slowly pop out," Kane said. "We wanted to create a stabilizing environment, and the nanotubes allow us to do that."

Having established the basics of embedding enzymes into polymers, they turned their attention to practical applications. "We asked ourselves -- were there examples in nature where enzymes can be exploited that have activity against bacteria?" Dordick said. The answer was yes and the team quickly focused on lysostaphin, an enzyme secreted by non-pathogenic Staph strains, harmless to humans and other organisms, capable of killing Staphylococcus aureus, including MRSA, and commercially available.

"It's very effective. If you put a tiny amount of lysostaphin in a solution with Staphylococcus aureus, you'll see the bacteria die almost immediately," Kane said.

Lysostaphin works by first attaching itself to the bacterial cell wall and then slicing open the cell wall (the enzyme's name derives from the Greek "lysis" meaning "to loosen or release"). "Lysostaphin is exceptionally selective," Dordick said. "It doesn't work against other bacteria and it is not toxic to human cells."

The enzyme is attached to the carbon nanotube with a short flexible polymer link, which improves its ability to reach the MRSA bacteria, said Kane.

"The more the lysostaphin is able to move around, the more it is able to function." Dordick said.

They successfully tested the resulting nanotube-enzyme conjugate at Albany Medical College, where Metzger maintains strains of MRSA.

"At the end of the day we have a very selective agent that can be used in a wide range of environments -- paints, coating, medical instruments, door knobs, surgical masks -- and it's active and it's stable," Kane said. "It's ready to use when you're ready to use it."

The nanotube-enzyme approach is likely to prove superior to previous attempts at antimicrobial agents, which fall into two categories: coatings that release biocides, or coatings that "spear" bacteria.

Coatings that release biocides -- which work in a manner similar to marine anti-fouling paint -- pose harmful side-effects and lose effectiveness over time as their active ingredient leaches into the environment.

Coatings that spear bacteria -- using amphipatic polycations and antimicrobial peptides -- tend to clog, also losing effectiveness.

The nanotube-lysostaphin coating does neither, said Dordick. "We spent quite a bit of time demonstrating that the enzyme did not come out of the paint during the antibacterial experiments. Indeed, it was surprising that the enzyme worked as well as it did while remaining embedded near the surface of the paint," Dordick said.

The enzyme's slicing or "lytic" action also means that bacterial cell contents disperse, or can be removed by rinsing or washing the surface.

Kane also said MRSA are unlikely to develop resistance to a naturally occurring enzyme.

"Lysostaphin has evolved over hundreds of millions of years to be very difficult for Staphylococcus aureus to resist," Kane said. "It's an interesting mechanism that these enzymes use that we take advantage of."

Steep Drop Seen in Circumcisions in U.S.

By RONI CARYN RABIN

Despite a worldwide campaign for circumcision to slow the spread of AIDS, the rate of circumcision among American baby boys appears to be declining.

A little-noted presentation by a federal health researcher last month at the International AIDS Conference in Vienna suggested that the rate had fallen precipitously — to fewer than half of all boys born in conventional hospitals from 2006 to 2009, from about two-thirds through the 1980s and ’90s.

Last week, officials at the Centers for Disease Control and Prevention cautioned that the figures in the presentation were not definitive. But they are already stirring a sharp debate on the Internet.

The numbers were presented to the AIDS conference by a C.D.C. researcher, Charbel E. El Bcheraoui. The presentation was not covered by any mainstream news outlets, but a report by the news service Elsevier Global Medical News, along with a photograph of a slide from the presentation, quickly made the rounds of the blogosphere.

The slide portrays a precipitous drop in circumcision, to just 32.5 percent in 2009 from 56 percent in 2006. The numbers are based on calculations by SDI Health, a company in Plymouth Meeting, Pa., that analyzes health care data; they do not include procedures outside hospitals (like most Jewish ritual circumcisions) or not reimbursed by insurance.

Andrew Kress, the chief executive of SDI Health, cautioned that the data had not yet been published and was still being analyzed, but he confirmed that the trend had been toward fewer circumcisions each year.

He added that measuring the circumcision rate was not the purpose of the study, which was designed to measure the rate of complications from the procedure.

Opponents of circumcision hailed the trend as a victory of common sense over what they call culturally accepted genital mutilation. For federal health officials, who have been debating whether to recommend circumcision to stem the spread of AIDS, the news suggests an uphill battle that could be more difficult than expected.

C.D.C. officials last week declined requests for interviews about the study, but a spokeswoman, Elizabeth-Ann Chandler, answered questions by e-mail. She reiterated that the agency used the SDI figures to calculate the rate of complications, not of circumcisions.

“C.D.C. was not involved in the collection of the data that was cited, nor has C.D.C. undertaken any review of this particular data for the purpose of calculating rates,” she wrote. “As such, we cannot comment on the accuracy of this particular estimate of infant male circumcision.”

But she did not dispute the waning popularity of circumcision. “What we can tell you is that male infant circumcision rates have declined somewhat in this decade,” she wrote.

The study found a very low rate of complications associated with newborn circumcisions; most were considered mild and no babies died.

Organizations opposed to circumcision said parents may be responding to the message their groups have been spreading through their Web sites and a video distributed to childbirth educators.

“Word has gotten out that it’s not necessary, it’s harmful and it’s painful,” said Georganne Chapin, executive director of Intact America, a nonprofit organization based in Tarrytown, N.Y.

Greater awareness about female circumcision may have influenced parents as well, she said, asking, “How can you think it’s O.K. to cut little boys, when you are horrified by the idea of cutting little girls?”

Both the C.D.C. and the American Academy of Pediatrics have been reviewing the scientific evidence on circumcision with an eye to issuing new policy recommendations, but so far neither body has done so, although the federal agency was to have issued its new recommendations by the end of last year.

Officials from the pediatrics academy said its new policy would be issued by early 2011; a task force that studied the topic has completed its report, which is being reviewed by several other committees, said Dr. Michael Brady, chairman of pediatrics at Nationwide Children’s Hospital in Columbus, Ohio, who served on the task force. The academy is likely to adopt a more encouraging stance than its current neutral position and to state that the procedure has health benefits beyond H.I.V. prevention, Dr. Brady said.

The World Health Organization in 2007 endorsed male circumcision as “an important intervention to reduce the risk of heterosexually acquired H.I.V.”

“No one is going to tell a parent, ‘You have to circumcise your child.’ That would be foolish,” Dr. Brady said. “The key thing physicians should be doing is providing information on both risks and benefits and allow the parent to make the best decision.”

Several state Medicaid programs stopped covering circumcision after the academy issued its current policy in 1999, and Dr. Brady said that may be one reason fewer parents opt for the procedure. Other possible reasons include a growing Hispanic population that has traditionally been disinclined to circumcision, as well the anti-circumcision movement and a broader trend among parents to spurn medical interventions like vaccination.

Some 80 percent of American men are circumcised, one of the highest rates in the developed world. Yet even advocates of circumcision acknowledge that an aggressive circumcision drive in the United States would be unlikely to have a drastic impact on H.I.V. rates here, since the procedure does not seem to protect those at greatest risk, men who have sex with men.

And while studies in Africa found that circumcision reduced the risk of a man’s becoming infected by an H.I.V.-positive female partner, it is not clear that a circumcised man with H.I.V. would be less likely to infect a woman.

Vaccination Is Steady, but Pertussis Is Surging

By TARA PARKER-POPE

For four weeks, my 11-year-old daughter has been coughing. It is not your run-of-the-mill summer cold, but a violent, debilitating cough that takes over her body, usually at night.

During these fits, her face turns red, and tears start streaming from her eyes. She coughs so hard she eventually starts to gasp for air, making a horrifying sucking sound that at one point had me reaching for the phone to call 911. But eventually she catches her breath. Several times she has coughed so hard she begins to throw up.

It took a few visits to the pediatrician before she finally got a diagnosis: pertussis, the bacterial disease better known as whooping cough.

That may sound surprising, since like most other children she was vaccinated against the disease on schedule, as an infant and again in preschool. But in recent years, pertussis has made an alarming comeback — even among adolescents and adults who were vaccinated as children.

Highly contagious, spread by coughs and sneezes, pertussis is now epidemic in California, with 2,774 confirmed cases in 2010 — a sevenfold increase from last year, putting the state on track for the worst outbreak in 50 years. Seven infants have died.

This month the Pennsylvania Department of Health issued an alert to physicians, and a top health official noted an unusually high rate of pertussis among 8-to-12-year-olds in the Philadelphia suburbs — including, incidentally, the county where I live. Outbreaks have also been reported in upstate New York, South Carolina and Michigan.

No one knows exactly why this is happening. In the 1920s and ’30s, pertussis was a feared childhood killer, with an annual toll as high as 250,000 cases and 9,000 deaths, according to the Centers for Disease Control and Prevention. In the 1940s, health authorities introduced a combined vaccine against diphtheria, pertussis and

tetanus (often called D.P.T. or DTaP), and by 1976 pertussis was virtually eliminated, with just 1,010 reported cases. But since the 1980s it has been rising, albeit in cycles, despite the introduction of new vaccines with far fewer side effects and a C.D.C. recommendation for adolescents and adults to get a booster.

In 2008 there were 13,000 cases, and health authorities say the actual figure may be far higher — 800,000 to 3.3 million a year — because reported cases reflect only those confirmed by testing, and many adult and adolescent cases go undiagnosed.

There are several explanations for the rise in pertussis, but the most likely is waning immunity after vaccination. “Immunity wears off, especially for adults who are decades past their most recent vaccination,” said Dr. Tom Clark, an epidemiologist with the C.D.C. Moreover, adults and adolescents often wait weeks before seeking treatment for a chronic cough — and even then, doctors may not recognize it as pertussis.

“You only begin to think about pertussis when it’s been going on for weeks and weeks,” Dr. Clark said, “and then treatment is much less likely to make a difference, and you’ve spread it to other people.”

Another factor may be the declining use of antibiotics to treat simple coughs and colds. While doctors legitimately worry that indiscriminate use of antibiotics can lead to the development of drug-resistant bacteria, it may be that in the past the drugs inadvertently cured many cases of undiagnosed pertussis.

The rise in pertussis doesn’t seem to be related to parents’ refusing to have their children vaccinated for fear of potential side effects. In California, pertussis rates are about the same in counties with high childhood vaccination rates and low ones. And the C.D.C. reports that pertussis immunization rates have been stable or increasing since 1992.

Efforts are under way to raise awareness of pertussis and encourage booster vaccinations of older children, teens and adults. The March of Dimes and the vaccine maker Sanofi-Aventis are sponsoring public-service announcements, and Web sites like whoopingcough.net offer audio and video of adults and children with pertussis. Some health departments and hospitals, including those in California and Pennsylvania, are offering free vaccines to mothers of infants.

Dr. Stephen Ostroff, Pennsylvania’s acting physician general, said his office issued a health alert to doctors this month after seeing higher than usual pockets of pertussis in several counties.

“Once the kids come back to school,” he said, “all it takes is for one kid to bring it into the school and you have this endless chain of transmission that is hard to stop.” The bacteria may incubate as long as three weeks after contact with someone who has pertussis.

For the first one to two weeks of illness, the symptoms are mild. But during the second phase, which can last one to six weeks, there can be severe fits of coughing, and some but not all patients will develop the characteristic whooping or gasping.

Testing to confirm pertussis can be chancy. A culture of nasal secretions may be ordered, but results can take up to two weeks. A rapid PCR test, which involves a cheek swab to look for the germ’s genetic material, can produce results in a few days, but not every lab performs the test. Both tests are typically reliable only in the earliest days of illness, before antibiotics are given. And a lack of knowledge about which test to order, and technicians’ inexperience in taking swabs, can result in a false negative diagnosis.

“These are relatively new lab tests, and we need to do a better job of educating physicians about what diagnostic tests are available,” said Dr. Neil Fishman, an infectious disease specialist at the University of Pennsylvania.

Alarmingly, pertussis is sometimes referred to as “the 100-day cough.” Often most of the damage is done before it is even diagnosed, because the bacteria release toxins that inflame the lining of the lungs. Recovery can be long and difficult, even after antibiotic treatment. (Doctors say my daughter may be coughing for weeks, although she’s no longer contagious and can start school next month.)

“It takes a long time for that healing process to occur,” says Dr. Ostroff. “Think of it like a tornado going through your neighborhood. The tornado may go through relatively quickly, but it takes a long time to clean up the damage. That’s true of this infection as well.”

Novel Diabetes Hope Comes from Chinese Herbs

ScienceDaily (Aug. 16, 2010) — Emodin, a natural product that can be extracted from various Chinese herbs including Rheum palmatum and Polygonum cuspidatum, shows promise as an agent that could reduce the impact of type 2 diabetes. Findings published in this month's edition of the British Journal of Pharmacology show that giving emodin to mice with diet-induced obesity lowered blood glucose and serum insulin, improved insulin resistance and lead to more healthy levels of lipid in the blood. It also decreased body weight and reduced central fat mass.

"If repeated in humans, all of these changes would be beneficial for people affected by type 2 diabetes or other metabolic diseases associated with insulin resistance," says lead author Dr Ying Leng, who works in the Shanghai Institute of Materia Medica, Chinese Academy of Science, Shanghai, China.

Research is increasingly showing that an enzyme known as 11β-HSD1 plays a role in the body's response to sugar contained in a person's diet. When someone eats sugar-containing food a lot of glucose floods into the blood stream. In response, the body releases insulin and this hormone triggers various actions that help to clear excess glucose from the blood. The body, however, also has another set of hormones known as glucocorticoids, which have the opposite effect to insulin. And this is where 11β-HSD1 fits in, because this enzyme increases glucocorticoids' ability to act.

The research revealed for the first time that emodin is a potent selective inhibitor of 11β-HSD1, and as a result it effectively limits the effect of the glucocorticoids, and ameliorates diabetes and insulin resistance.

"Our work showed that this natural extract from Chinese herbs could point the way to a new way of helping people with type 2 diabetes as well as other metabolic disorders. To develop it further, researchers would need to develop chemicals that have similar effects as emodin, and see which if any of these could be used as a therapeutic drug," says Dr Leng.

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Wiley - Blackwell, via AlphaGalileo.

Meningitis research breakthrough could save children's lives

Researchers at Queen's University Belfast and the Belfast Health and Social Care Trust have developed a groundbreaking test for meningitis which could help save lives.

A rapid diagnostic test for meningococcal bacteria that can produce results within an hour has been developed by scientists from Queen's Centre for Infection and Immunity and the Trust. The speed of this new test is a vital factor in the treatment of young children with meningococcal meningitis and septicaemia who become very ill over a short period. This research has been supported by the Meningitis Research Foundation (MRF).

Professor Mike Shields, of Queen's University and the Belfast Trust, explained: "The first symptoms of meningococcal infections are the same as a simple viral infection, making it difficult to diagnose in the early stages. Parents often use the 'tumbler test' on their children's bodies, but the non-blanching rash that is associated with a positive outcome of this test is a late sign and is not always present in children who have meningitis.

"Currently doctors will admit and treat with antibiotics any child that they suspect of having meningococcal disease while they await the traditional test results that take between 24 and 48 hours. Some children are not diagnosed in the early stages while others are admitted and treated 'just in case' when they don't actually have the disease. "With the development of a small piece of equipment, which resembles a portable home printer, a sample of blood or a secretion such as saliva, can be tested quickly by the machine. This produces a colour reading that determines if the patient has meningitis or not."

Alongside saving lives, early detection can potentially improve outcomes for meningitis patients who are often left with life-altering conditions such as deafness and cerebral palsy. The machine is now being trialled in the A&E Department of the Royal Victoria Hospital for Sick Children in Belfast.

Professor Shields explained how the breakthrough is a great example of research benefitting patients.

"There is no other rapid test that can confirm the diagnosis in such a short time. The current tests are expensive and take up to two days to obtain. Speedy identification of the cause of infection can enable doctors to make life-saving decisions about the treatment of patients. If we have the results within an hour we will be able to start the appropriate course of treatment right away."

The new test is very different to standard culture based detection methods that have been used up until now.

Professor Shields: "In recent years molecular diagnostic tests, that use the DNA finger print from 'bugs' for diagnosis, have been developed, but they still require the specimen sample to be transported to the laboratory and takes a considerable time to get the result back to the doctor. This means that doctors have to make clinical decisions before results are available.

"The new test called 'loop mediated isothermal amplification' also utilises a molecular method to detect genes that are common to all strains on the meningococcus. The real advantage of the new LAMP test is that it has the potential to be a simple bedside test that is rapid, cheap, easy to use and doesn't require laboratory trained staff."

Currently there are 1,200 to 1,500 laboratory confirmed cases of meningococcal disease in the UK each year and it is thought that actual numbers could be higher.

The medical team behind this breakthrough was recognised for its work in June of this year when they won an Elevations Diagnostics idea of the year award, organised by HSC innovators, a panel of experts from industry, healthcare and business support organisations.

Postnatal Depression Can Be Prevented, Study Shows

By LiveScience Staff

Nurses trained to assess and psychologically support new mothers can prevent the onset of postnatal depression, according to a new study in England.

Postnatal depression, also called postpartum depression, is a serious condition that affects between 8 percent and 20 percent of women after pregnancy, according to the National Institutes of Health.

The study is the first large-scale randomized trial to clearly show a significant reduction in future cases of depression, according to the researchers. The analysis was based on women who were not depressed when they joined the study, and who were randomly selected from a larger sample.

"Up until now, it was thought that depression could only be treated when it is picked up by a general practitioner or health visitor," study researcher Terry Brugha, of the department of health sciences at the University of Leicester in England, said in a statement. In the National Health System in the United Kingdom, so-called health visitors are registered nurses who may visit homes and who have specialized training in child health, health promotion and health education.

"But this study shows that women are less likely to become depressed in the year after childbirth if they are attended by an NHS health visitor who has undergone additional training in specific mental health assessment and in psychological approaches based on either cognitive behavioral or listening techniques," Brugha said.

Women who had a health visitor with additional mental health training were 30-percent less likely to have developed depression six months after giving birth compared with women receiving usual care, according to the study, which is published in the current issue of the journal Psychological Medicine.

The results also suggest that these improvements continued throughout the 18-month follow-up. In discussing the findings, the investigators considered that the quality of the ongoing relationship between the health visitor and mother.

Brugha determined that, in instances where the relationship between the nurse and the mother continued until the child started to attend school, the nurse likely provided the mother with a reliable confidant to turn to if necessary.

In addition, these mothers may have benefited from knowing they didn't have to discuss emotional concerns with relative strangers, such as a doctor or psychologist, and that access to help would be easy and non-stigmatizing, according to the findings.

The study involved analyzing data previously collected as part of a clinical trial designed to test the effectiveness of health visitors in identifying and managing postnatal depression following childbirth.

Hayabusa 2 will seek the origins of life in space

* 18:21 18 August 2010 **by Wendy Zukerman**

A new-and-improved successor to the troubled Japanese spacecraft Hayabusa – which finally returned a capsule to Earth earlier this year – could launch as soon as 2014. Hayabusa 2 would then be expected to return in 2020, bearing clues to the origin of life on Earth.

Last week, the Japan Aerospace Exploration Agency (JAXA) got the go-ahead from the government to begin development of Hayabusa 2, which will cost an estimated 164 billion yen ($2 billion).

Like its predecessor, it will visit an asteroid to collect dust samples. But whereas Hayabusa visited the 500-metre-wide asteroid Itokawa to collect silicon- and iron-rich dust, Hayabusa 2 will visit a kilometre-sized space rock called 1999 JU3, in search of organic molecules that might have seeded life on Earth.

It will also be designed to dodge the problems that Hayabusa encountered during its nail-biting and troubled mission. Although Hayabusa succeeded in delivering its capsule to Earth earlier this year, it's not yet clear if it managed to collect asteroid dust as planned.

Hit and run

One new feature on Hayabusa 2 will be a 30-centimetre-wide bomb known as an impactor, says Makoto Yoshikawa, part of the Hayabusa 2 team at JAXA. When Hayabusa 2 is 500 metres from the asteroid, it will release the impactor and then retreat behind the asteroid "to hide", says Yoshikawa. "Then the impactor explodes."

The resulting 1-metre crater will enable samples to be taken from below the asteroid's surface, where its material is less affected by solar radiation. Hayabusa aimed to take samples from Itokawa's surface, but the subsurface material that Hayabusa 2 will sample is more likely to hold clues to the chemistry of the asteroid's past.

To scoop up dust from this crater, Hayabusa 2 will deploy two different methods. Like its predecessor, it will have a small pellet to fire into the asteroid, kicking up dust for collection by a cone-shaped device. Hayabusa's pellet failed to fire, however, so next time there will be a back-up.

The new spacecraft will also be designed to push a sticky, silicon-based material into the asteroid crater to gather extra dust. "If we have two kinds of sampling methods, we are sure to get more samples," reasons Yoshikawa.

To help avoid other problems that dogged Hayabusa, the new asteroid probe will have backup orientation control systems, a better antenna and a redesigned engine.

Life from space

The dust gathered by this souped-up craft could tell us something about life's origins. One theory as to how amino acids first arrived on Earth is that they hitch-hiked on asteroids or comets that bombarded our infant planet. But to prove this, researchers must first find amino acids on space rocks.

Last year NASA confirmed that its Stardust mission had captured amino acids from the tail of the icy comet Wild 2. But asteroid 1999 JU3, which thermal imaging indicates is rich in carbon compounds, is much closer to Earth and may therefore provide new insights into life's origins.

Gentler touch

Jeremy Bailey, an astrophysicist at the University of New South Wales in Sydney, Australia, adds that landing on an asteroid and then collecting samples, rather than using Stardust's fly-by catching method, might be a gentler and therefore more effective way to gather organic compounds.

He says that some organic material may have burned up when it smashed into Stardust's collection gel at high speed.

Eventually, humans may get a chance to take such samples themselves. In April US president Barack Obama promised to send astronauts to an asteroid by 2025.

For now, the contents of the capsule that Hayabusa delivered to Earth are still being analysed.

Smokers Trying to Give Up: Don't Stop Thinking About Cigarettes

ScienceDaily (Aug. 18, 2010) — Blocking thoughts of cigarettes helps reduce smokers' intake at first, but means they smoke more than usual when they stop suppressing, according to new research.

The study was carried out by researchers at St George's, University of London and the University of Hertfordshire.

Co-author Dr James Erskine, a psychologist at St George's, says the study shows that many smokers attempting to give up -- as well as people trying to quit other vices -- may be thwarted by the very technique they use to stop.

Dr Erskine said: "These findings have obvious implications for individuals seeking to give up certain behaviours, for example, smoking, overeating, drinking, sex and other excessive behaviours.

"If trying to avoid thoughts of something in an attempt to give it up actually unwittingly triggers a subsequent increase, it's a poor method of achieving self control. This work may stop people using quitting techniques that are ultimately harmful."

Dr Erskine and his team set out to test whether smokers experienced behavioural rebound -- the phenomenon where trying not to think about something leads to an increase in the behaviour. Their previous research into eating behaviour and thought suppression showed that people trying not to think about chocolate subsequently ate much more than people who were deliberately thinking about it. However, previous studies only examined behavioural rebound over a period of five minutes, rather than days and weeks.

Eighty five smokers, who smoked at least ten cigarettes a day, took part in the latest study, which has been published in the journal Psychological Science. They were split into three groups and asked to monitor their cigarette intake over three weeks. All three groups were asked to behave as usual in the first and third weeks. But in the second week one group of 30 people was told to suppress their thoughts of smoking, and one group of 29 people was told to actively express thoughts about smoking. A control group of 26 was told not to change anything.

The first week's results showed that each group smoked a different average number of cigarettes, so the researchers applied a formula to the following weeks' results to ensure they were comparing like for like.

The results showed that neither the expression group nor the control group differed significantly in the number of cigarettes smoked from week to week. However, in the second week the suppression group smoked, on average, nearly five less cigarettes each than the expression group and almost four less than the control group. And in the third week -- when they stopped suppressing their thoughts -- the suppression group smoked nearly three more than the expression group and the control group. From the raw results, the suppressions group's increase from week two to three was six cigarettes per person, roughly three more each than smoked in the first week.

Dr Erskine said: "This shows a clear behavioural rebound. The fact that the suppression group smoked less in the second week shows that this method may be effective in reducing unwanted behaviour in the short term.

But this actually isn't helpful, as smokers might then think that thought suppression is a useful strategy in quitting smoking.

"In this case, we asked the suppression group to stop suppressing in week three, but the rebound effect should be the same whether it is deliberate, or whether other real life factors cause someone to stop suppressing thoughts of smoking. In real life, it can be hard to continue suppressing your thoughts.

"Although the differences in the number of cigarettes smoked from week to week may seem small, we know that habitual smokers are remarkably consistent in how many they smoke. So, even a small difference can be considered significant.

"Knowing what techniques not to use should lead to better understanding of what methods of quitting do work."

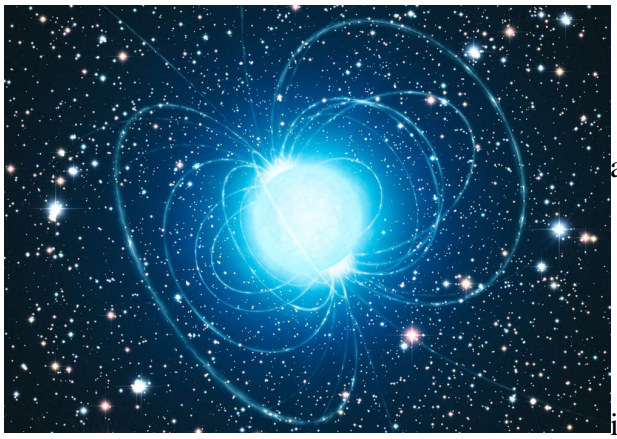
Massive Mega-Star Challenges Black Hole Theories

By Clara Moskowitz, SPACE.com Senior Writer

Astronomers have discovered a massive star that once dwarfed our sun and is now challenging theories of how stars evolve, die and form black holes.

The star is a peculiar cosmic object known as a magnetar. Magnetars are extremely dense, super-magnetic stars that can form from supernova explosions.

The newly discovered magnetar is perplexing, because astronomers have calculated that its progenitor likely weighed at least 40 times as much as the sun. Large stars in this mass category are thought to become black holes, not magnetars, when they explode in supernovas.



"This therefore raises the thorny question of just how massive a star has to be to collapse to form a black hole if stars over 40 times as heavy as our sun cannot manage this feat," said researcher Norbert Langer of the Universität Bonn in Germany and the Universiteit Utrecht in the Netherlands.

This artist's impression shows the magnetar in the very rich and young star cluster Westerlund 1. This remarkable cluster contains hundreds of very massive stars, some shining with a brilliance of almost one million suns. Credit: ESO/L. Calçada

When massive stars reach the end of their lives and die in supernovas, they leave behind remnants. If the star is very massive, that remnant is a black hole — an extremely dense collection of mass with such a strong gravitational pull, not even light can escape.

If the original star was slightly less massive, the supernova remnant will become a neutron star. These objects, made of mostly neutrons, are more dense than a regular star but less dense than a black hole.

Magnetars are a type of neutron star with colossal magnetic fields that are about a million billion times stronger than that of Earth.

Perplexing magnetic star

This unusual magnetar star was discovered in the star cluster Westerlund 1, located 16,000 light-years away in the southern constellation of Ara (the Altar).

This special clump of hundreds of massive stars was formed in a single event, which means that all its stars are roughly the same age – between 3.5 and 5 million years old.

The age and characteristics of the cluster allowed astronomers to estimate the mass of the magnetar, which is one of only a few magnetars known in the Milky Way. Its mass puts it well within the range expected to create a black hole.

How massive stars die

Scientists have thought that stars with initial masses between about 10 and 25 suns would form neutron stars when they die, while stars above 25 times that of the sun would produce black holes.

The researchers think the magnetar in question must have lost much of its mass before it died to have ended up the way it did.

"These stars must get rid of more than nine tenths of their mass before exploding as a supernova, or they would otherwise have created a black hole instead," said researcher Ignacio Negueruela of the Universidad de Alicante in Spain. "Such huge mass losses before the explosion present great challenges to current theories of stellar evolution."

The researchers observed the magnetar with the European Southern Observatory's Very Large Telescope in Chile. They detailed their findings in a paper to be published in an upcoming issue of the journal Astronomy and Astrophysics.