Ethnobotany Role In Relation To Medicinal Plants In India

By Ashwani Kumar Created Jul 12 2010 - 11:32am

Ethnobotany is usually defined as anthropological approach to botany. There are several methods of ethnobotanical research and those relevant to medicinal plants are archaeological search in literature, herbaria and the field studies.

"Man, ever desirous of knowledge, has already explored many things, but more and greater still remains concealed; perhaps reserved for far distant generations, who shall prosecute the examination of their creator's work in remote countries and make many discoveries for the pleasure and convenience of life…"

The above quotation of Linneaus is the most appropriate to this chapter which deals with the relationship between medicinal plants and the total filed of ethnobotany.

According to Schultes (1962), ethnobotany is "the study of the relationship which exists between people of primitive societies and their plant environment". The term is not new even to India, Kirtikar and Basu (1935) stated", The ancient Hindus should be given the credit for cultivating what is now called ethnobotany".

Ethnobotany, is totality, is virtually a new field of research, and if this field is investigated thoroughly and systematically, it will yield results of great value to the ethnologists, archaeologists, anthropologists, plant-geographers and pharmacologists etc. Though ethnobotany provides several approaches in plant researches, here only the resources which help in medicinal are plant-research mentioned.

Archaeological resources

India has a rich treasure of archaeological sculptures of antiquity, which can be of great value in tracing the plants which were used during early civilization.

Sithole (1976) described about 40 such plants from bas reliefs on the gateways of the Great Stupa at Sanchi and the railing of Bharhut tupa, belonging to the first and second century B.C., respectively.

Literature resources

Our ancient literature can also be tapped for information on medicinal plants. No authentic record of any kind except a few archaeological sculptures of Mohenjo-Daro is available from the prevedic period in this country. But, Rigveda and Atharvaveda, which date back to 2000 to 1000 B.C. which are our oldest Vedic literature resources, contain valuable information regarding medicinal plants of that period.

Sharma (1968-69) enlisted 248 botanical drugs which are mentioned mainly in Atharvaveda and Rigveda. Singh and Chunekar (1972) published a glossary of such medicinal plants, which have been mentioned in Charak Samhita, Sushurta Samhita and Ashtanga Hridiyam.

Perhaps the outstanding example, at least in modern times of the use of the literature is the huge compilation of all anti-tumour plants, cited in old texts and local folk medicine from all over the world for screening purpose at Cancer Chemotherapy National Service Center (CCNSC) (Hartwell, 1967-71).

Recently, checklists of Ayurvedic and Yunani treatises have been published (Anonymous 1962 and Tripathi et al, 1978). A list of some of the important Indian treatises is presented in Table 3.

Indian treatises Authors Dates No. of medicinal plants included.

Herbarium Resources

Herbarium sheets and field notes have also proved to be a good source of ethnobotanical data. The most outstanding example of this type of research is of Dr. Altschul, who searched about 2.5 million plant specimens in Harvard University Herbarium and from these 5,178 useful notes of drugs and food value were recorded (Altschul, 1973).

Field Resources

The plants have become the never ending source for new biodynamic compounds of potential therapeutic value. Ethnobotanist brings out from the field the suggestion as to which raw plant material may be tapped and for this, he gets clues from the tribals.

Atkinson (1882) published 12 volumes of the Gazetteer of North West Provinces of India, three of which are concerned with the Kumaon and Garhwal Himalayan Region. Recently, the Central Councils for Research in Ayurveda, Siddha and Yunani conducted several medicobotanical surveys in some important ethnic and tribal regions of the country.

It was found that the Nicobaris use the resinous wood of Canarium and Dipterocarpus spp. for repelling mosquitoes and as a torch.

In the Nilgiris, the decoction of Bambusa arundinacea is used as an abortifacient (Ragunathan, 1976).

Comparative study of the Ethnobotanical Resources

Ethnobotany becomes a more important and interesting subject when its study reaches a point when the results are studied comparatively. For example, Ficus religiosa and Ficus racemosa are among the most important sacred as well as medicinal plants of antiquity.

In Atharvaveda, Ficus racemosa is attributed the property of increasing the number of domestic cattle, giving virility and strength of its wearer, add to the fertility of his land and growth of the fruits.

In Charak Samhita there are about 23 references of Ficus religiosa corresponding to medicinal and other properties. A few therapeutic uses described there are : in fever, in rheumatism, in urinary troubles, in spermatorrhoea, in pile and in dysentery (Vidyalankar, 1959).

Schultes (1963) rightly stated, "Our challenge is to salvage some of the modern medico-botanical lore before it becomes for ever entombed with the cultures that give it birth".

Kirtikar and Basu (1935) stated, "The only way to illumine the whole field of native therapeutics is to survey it in small tracts and sift the value of those drugs peculiar to each province… There is wide feeling that there is beneficence in the scheme of nature which provides in every country, suitable remedies on the spot for the ill to which humanity is locally most prone. Very little has been done so far to incorporate in the practice of physicians in the country the medicines which in India nature scatters broadcast from her lap".

Wild medicinal plants in Indian Folk Life - A Historical Perspective

Parts of over 3500 wild species are used to cure ailments in man and his domesticated animals :

Plants in folk medicine of the Himalaya

The Himalayan ranges are inhabited by a large tribal population, often with their distinct way of life, traditions, dialects and cultural heritage. The Himalaya have bestowed them with vast, varied and even endemic plants. The tribals have learnt to utilize local herbs for different ailments after centuries of trials, often at the risk of loss of human life. Many tribal beliefs forbid them to unravel the virtues of the plants to outside world. But, it is also true that till recent little concerted effort had been made to document this knowledge by detailed ethnobotanical surveys.

Some folkore medicines of the region have proved efficaceous after detailed pharmacological and clinical trials. Rauvolfia serpentina roots are a classical example. Coptis teeta is another plant which has given encouraging results. The oil of seed kernel of Hydnocarpus kurzii, from upper Assam and Tripura hills, has proved useful in the treatment of leprosy and skin diseases. The roots of Nardostachys grandiflore have provided a safe sedative.

Table-4

S. No.	Ailments	Plant used
1.	For wounds and as disinfectant.	Panicum anidotale, Artemisia maritima
2.	Bronchisl troubles.	Bulbs of Urginea indica
3.	Blood purification and promoting lochial discharge.	Mollugo cerviana
4.	Urinary troubles.	Glinus lotoides
5.	For swellings.	Root paste of Corallocarpus epigaeus
6.	As tonics	Neurada procumbens and Colchium luteum, seeds of Mimosa hamata root of Asparagus recemosus
7.	Pneumonia	Achyranthus aspera
8.	Diarrhoea	Podophyllum hexandrun; Salvia aegyptiaca
9.	Chest pain	Cuscuta hyalina
10.	Rheumatism	Carum carvi, Inula racemosa
11.	Gastritis and fever	Achillea millaefolia
12.	Spleen disorders	Capparis spinosa
13.	Hyperacidity	Nepeta lingibracteata
14.	Skin diseases	Ranunculus hirtellus
15.	Conjunctivitis	Thalictum minus

Use of plants in folk medicine by tribals of Central India.

Use of plants in folk medicine is very prevalent in Central India (Jain, 1963, Jain and Tarafder, 1963). More than one hundred plants were reported to be commonly used in medicine in the district of Bastar (Jain, 1965). Some plants are used singly, whereas others are used in mixture. Similarly, certain plants were considered useful in only one disease whereas several had multiple uses.

Many medicinal uses reported by tribals of Bastar appeared to be unknown or little- known outside their community. Examples of a few such plants are given below:

Cassia tora (Charota) : Tender leaves eaten to prevent skin diseases.

Combretum decandrum (Ainti) : Oil from seeds applied on eczema.

Flacourtia indica (Kakai) : Bark applied on eczema.

Nyctanthes arbortristis (Harsingar) : The inflorescence and young fruits pounded in water; this is used for relieving cough.

Polygonum plebejum (Chatibhaji) : The plant eaten as a vegetable to promote lactation.

An Ethno-Medico-Botanical survey of Ambikapur District, M.P. – Ethno-Medico-botanical surveys of tribal area of Ambikapur distt. M.P. were conducted during 1990 and 1991 and folk-lore information on forty medicinal plants was recorded with the help of Corwa, Oraon and Pando tribes. The Tribals are living in Asad, Dindo, Kusmi, Mainpat, Janakpur, Sonhat and Rampur forests of Ambikapur district. Some noteworty plant species which are used in the treatment of various diseases are Boerhavia diffusa (Elephantiasis), Hemidesmus indicus (Stomach ulcer), Indigofera cassioides (Antifertility agent), Leea macrophylla (Chest pain).

Larger head size may protect against Alzheimer's symptoms

ST. PAUL, Minn. – New research shows that people with Alzheimer's disease who have large heads have better memory and thinking skills than those with the disease who have smaller heads, even when they have the same amount of brain cell death due to the disease. The research is published in the July 13, 2010, issue of Neurology®, the medical journal of the American Academy of Neurology.

"These results add weight to the theory of brain reserve, or the individual capacity to withstand changes in the brain," said study author Robert Perneczky, MD, of the Technical University of Munich in Germany. "Our findings also underline the importance of optimal brain development early in life, since the brain reaches 93 percent of its final size at age six."

Head size is one way to measure brain reserve and brain growth. Perneczky said that while brain growth is determined in part by genetics, it is also influenced by nutrition, infections and inflammations of the central nervous system, and brain injuries.

"Improving prenatal and early life conditions could significantly increase brain reserve, which could have an impact on the risk of developing Alzheimer's disease or the severity of symptoms of the disease," he said.

For the study, 270 people with Alzheimer's disease took tests of their memory and cognitive skills and had MRI scans of their brains to measure the amount of brain cell death. Head size was determined by the circumference measurement.

The study showed that larger head size was associated with a greater performance on memory and thinking tests, even when there was an equivalent degree of brain cell death. Specifically, for every one percent of brain cell death, an additional centimeter of head size was associated with a six percent greater performance on the memory tests.

The study was supported by the National Institute on Aging.

The American Academy of Neurology, an association of more than 22,000 neurologists and neuroscience professionals, is dedicated to promoting the highest quality patient-centered neurologic care. A neurologist is a doctor with specialized training in diagnosing, treating and managing disorders of the brain and nervous system such as stroke, Alzheimer's disease, epilepsy, Parkinson's disease and multiple sclerosis.

Arsenic shows promise as cancer treatment, Stanford study finds

STANFORD, Calif. — Miss Marple notwithstanding, arsenic might not be many people's favorite chemical. But the notorious poison does have some medical applications. Specifically, a form called arsenic trioxide has been used as a therapy for a particular type of leukemia for more than 10 years. Now researchers at the Stanford University School of Medicine have shown that it may be useful in treating a variety of other cancers.

Combining arsenic with other therapies may give doctors a two-pronged approach to beating back forms of the disease caused by a malfunction in a critical cellular signaling cascade called the Hedgehog pathway. The U.S. Food and Drug Administration has already approved arsenic trioxide for use in humans, which could pave the way for clinical trials of this approach.

"Many pharmaceutical companies are developing anticancer drugs to inhibit the Hedgehog pathway," said Philip Beachy, PhD, professor of developmental biology and the Ernest and Amelia Gallo Professor in the School of Medicine. In addition, Beachy recently identified an antifungal drug commonly used in humans, itraconazole, as a Hedgehog pathway inhibitor. "However, these compounds target a component of the pathway that can be mutated with patients then becoming resistant to the therapy. Arsenic blocks a different step of the cascade."

Beachy is the senior author of the new findings about arsenic, which will be published online in the Proceedings of the National Academy of Sciences July 12. Jynho Kim, DVM, PhD, a postdoctoral scholar in Beachy's lab, is the first author of the study.

The mechanism of action described by the researchers in the current paper differs from what happens during arsenic poisoning, which occurs when higher levels of the compound choke off a cell's energy production system.

Beachy and his colleagues studied the effect of arsenic trioxide in cultured human and mouse cells and in laboratory mice with a brain tumor known as medulloblastoma. (The Hedgehog pathway is known to be overly active in this and other tumors in the skin, brain, blood and muscle.) They found that relatively low levels of the compound, equivalent to those approved for use in treating patients with acute promyelocytic leukemia, block one of the last steps of the Hedgehog pathway; it prevents the expression of a select few of the cell's genes in response to external messages. Because only the tail end of the pathway is affected, a cancer cell has fewer opportunities to mutate and sidestep arsenic's inhibitory effect.

In contrast, another Hedgehog pathway inhibitor called cyclopamine acts near the beginning of the signaling cascade. Cyclopamine, a plant-derived molecule identified as a Hedgehog pathway inhibitor by Beachy in

1998, binds to a protein on the surface of the cell called Smoothened and blocks its ability to transmit the Hedgehog signal to the cell's innards. Drugs mimicking cyclopamine's action are currently being developed for human use. However, the ability of these drugs to disrupt the Hedgehog pathway early on may be lessened by mutations in Smoothened that allow the cascade to get around this initial treatment.

Beachy and Kim became curious as to whether and how arsenic worked to interfere with the signaling cascade as a result of observations that birth defects caused by arsenic exposure resemble the physical effects of having an inactive Hedgehog pathway. They studied human cells in culture and discovered that levels of arsenic trioxide similar to those currently used in patients with acute promyelocytic leukemia inhibit the Hedgehog pathway.

Specifically, the researchers found that arsenic trioxide blocks the ability of a protein called Gli2 to induce gene transcription in the nucleus. It works by stopping Gli2 from moving into the cell's primary cilium, a communication hub, where many of the events of Hedgehog signaling take place. Without Gli2 in the cilium, the Hedgehog message comes to an abrupt, and fruitless, dead end. This occurs even in cells known to be resistant to cyclopamine treatment.

To find out what this might mean for cancer cells, they studied mice with a type of brain tumor known to be dependent on Hedgehog signaling. Treating the mice with arsenic trioxide slowed or stopped tumor growth. They also found that combining arsenic trioxide with cyclopamine was even more effective in blocking the pathway in cultured cells.

"Arsenic might be especially effective for treating some types of cancers in combination with other drugs that act at different levels of the Hedgehog pathway, such as the cyclopamine mimics that pharmaceutical companies are developing, or itraconazole, an approved drug that we have recently shown also acts at the level of Smoothened," said Beachy, who is also a member of the Stanford Cancer Center and the Stanford Institute for Stem Cell Biology and Regenerative Medicine, as well as a Howard Hughes Medical Institute investigator.

In addition to Beachy and Kim, other Stanford researchers involved in the study include postdoctoral scholars John Lee, MD, PhD, and James Kim, MD, PhD. The research was funded by the Stanford Center for Children's Brain Tumors, the Howard Hughes Medical Institute and the National Institutes of Health.

Study implicates new epigenetic player in mental retardation and facial birth defects

Findings may lead to new drug targets

Boston, Mass. -- A subtle mutation affecting the epigenome - a set of dynamic factors that influence gene activity -- may lead to an inherited form of mental retardation that affects boys, find researchers at Children's Hospital Boston. The disorder, which also involves cleft lip or cleft palate, appears to hinge on an enzyme working in a biological pathway that may offer several potential drug targets.

The study, published online July 11 in the journal Nature, reveals that this enzyme is a histone demethylase and works with a key genetic partner to help keep neuronal cells alive during development of the embryonic brain. Patients with this form of mental retardation are known to have mutations in the gene that encodes the active part of this enzyme. The findings may help scientists further understand the underlying biological reasons why X-linked disorders cause cognitive impairment and develop new therapies to treat or prevent them.

"Human genetics has made great strides in identifying genes as potential causes of diseases and disorders, but we don't know much about how they work," says senior author Yang Shi, PhD, the Merton Bernfield Professor of Neonatology in the Newborn Medicine division at Children's. "We knew this was a biologically relevant gene. We wanted to understand the etiology, so we asked why the gene causes problems when it is mutated. Here, we have identified a direct target in neuronal and craniofacial development."

The fast-moving young field known as epigenetics is revealing the dynamic structures and processes that organize, index and control access to the information stored in the DNA code. The epigenetic program orchestrates different combinations of gene activity – allowing cells with identical genomes to be transformed into more than 200 different specialized tissues and organs in our bodies.

When most people think of DNA, they picture the iconic spiraling ladder of naked DNA. But in nature, the twisting double-helix strands actually spool around clusters of proteins called histones with protruding "tails" that act like specialized antennas, transmitting directions for DNA. This dynamic structure, called chromatin, extends the genetic code by offering, measuring or limiting access to different genes.

Several years ago, Shi and his colleagues identified the first enzyme that can detach a molecule known as a methyl group, previously thought to be a permanent fixture, from the histones tails. Then his team and a number of other research groups independently discovered members of a second known family of these enzymes, known collectively as histone demethylases.

The latest study began with a gene mutated in several male patients with X-linked mental retardation and craniofacial abnormalities. The gene codes for an enzyme that looked a lot like a member of the second family

of histone demethylases. The mutations in these patients abolished the working part of the enzyme that plucks the methyl group from the histone tail.

Led by Hank Qi, PhD, co-first author and postdoctoral fellow, the researchers demonstrated in human cells that the enzyme, PHF8, indeed works as a histone demethylase. (And it is the first known demethylase discovered for a strategic methylation point on the tail of histone 4 known as H4K20, which other evidence suggests plays a critical role in gene expression and regulation and in the DNA damage response.) In this case, by removing the methyl group, the enzyme appears to maintain active gene transcription.

"The histone methylation and demethylation doesn't turn the gene on or off," Qi says. "When this histone mark changes, it generates an equilibrium important for fine-tuning gene expression."

Despite its widespread presence, the enzyme seems to have a narrowly targeted biological effect on a master genetic regulator of craniofacial development, the transcription factor MSX1. Taking a cue from the scientific literature, Qi and his collaborators, Madathia Sarkissian and Thomas Roberts at Dana-Farber Cancer Institute, tested the normal enzyme function in zebrafish, a popular model for genetic function.

It is hard to judge cognitive impairment in a small fish, but the dramatic impact on craniofacial development was obvious. Fish without the enzyme developed virtually no jawbone, a condition that could be prevented by providing the functioning enzyme, showing its importance in development. As importantly, providing more of the fish version of the MSX1 gene (whose activity the demethylase enzyme encourages) also partially prevented the biological defects caused by the missing enzyme.

Hope for the reversibility of some aspects of mental retardation arose three years ago in a Scottish mouse study of Rett syndrome, a disorder on the autism spectrum that is also a cause of severe mental retardation in girls. The disease is caused by a molecule, MeCP2, that binds to methylated DNA and may be involved in another form of epigenetic regulation.

"In practical terms, we use gene expression as a read out," says Shi, also a professor of pathology at Harvard Medical School. "Epigenetic states affect the expression of critical genes. These studies suggest that the imbalance of histone methylation dynamics plays a critical role in mental retardation. You can imagine a therapeutic approach to enhance the compromised enzymatic activity or to restore the downstream function."

For additional clinical information on cleft lip and cleft palate:
http://www.childrenshospital.org/az/Site2034/mainpageS2034P0.html

A Person's Language May Influence How He Thinks About Other People

The language a person speaks may influence their thoughts, according to a new study on Israeli Arabs who speak both Arabic and Hebrew fluently. The study found that Israeli Arabs' positive associations with their own people are weaker when they are tested in Hebrew than when they are tested in Arabic.

The vast majority of Arab Israelis speak Arabic at home and usually start learning Hebrew in elementary school. The subjects in this study were Arab Israelis, fluent in both Hebrew and Arabic, who were students at Hebrew-speaking universities and colleges. Researchers Shai Danziger of Ben-Gurion University and Robert Ward of Bangor University took advantage of the tensions between Arabs and Israelis to design an experiment that looked at how the students think differently in Arabic and Hebrew. Their hypothesis: "It's likely that a bilingual Arab Israeli will consider Arabs more positively in an Arab speaking environment than a Hebrew speaking environment," says Danziger.

The study used a computer test known as the Implicit Association Test, which is often used to study bias. Words flash on the computer screen, and subjects have to categorize them by pressing two keys on the keyboard as quickly as possible. It's a nearly automatic task, with no time to think about the answers. The trick is, the subjects are classifying two different kinds of words: words describing positive and negative traits and, in this case, names - Arab names like Ahmed and Samir and Jewish names like Avi and Ronen. For example, they might be told to press "M" when they saw an Arab name or a word with a good meaning, or "X" when they saw a Jewish name and a word with a bad meaning. In this example, if people automatically associate "good" words with Arabs and "bad" with Jews, they'll be able to do the classifications faster than if their automatic association between the words is the other way around. In different sections of the test, different sets of words are paired.

For this study, the bilingual Arab Israelis took the implicit association test in both languages “Hebrew and Arabic” to see if the language they were using affected their biases about the names. The Arab Israeli volunteers found it easier to associate Arab names with "good" trait words and Jewish names with "bad" trait words than Arab names with "bad" trait words and Jewish names with "good" trait words. But this effect was much stronger when the test was given in Arabic; in the Hebrew session, they showed less of a positive bias toward Arab names over Jewish names. "The language we speak can change the way we think about other

people," says Ward. The results are published in Psychological Science, a journal of the Association for Psychological Science.

Danziger himself learned both Hebrew and English as a child. "I am a bilingual and I believe that I actually respond differently in Hebrew than I do in English. I think in English I'm more polite than I am in Hebrew," he says. "People can exhibit different types of selves in different environments. This suggests that language can serve as a cue to bring forward different selves."

Accepting That Good Parents May Plant Bad Seeds

By RICHARD A. FRIEDMAN, M.D.

“I don’t know what I’ve done wrong,” the patient told me.

She was an intelligent and articulate woman in her early 40s who came to see me for depression and anxiety. In discussing the stresses she faced, it was clear that her teenage son had been front and center for many years.

When he was growing up, she explained, he fought frequently with other children, had few close friends, and had a reputation for being mean. She always hoped he would change, but now that he was almost 17, she had a sinking feeling.

I asked her what she meant by mean. “I hate to admit it, but he is unkind and unsympathetic to people,” she said, as I recall. He was rude and defiant at home, and often verbally abusive to family members.

Along the way, she had him evaluated by many child psychiatrists, with several extensive neuropsychological tests. The results were always the same: he tested in the intellectually superior range, with no evidence of any learning disability or mental illness. Naturally, she wondered if she and her husband were somehow remiss as parents.

Here, it seems, they did not fare as well as their son under psychiatric scrutiny. One therapist noted that they were not entirely consistent around their son, especially when it came to discipline; she was generally more permissive than her husband. Another therapist suggested that the father was not around enough and hinted that he was not a strong role model for his son.

But there was one small problem with these explanations: this supposedly suboptimal couple had managed to raise two other well-adjusted and perfectly nice boys. How could they have pulled that off if they were such bad parents?

To be sure, they had a fundamentally different relationship with their difficult child. My patient would be the first to admit that she was often angry with him, something she rarely experienced with his brothers.

But that left open a fundamental question: If the young man did not suffer from any demonstrable psychiatric disorder, just what was his problem?

My answer may sound heretical, coming from a psychiatrist. After all, our bent is to see misbehavior as psychopathology that needs treatment; there is no such thing as a bad person, just a sick one.

But maybe this young man was just not a nice person.

For years, mental health professionals were trained to see children as mere products of their environment who were intrinsically good until influenced otherwise; where there is chronic bad behavior, there must be a bad parent behind it.

But while I do not mean to let bad parents off the hook — sadly, there are all too many of them, from malignant to merely apathetic — the fact remains that perfectly decent parents can produce toxic children.

When I say “toxic,” I don’t mean psychopathic — those children who blossom into petty criminals, killers and everything in between. Much has been written about psychopaths in the scientific literature, including their frequent histories of childhood abuse, their early penchant for violating rules and their cruelty toward peers and animals. There are even some interesting studies suggesting that such antisocial behavior can be modified with parental coaching.

But there is little, if anything, in peer-reviewed journals about the paradox of good parents with toxic children.

Another patient told me about his son, now 35, who despite his many advantages was short-tempered and rude to his parents — refusing to return their phone calls and e-mail, even when his mother was gravely ill.

“We have racked our brains trying to figure why our son treats us this way,” he told me. “We don’t know what we did to deserve this.” Apparently very little, as far as I could tell.

We marvel at the resilient child who survives the most toxic parents and home environment and goes on to a life of success. Yet the converse — the notion that some children might be the bad seeds of more or less decent parents — is hard to take.

It goes against the grain not just because it seems like such a grim and pessimistic judgment, but because it violates a prevailing social belief that people have a nearly limitless potential for change and self-improvement.

After all, we are the culture of Baby Einstein, the video product that promised — and spectacularly failed — to make geniuses of all our infants.

Not everyone is going to turn out to be brilliant — any more than everyone will turn out nice and loving. And that is not necessarily because of parental failure or an impoverished environment. It is because everyday character traits, like all human behavior, have hard-wired and genetic components that cannot be molded entirely by the best environment, let alone the best psychotherapists.

"The central pitch of any child psychiatrist now is that the illness is often in the child and that the family responses may aggravate the scene but not wholly create it," said my colleague Dr. Theodore Shapiro, a child psychiatrist at Weill Cornell Medical College. "The era of 'there are no bad children, only bad parents' is gone."

I recall one patient who told me that she had given up trying to have a relationship with her 24-year-old daughter, whose relentless criticism she could no longer bear. "I still love and miss her," she said sadly. "But I really don't like her." For better or worse, parents have limited power to influence their children. That is why they should not be so fast to take all the blame — or credit — for everything that their children become.

Dr. Richard A. Friedman is a professor of psychiatry at Weill Cornell Medical College in Manhattan.

Invisible weapons to fight fake drugs

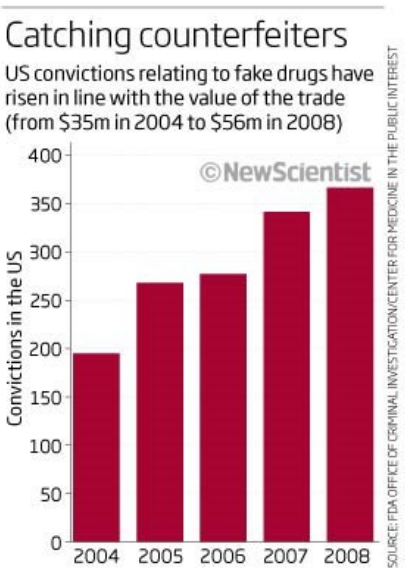
*** Updated 15:58 13 July 2010 by Paul Marks**

THE perils of counterfeit drugs go way beyond being ripped off by dubious online pill-pushers. Malaria treatments containing no active ingredients, out-of-date chemotherapy drugs and diabetes medication with lethal levels of compounds that encourage insulin release have all recently been found on sale in legitimate outlets. Now the pharmaceutical industry is trying to fight back by making it easier to spot fakes.

The World Health Organization estimates that 50 per cent of all medicines sold online are worthless counterfeits. In developing nations fake pills may account for as much as 30 per cent of all drugs on the market. Even in the developed world, 1 per cent of medicines bought over the counter are fakes.

Some key events illustrate the risk these pose. In Nigeria, 2500 children died in 1995 after receiving fake meningitis vaccines. In Haiti, Bangladesh and Nigeria, around 400 people died in 1998 after being given paracetamol (acetaminophen) that had been prepared with diethylene glycol - a solvent used in wallpaper stripper. The fakers are nothing if not market-aware: in the face of an outbreak of H5N1 bird flu in 2005, they began offering fake Tamiflu.

What can be done? The WHO coordinates an umbrella body called the International Medical Products Anti-Counterfeiting Taskforce (IMPACT), an industry initiative that issues alerts when it finds anomalies in the medicine supply chain. Such events include sudden drops in wholesale prices, hinting at fakes coming onto the market, or the mimicking of anti-counterfeiting features on packaging, such as holograms or barcodes, says Nimo Ahmed, head of intelligence at the UK's Medicine and Healthcare Products Regulatory Agency.



Drug packaging is an obvious avenue for counterfeiters to exploit. Boxes and blister packs are usually easy to copy and the repackaging of drugs is not necessarily illegal. Indeed it is standard practice in the pharmaceutical industry as countries have their own rules on, for example, the quantity of a drug that can be supplied in a pack.

What's really needed, says Dean Hart of NanoGuardian, a nanotechnology firm based in Chicago, Illinois, is a way to authenticate the drugs inside the packs. The company is aiming to do that by printing microscale and nanoscale information on pills and capsules.

The idea is based loosely on technology developed by NanoGuardian's owner, NanoInk, which pioneered a process called Dip Pen Nanolithography. DPN was originally designed to drop biological samples such as individual stem cells into test wells. NanoInk has adapted the technology to create a print head 15 nanometres across at the end of a nanoscale arm steered by an electric field. The tip can incorporate hollows that hold a minuscule volume of a substance to be "printed" onto a surface.

"We are using a lot of what we learned building those nanoscale tools to write on pills, capsules, vial caps and pre-filled syringes," Hart told New Scientist.

Nothing is added chemically to a tablet in the process, he stresses. Instead, they use a nano-imprinter whose precise mode of operation is confidential. First, they use their imprinting pen to create a microscale mark -

perhaps the drug company's logo - that is visible only using a high-magnification eyeglass, or loupe. "That gives you a very good indication that the drug's authentic," says Hart.

Inside the logo they then imprint a 350-digit nanoscale random number that is changed daily. That number is recorded on the drug-maker's database alongside information on where the batch was made, where it was destined to be sold and the drug's expiry date.

Should investigators find out-of-date drugs on sale, they can send them to NanoGuardian to read the number and trace where that consignment was originally shipped to. The technology has been approved by the US Food and Drug Administration for use on a drug made by Capsugel, a division of pharmaceutical giant Pfizer, which will debut later this year.

NanoGuardian is not alone in trying to apply a benign ID mark to tablets. At Ghent University in Belgium, nanomedical engineer Stefaan De Smedt is developing an edible polymer fibre that can be labelled with a telltale fluorescent barcode along its length and incorporated into a pill (Advanced Materials, DOI: 10.1002/adma.201000130).

De Smedt is experimenting with cellulose and polystyrene-based fibres. To make them, he takes a solution of the fibres and adds fluoroscein, a fluorescing agent used in medical tests. The solution is then turned into microfibres using a process called electrospinning, where the solution is squirted from a charged syringe tip onto a rotating wheel on which fibres adhere like sticky tape on a roll.

To write barcode-style stripes into these fibres - perhaps encoding information on the type of drug, its source and expiry date - De Smedt illuminates them with laser light at 488 nanometres, a wavelength which locally bleaches the fluoroscein in the fibres, creating dark stripes. The fibres are then cut by laser into 10-micrometre lengths for dropping into the mixture from which the drug will be made.

"You can easily see the pattern of bleached stripes through a simple microscope," De Smedt says. That makes it particularly suitable for the developing world, he adds.

Another authentication method in development uses gadgets that fire near-infrared light at tablets and which then analyse the reflected spectra to ascertain what they contain. With funding from GlaxoSmithKline, Marta Lopes of the Technical University of Lisbon in Portugal is hoping to use this "spectral unmixing" technique to spot the lack of active ingredients or the presence of harmful ones in an instant (Analytical Chemistry, DOI: 10.1021/ac902569e).

All, however, realise they are in an arms race to some extent. Hart reckons they have a good 10 years before fakers can copy them. "Counterfeiters are highly resourced, highly intelligent and have picked apart every security measure that's out there," he says. "But we're confident that nano-encryption is as close to being uncopyable as possible."

Smedt is not so confident. "The fact is, every type of anticounterfeiting technology gets counterfeited in the end."

Prompt actions halt alarming infection outbreak at Dallas hospital

Rapid identification and aggressive infection control measures allowed a Dallas hospital to stop the spread of Acinetobacter baumannii, a type of bacteria that has become increasingly prevalent in healthcare facilities and is resistant to most antibiotics. The findings were presented today at the 37th Annual Conference and International Meeting of the Association for Professionals in Infection Control and Epidemiology (APIC).

Methodist Dallas Medical Center identified an unusual cluster of drug-resistant Acinetobacter during a one-week period in 2009 and conducted an immediate investigation. Through rapid response and comprehensive interventions, the hospital was able to arrest the outbreak in a much shorter time-frame compared with most other reported outbreaks of this bacterium that have been known to last for months or years.

Infection control staff at the 515-bed hospital, in consultation with the Hospital Epidemiologist, Dr. Zakir Shaikh, quickly concluded that the known cases met the criteria for full epidemiological investigation and began an aggressive campaign of surveillance and intervention. All current and incoming patients were tested for Acinetobacter, and in affected units, every patient was put under contact precautions—where staff is required to don gloves and gowns upon entry to the patient's room, and visitors are encouraged to do the same. The hospital also instituted regular meetings between all of the departments involved with caring for these patients; administrators, physicians, nurses, lab technicians, environmental services and physical plant staff were all consulted to control the outbreak.

"A responsive hospital administration including a CEO who supports our program, close contact with local and state health departments, and collaborative teamwork between departments were responsible for our success," said Beth Wallace, MPH, CIC, infection preventionist at Methodist Dallas Medical Center who presented the findings at the APIC conference. "Our experience shows that controlling Acinetobacter outbreaks

requires effective surveillance, dedicated teamwork and rapid intervention with application of best practices in a consistent and timely manner."

Acinetobacter baumannii is a species of gram-negative bacteria that has caused outbreaks of infection in healthcare facilities over the last decade and considerable concern in the medical community. Infections from this pathogen primarily occur in very ill, wounded or immunocompromised patients. The germ can remain on wet or dry surfaces for longer than most other organisms, making it harder to eradicate. As is the case with other, more well-known healthcare-associated infections, such as MRSA, Acinetobacter has effectively developed resistance to most common antibiotics and continues to evolve against the medicines used to fight its infections. Though much literature on the topic has been published in the last five years, there are no agreed-upon prevalence, morbidity or mortality figures for the infection.

"Methodist Health System makes infection prevention a priority and has the fully recommended infection prevention resources and staffing in all of their facilities," said Wallace. "Because we have adequate resources in terms of staffing and technology, we were able to keep a close eye on this and act quickly."

"With outbreaks of pan-resistant Acinetobacter baumannii and other multi-drug resistant organisms on the rise, it is absolutely essential that infection prevention departments be fully staffed and adequately resourced," said APIC President Cathryn Murphy, RN, PhD, CIC. "Methodist Dallas Medical Center was proactive in their approach, responding rapidly and mobilizing an interdisciplinary team to control the outbreak. The experiences of infection preventionists such as Ms. Wallace serve as practical guidance for healthcare professionals combating multi-drug resistant pathogens. Their experience is a powerful reminder that aggressive infection prevention programs are required to protect patients and save lives."

Wallace presented an abstract on her facility's experiences at APIC's Annual Conference. The meeting, which is the largest annual gathering of infection preventionists from around the world, takes place July 11-15 in New Orleans.

Medications found to cause long term cognitive impairment of aging brain

INDIANAPOLIS – Drugs commonly taken for a variety of common medical conditions including insomnia, allergies, or incontinence negatively affect the brain causing long term cognitive impairment in older African-Americans, according to a study appearing in the July 13, 2010 print issue of Neurology, the medical journal of the American Academy of Neurology.

These drugs, called anticholinergics, block acetylcholine, a nervous system neurotransmitter, and are widely-used medical therapies. They are sold over the counter under various brand names such as Benadryl®, Dramamine®, Excedrin PM®, Nytol®, Sominex®, Tylenol PM®, and Unisom®. Other anticholinergic drugs, such as Paxil®, Detrol®, Demerol® and Elavil® are available only by prescription. Older adults most commonly use drugs with anticholinergic effects as sleep aids and to relieve bladder leakage problems.

Researchers from Indiana University School of Medicine, the Regenstrief Institute and Wishard Health Services conducted a six-year observational study, evaluating 1,652 Indianapolis area African-Americans over the age of 70 who had normal cognitive function when the study began. In addition to monitoring cognition, the investigators tracked all over-the-counter and prescription medications taken by study participants.

"We found that taking one anticholinergic significantly increased an individual's risk of developing mild cognitive impairment and taking two of these drugs doubled this risk. This is very significant in a population - African-Americans - already known to be at high risk for developing cognitive impairment," said Noll Campbell, PharmD, first author of the study. Dr. Campbell is a clinical pharmacist with Wishard Health Services.

"Simply put, we have confirmed that anticholinergics, something as seemingly benign as a medication for inability to get a good night's sleep or for motion sickness, can cause or worsen cognitive impairment, specifically long-term mild cognitive impairment which involves gradual memory loss. As a geriatrician I tell my Wishard Healthy Aging Brain Center patients not to take these drugs and I encourage all older adults to talk with their physicians about each and every one of the medications they take," said Malaz Boustani, M.D., IU School of Medicine associate professor of medicine, Regenstrief Institute investigator and IU Center for Aging Research center scientist.

"The fact that we found that taking anticholinergics is linked with mild cognitive impairment, involving memory loss without functional disability, but not with Alzheimer Disease, gives me hope. Our research efforts will now focus on whether anticholinergic-induced cognitive impairment may be reversible," said Dr. Boustani, who added that "this study offers a new window to change the burden of dementia" for the individual, the caregiver and the healthcare system."

"This finding of a link between anticholinergics and long term mild cognitive impairment complements our previous work which confirmed a link between anticholinergics and delirium, which is a sudden onset cognitive

impairment," said Dr. Campbell. Although this study, which was funded by the National Institute on Aging, looked at only African-Americans, both Dr. Campbell and Dr. Boustani believe future studies will find that the results are generalizable to other races.

In addition to Dr. Campbell and Dr. Boustani, co-authors of "Use of Anticholinergics and the Risk of Cognitive Impairment in an African-American Population" are Hugh Hendrie, MB, ChB, DSc, of the IU School of Medicine and the Regenstrief Institute; Valerie Smith-Gamble, M.D. of the IU School of Medicine and the Roudebush VA Medical Center; and Kathleen A. Lane, M.S., Sujuan Gao, Ph.D., Babar A. Khan, M.D., Jill R. Murrell, Ph.D., Frederick W. Unverzagt, Ph.D., Ann Hake, M.D., and Kathleen Hall, PhD. of the IU School of Medicine. Dr. Hall is also a Regenstrief Institute affiliated scientist.

Divide and conquer: Genes decide who wins in the body's battle against cancer

Researchers funded by the Medical Research Council (MRC) have discovered for the first time that two proteins called Mahjong and Lgl could be star players in helping to identify how the body's own cells fight back against cancer cells. This discovery, publishing today in the online, open-access journal PLoS Biology, could lead to future treatments to make our healthy cells better-equipped to attack cancer cells, an entirely new concept for cancer research.

The team, who undertook the research at the MRC Laboratory for Molecular Cell Biology and Cell Biology Unit at University College London (UCL), have proven that normal cells and cancerous cells compete in a game of 'do or die'. If non-cancerous cells gain the advantage and entirely surround cancer cells, the cancer cells will die. If, however, the cancerous cells manage to break free, they will continue to divide and grow undisturbed. The study shows that the Lgl and Mahjong proteins play a key role in the cells' competitiveness, influencing the outcome over which cells will die. This kind of cell competition had previously been shown to occur in flies, however this is the first time it has been seen in mammals.

This discovery could potentially lead to new kinds of treatments for carcinomas, tumours which make up more than 80 per cent of all cancers. Carcinomas originate from the epithelial cells that make up tissues such as our lungs, glands and digestive system.

Dr Yasuyuki Fujita, group leader at MRC Laboratory for Molecular Cell Biology and Cell Biology Unit at UCL is thrilled by the results: "This is the first time that we have seen cancer cells being killed simply by being surrounded by healthy cells. If we can build on this knowledge and improve our understanding of how this happens, in the future we may be able to find a way to enhance this ability and develop a totally new way of preventing and treating cancer."

Basic science is critical to understanding the human body's natural resilience to diseases such as cancer and to guiding the development of future treatments. The MRC has a dedicated record of investment in science that links laboratory-based knowledge to clinical investigation.

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Competing interests statement: The authors declare that no competing interests exist.

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Whisker stimulation prevents strokes in rats, UCI study finds

Team working to determine if stimulating fingers, lips and face will work in humans

Talk about surviving by a whisker. The most common type of stroke can be completely prevented in rats by stimulating a single whisker, according to a new study by UC Irvine researchers.

Strokes are the No. 3 cause of death in the U.S., after heart disease and cancer. About 795,000 Americans suffer them annually, according to the American Heart Association, and more than 137,000 die as a result.

So should we be tickling our own whiskers? And what about women, who are less likely to have facial hair? While it’s too soon to tell if the findings will translate to humans, researchers say it’s possible, and stubble is not required. We have sensitive body parts wired to the same area of the brain as rodents’ fine-tuned whiskers. In people, “stimulating the fingers, lips or face in general could all have a similar effect,” says UCI doctoral student Melissa Davis, co-author of the study, which appears in the June issue of PLoS One.

“It’s gender-neutral,” adds co-author Ron Frostig, professor of neurobiology & behavior.

He cautions that the research, funded by the National Institutes of Health, is a first step, albeit an important one. “This is just the beginning of the whole story,” he says, “with the potential for maybe doing things before a victim even reaches the emergency room.”

A stroke usually happens when a main artery bringing oxygen and nutrients to the brain either ruptures or is blocked by a clot, causing partial brain death. The key to preventing strokes in rats whose main cerebral artery has been obstructed, UCI researchers found, is to stimulate the blood-starved brain area.

The team discovered that mechanically stroking just one whisker for four minutes within the first two hours of the blockage caused the blood to quickly flow to other arteries – like cars exiting a gridlocked freeway to find detours. But unlike freeway off-ramps, which can quickly clog, the alternate arteries expanded beyond their normal size, opening wide to allow critical blood flow to the brain. The technique was 100 percent effective in preventing strokes in rats with arterial obstruction.

UC San Diego neuroscientist David Kleinfeld, who has also studied brain structure and strokes, calls the results "unexpected and spectacular." Random stimulation of the rat whisker also worked, but timing was critical – waiting three hours to do so led to major brain cell death.

Scientists have struggled for years to find ways of preventing strokes or minimizing their effects, which include slurred speech, paralysis and brain damage. One drug can help some patients but also often causes bleeding in the brain. People believed to be suffering a stroke are currently told to lie still and stay calm in a quiet environment. Frostig says a good massage, listening to a song or otherwise stimulating the right nerve endings might work better.

Kleinfeld cautions that the rodent findings might not be relevant to humans. But with such clear evidence that strokes in rats were prevented, he says, "it would be criminal not to try" controlled human studies. That could be tricky, since it's not possible to predict when someone will have a stroke.

The UCI team – which also includes graduate student Christopher Lay and researcher Cynthia Chen-Bee – would like to find physicians or emergency medical technicians willing to try the technique on patients with early stroke symptoms.

Signs of stroke include:

**** Sudden numbness or weakness in face or limbs, especially on one side.***
**** Sudden confusion, trouble speaking or understanding.***
**** Sudden difficulty seeing or walking.***
**** Dizziness or loss of balance or coordination.***
**** Sudden, severe headache with no known cause.***

If you or someone you know experiences one or more of these symptoms, call 911. The first two hours are critical.

Japanese monkey deaths puzzle researchers

Researchers claim outbreaks of unknown haemorrhagic illness are no threat to humans.

By David Cyranoski

Scientists from Japan's premier primate research center are struggling to reassure the public that a mysterious illness killing their monkeys poses no threat to humans. Almost a decade after it first appeared, scientists from Kyoto University's Primate Research Institute (PRI) described the disease and their unsuccessful search for a cause in an online publication on July 1 and in a press release on July. 7 But their account leaves other researchers hungry for details.

In the first outbreak to hit the PRI in Inuyama, near Nagoya, between July 2001 and July 2002, seven Japanese macaques (Macaca fuscata) fell ill and six of them died from what the institute scientists provisionally call a "hemorrhagic syndrome." Symptoms included anorexia, lethargy, pallor and nasal hemorrhaging. Autopsies revealed bleeding in the lungs and intestines. Genetic, bacterial and toxicological tests failed to pinpoint a cause, and after the outbreak ran its course, operations at the institute returned to normal. But between March 2008 and April 2010, another 39 cases appeared in the same species. Of those, 25 died of the disease and 13 were humanely killed. Only one monkey survived each outbreak.

On July 1, an institute committee set up after the second outbreak published its findings in the online version of the Japanese-language journal Primate Research. The committee tested blood, feces and tissues from the diseased monkeys for six bacteria and 16 viruses. The tests, which included PCR analysis, turned up nothing that could explain the deaths. François Villinger, director of pathology at the Yerkes National Primate Research Center in Atlanta, Ga., says that Japanese laboratories tend to have excellent diagnostic capabilities: "Therefore I have confidence in the fact that the illness is probably not due to any of the known agents inducing hemorrhagic fevers."

PRI director Tetsuro Matsuzawa spoke out against suggestions in the local media that the disease could spread to humans or other animals. At the July 7 press conference, he stressed that none of the other primate species at the institute, which houses more than 1,200 animals from 13 species, including chimpanzees, marmosets and crab-eating macaques, has contracted the syndrome. The humans who handled the monkeys also

show no symptoms. "I don't like the headlines in the news media," he says. "We think that the hemorrhagic syndrome is due to a species-specific pathogen of the Japanese monkeys."

Matsuzawa says that the institute did not publish its findings earlier because it feared causing panic in the wider population. Cases are still occurring, but following the use of disinfectants and the isolation of sick monkeys, the pace has slowed to one case in May and one in June. Matsuzawa is holding back some data for a more detailed future publication and would not answer Nature's questions about whether his group is also probing possible environmental causes, which bacteria and viruses have been tested for, and what analysis of the two surviving monkeys has revealed.

By screening the 790 remaining Japanese macaques for other viruses and bacteria and running genetic tests, Matsuzawa hopes to pin down the cause of the syndrome and to create a test for early diagnosis. He says that he is looking for collaborators, and animal-pathogen researchers contacted by Nature are certainly eager to learn more about the illness. Primate disease specialist Sonia Altizer of the University of Georgia in Athens wonders whether any of the animals were recently captured in the wild, where they could have picked up the infection, and whether animals were housed singly or in groups. "Knowing the possible contacts between animals and the chronological pattern of illness or deaths might also help determine whether this was indeed an infectious agent, and the possible routes of transmission," she says.

She also asks what measures the human workers were taking before the outbreaks to minimize transmission of infectious agents between monkeys and humans. "Presumably there would be some pretty careful measures in place that would limit human exposure to any contaminant or pathogen," she says, "so saying that humans are not susceptible to me seems premature."

Obesity harms women's memory and brain function

First study to link obesity and body shape to poorer brain function in older women

CHICAGO --- The more an older woman weighs, the worse her memory, according to new research from Northwestern Medicine. The effect is more pronounced in women who carry excess weight around their hips, known as pear shapes, than women who carry it around their waists, called apple shapes.

The study of 8,745 cognitively normal, post-menopausal women ages 65 to 79 from the Women's Health Initiative hormone trials is the first in the United States to link obesity to poorer memory and brain function in women and to identify the body-shape connection.

"The message is obesity and a higher Body Mass Index (BMI) are not good for your cognition and your memory," said lead author Diana Kerwin, M.D., an assistant professor of medicine and a physician at Northwestern Medicine. "While the women's scores were still in the normal range, the added weight definitely had a detrimental effect."

For every one-point increase in a woman's BMI, her memory score dropped by one point. The women were scored on a 100-point memory test, called the Modified Mini-Mental Status Examination. The study controlled for such variables as diabetes, heart disease and stroke.

The study will be published July 14 in the Journal of the American Geriatric Society.

The reason pear-shaped women experienced more memory and brain function deterioration than apple-shaped women is likely related to the type of fat deposited around the hips versus the waist.

"Obesity is bad, but its effects are worse depending on where the fat is located," Kerwin said.

Cytokines, hormones released by the predominant kind of fat in the body that can cause inflammation, likely affect cognition, Kerwin said. Scientists already know different kinds of fat release different cytokines and have different effects on insulin resistance, lipids and blood pressure.

"We need to find out if one kind of fat is more detrimental than the other, and how it affects brain function," she said. "The fat may contribute to the formation of plaques associated with Alzheimer's disease or a restricted blood flow to the brain."

In the meantime, the new findings provide guidance to physicians with overweight, older female patients.

"The study tells us if we have a woman in our office, and we know from her waist-to-hip ratio that she's carrying excess fat on her hips, we might be more aggressive with weight loss," Kerwin said. "We can't change where your fat is located, but having less of it is better."

Kerwin's research is funded by the T. Franklin Williams Award from Atlantic Philanthropies and Association of Specialty Professors and the Wisconsin Women's Health Foundation Faculty Scholar Award. The Women's Health Initiative was funded by a grant from the National Heart, Lung and Blood Institute.

Doctors warn that using domestic spoons to give children medicine increases overdose risk

Study shows significant variations in spoon capacity

Medical experts have warned parents that using domestic spoons to dispense children's medicine could lead to overdoses after discovering that some hold two to three times as much as others.

The study in the August issue of IJCP, the International Journal of Clinical Practice, looked at 71 teaspoons and 49 tablespoons collected from 25 households in Attica, Greece.

It found that the capacity of the teaspoons ranged from 2.5ml to 7.3ml, with an average and median volume of 4.4ml. The capacity of the tablespoons ranged from 6.7ml to 13.4ml, with an average of 10.4ml and a median of 10.3ml.

"The variations between the domestic spoon sizes was considerable and in some case bore no relation to the proper calibrated spoons included in many commercially available children's medicines" says Professor Matthew E Falagas, Director of the Alfa Institute of Biomedical Sciences in Athens, Greece.

"A parent using one of the biggest domestic teaspoons would be giving their child 192 per cent more medicine than a parent using the smallest teaspoon and the difference was 100 per cent for the tablespoons. This increases the chance of a child receiving an overdose or indeed too little medication."

The 25 women who took part in the study were aged between 24 and 84 with an average age of 48. Most had between one and three different teaspoons and tablespoons in their house, but two women had as many as six different teaspoons and one of those also had five different tablespoons. "We not only found wide variations between households, we also found considerable differences within households" says Professor Falagas.

The researchers were also keen to see whether there were any differences when five of the women were asked to dispense liquid from a calibrated 5ml medicine spoon. They found that only one dispensed the correct dose of liquid, with three dispensing 4.8ml and one 4.9ml.

As a result of their findings, the researchers, from Athens and Boston, USA, are urging parents to use calibrated medicine syringes to dispense liquid medication to children. This method is also more effective if children are very young or reluctant to take medicine, as a spoon can be pushed away and spilt, leaving the parent unsure about how much the child has actually taken.

"Dosing and administering medication to children is different from adults" says Professor Falagas. "Paediatric dosages need to be adjusted to age and body weight and, as a result, children are considered to be more vulnerable to dosage errors than adults. "Our research clearly shows that using domestic teaspoons and tablespoons can result in children receiving considerably more or less medicine than they need.

"Low-cost medicine syringes are widely available from pharmacists, very easy to use and will give parents greater confidence that they have dispensed the correct dose."

The authors also suggest that adults avoid using domestic spoons for themselves.

"Although adults do not face the same risk levels as children, we would still advise them to use properly calibrated spoons or cups if they take any liquid medicine."

*The article is free online**:** **Inaccuracies in dosing drugs with teaspoons and tablespoons.** Falagas et al. IJCP. 64.9, pp1185-1189. (August 2010). DOI: 10.1111/j.1742-1241.2010.02402.x*

Toward making 'extended blood group typing' more widely available

Scientists are reporting an advance toward enabling more blood banks to adopt so-called "extended blood group typing," which increases transfusion safety by better matching donors and recipients. Their report on a new, automated genetic method for determining a broader range of blood types appears in ACS' Analytical Chemistry, a semi-monthly journal.

Christophe Marquette and colleagues explain that most blood banks still use a century-old blood approach to blood typing. It identifies blood group antigens on red blood cells -- proteins that must match in donor and recipient to avoid potentially serious transfusion reactions. Most blood currently is typed for only a few of the 29 known human blood groups, even though some rare blood groups can affect the outcome of a transfusion. Commercial technology does exist for extended typing with DNA tests. However, it is expensive, difficult to use, and suited more for research labs than high-volume blood centers, they state. Wide adoption of extended blood group typing, they note, requires a test that can handle the high volume of blood processed each year -- 14 million donations in the United States, for instance, and 20 million in Europe.

The study describes evaluation of the new more affordable method, called the HiFi Blood 96, which types blood with DNA testing in a high-speed automated procedure. Tests on 293 human blood samples demonstrated the performance and reliability of the new method. The report compares HiFi Blood 96 to existing commercial tests, and discusses improvements that are underway.

ARTICLE FOR IMMEDIATE RELEASE** **"Robust, High-Throughput Solution for Blood Group Genotyping"

Blind mice can 'see' thanks to special retinal cells

It would make the perfect question for the popular television show "Are You Smarter than a 5th Grader:" What parts of the eye allow us to see?

The conventional wisdom: rods and cones. The human retina contains about 120 million rods, which detect light and darkness, shape and movement, and about 7 million cones, which in addition detect color. Without them, or so we are taught, our eyesight simply would not exist.

But that might not be true, according to a study -- published July 15 in the journal Neuron -- that provides new hope to people who have severe vision impairments or who are blind.

A team led by biologist Samer Hattar of The Johns Hopkins University's Krieger School of Arts and Sciences found that mice that didn't have any rods and cones function could still see -- and not just light, but also patterns and images -- courtesy of special photosensitive cells in the rodents' retinas. Until now, it was presumed that those cells, called intrinsically photosensitive Retinal Ganglion Cells, (or ipRGCs), didn't play a role in image formation, but instead served other functions, such as dictating when the animals went to sleep or woke up. (All mammals, including humans, have ipRGCs, as well as rods and cones.)

"Up until now, it was assumed that rods and cones were the only cells capable of detecting light to allow us to form images," said Hattar, who as an assistant professor in the Department of Biology, studies mammals' sleep-wake cycles, also called "circadian rhythms." "But our study shows that even mice which were blind could form low-acuity yet measurable images, using ipRGCs. The exciting thing is that, in theory at least, this means that a blind person could be trained to use his or her ipRGCs to perform simple tasks that require low visual acuity."

"Visual acuity" refers to the sharpness or clarity of a person's (or animal's) vision. Someone with so-called "20/20 vision" can see clearly at a distance of 20 feet what the "average" human being can see at that distance. In contrast, a person with "20/100" vision would have to stand 20 feet away from, for instance, an eye chart that the average person could read from 100 feet away. People with very low visual acuity (worse than "20/100" with corrective lenses) are considered "legally blind."

In addition to providing hope for people with serious vision problems, Hattar's findings hint that, in the past, mammals may have used their ipRGCs for sight/image formation, but during the course of evolution, that function was somehow taken over by rods and cones.

The study also concludes that, far from being homogenous, ipRGCs come in five different subtypes, with the possibility that each may have different light-detecting physiological functions.

To conduct the study, the team used a special system to genetically label cells and then "trace" them to the rodents' brains before subjecting the mice to a number of vision tests. In one, mice followed the movements of a rotating drum, a test that assessed the animals' ability to track moving objects. In another, the rodents were placed within a "Y"-shaped maze and challenged to escape by selecting the lever that would let them out. That lever was associated with a certain visual pattern. The mice that were blind -- they lacked rods, cones and ipRGCs -- couldn't find that lever. But those with only ipRGCs could.

"These studies are extremely exciting to me, because they show that even a simple light-detecting system like ipRGCs has incredible diversity and may support low-acuity vision, allowing us to peer into evolution to understand how simple vision may have originally evolved before the introduction of the fancy photoreceptors rods and cones," Hattar said.

Hattar's team worked on this study in collaboration with groups led by David Berson of Brown University and Glen Prusky of Weill Cornell Medical College. It was supported by grants from the National Institutes of Health, the David and Lucile Packard Foundation and the Alfred P. Sloan Foundation.

Scientists discover human sperm gene is 600 million years old

What do a trout, sea anemone, rooster, fly and man have in common?

CHICAGO --- Just as styles in sexy clothes or fashion change from year to year and culture to culture, "sexy" genes, or genes specific to sex, also change rapidly. But there is one sex-specific gene so vital, its function has remained unaltered throughout evolution and is found in almost all animals, according to new research from Northwestern University Feinberg School of Medicine.

The gene, called Boule, is responsible for sperm production. Northwestern scientists also discovered in their research that Boule appears to be the only gene known to be exclusively required for sperm production from an insect to a mammal.

"This is the first clear evidence that suggests our ability to produce sperm is very ancient, probably originating at the dawn of animal evolution 600 million years ago," said Eugene Xu, assistant professor of obstetrics and gynecology at Feinberg. "This finding suggests that all animal sperm production likely comes from a common prototype."

Xu is senior author of a paper on the study that will be published July 15 in PLoS Genetics.

The discovery of Boule's key role in perpetuating animal species offers a better understanding of male infertility, a potential target for a male contraceptive drug and a new direction for future development of pesticides or medicine against infectious parasites or carriers of germs.

"Our findings also show that humans, despite how complex we are, across the evolutionary lines all the way to flies, which are very simple, still have one fundamental element that's shared," Xu said.

"It's really surprising because sperm production gets pounded by natural selection," he said. "It tends to change due to strong selective pressures for sperm-specific genes to evolve. There is extra pressure to be a super male to improve reproductive success. This is the one sex-specific element that didn't change across species. This must be so important that it can't change."

Boule is likely the oldest human sperm-specific gene ever discovered, Xu said. He originally discovered the human gene in 2001. Prior to the new findings, it was not known whether sperm produced by various animal species came from the same prototype. Birds and insects both fly, for example, but the fly wing and bird wing originated completely independently.

For the study, Xu searched for and discovered the presence of the Boule gene in sperm across different evolutionary lines: human, mammal, fish, insect, worm and marine invertebrate.

In order to search for Boule's presence across the spectrum of evolutionary development, Xu had an interesting shopping list. He needed sperm from a sea urchin, a rooster, a fruit fly, a human and a fish. The fish proved to be the most difficult.

Xu purchased a rainbow trout at a Chicago fish market, unwrapped it and was dismayed to discover it had been gutted. "I need the testicles!" he exclaimed to the seafood salesman. Xu decided he'd have to catch his own. He cast a fishing line into a recreational pond stocked with trout and reeled in a rainbow trout.

Discovery of this common gene involved in sperm production could have many practical uses for human health, including male contraception. When Xu's research group knocked out the Boule gene from a mouse, the animal appeared to be healthy but did not produce sperm.

"A sperm-specific gene like Boule is an ideal target for a male contraceptive drug," Xu noted.

Boule also has the potential to reduce diseases caused by mosquitoes and parasites such as worms.

"We now have one strong candidate to target for controlling their breeding," Xu said. "Our work suggests that disrupting the function of Boule in animals most likely will disrupt their breeding and put the threatening parasites or germs under control. This could represent a new direction in our future development of pesticides or medicine against infectious parasites or carriers of germs."

To further support his hypothesis that Boule is widespread across all animals producing sperm and eggs, Xu also examined the genome of one of the most primitive animals, a sea anemone, for the presence of Boule. He looked at its genome because the sperm of the sea anemone is difficult to find and few labs study the animal. When Xu identified Boule in the sea anemone genome, his theory was clinched.

Xu's co-authors, all past or present members of his lab, include Chirag Shah, Michael VanGompel, Villian Naeem, Yanmei Chen, Terrance Lee, Nicholas Angeloni and Yin Wang.

Xu's research was supported by the National Institutes of Health and Northwestern Memorial Foundation.

Heart of darkness could explain sun mysteries

*** 14 July 2010 by Eugenie Samuel Reich**

IS DARK matter lurking at the centre of our bright sun? Yes, say two research groups who believe the elusive stuff is cooling the solar core.

The insight doesn't significantly affect the sun's overall temperature. Rather, a core chilled by dark matter would help explain the way heat is distributed and transported within the sun, a process that is poorly understood.

Dark matter doesn't interact with light and so is invisible. The only evidence for its existence is its gravitational effects on other objects, including galaxies. These effects suggest dark matter makes up about 80 per cent of the total mass of the universe.

The idea that it might lurk at the heart of the sun goes back to the 1980s, when astronomers found that the number of ghostly subatomic neutrinos leaving the sun was only about a third of what computer simulations suggested it should be. Dark matter could have explained the low yield because it would absorb energy, reducing the rate of the fusion reactions that produce neutrinos.

However, the problem was solved another way when it was found that neutrinos oscillate between three kinds, only one of which was being detected on Earth. As a result, the idea of solar dark matter was dropped.

Now it is being resurrected in the light of recent searches for dark matter, which have put limits on the mass of the particles that it is made of and shown that it interacts only very weakly with ordinary matter. These led

Stephen West of Royal Holloway, University of London, and his colleagues to explore what would happen if particles that fell within these limits exist in the sun.

Their simulations show that gravity would pull such dark particles to the centre of the sun, where they would absorb heat. Some of these dark matter particles would then carry this heat from the core to the surface, decreasing the core temperature (www.arxiv.org/abs/1005.5102).

Similar, earlier work published this week by Mads Frandsen and Subir Sarkar of the University of Oxford also supports the idea that dark matter in the sun would cool the core (Physical Review Letters, DOI: 10.1103/physrevlett.105.011301). Their calculations used a dark matter particle with a mass of 5 gigaelectronvolts - lighter than the one in West's simulations.

Frandsen points out that this would make the dark matter particle about five times as heavy as a proton or neutron - which is consistent with the observation that there seems to be around five times as much dark matter as ordinary matter in the universe. "This is a very interesting dark matter candidate because it gives us a way to understand the ratio of matter to dark matter," he says.

Sarkar and Frandsen say that their solar dark matter particle also resolves another problem. Heat energy travels in the sun by conduction and radiation around the core, and by convection nearer the surface, but the position of the so-called convective boundary between these regions is disputed.

Simulations based on the sun's composition suggest that the boundary is further out than is indicated by sound waves detected on the surface of the sun, which are affected by the position of this boundary. Sarkar and Frandsen say that including their proposed dark matter particle in the simulations would bring this boundary inwards, resulting in closer agreement between simulations and observation.

Not everyone is convinced. Joyce Guzik, West's collaborator at Los Alamos National Laboratory in New Mexico, points out that while there is a problem with current models of the sun, the difficulty is that these models already give a lower solar temperature than the one observed. Adding a chilling effect at the core only makes this discrepancy harder to resolve.

We may not have to wait long to find out whether there is dark matter in the sun. Both research groups agree that if there is core cooling, it should reduce the output of some kinds of solar neutrinos by around 10 per cent. It should be possible to check for this reduction when neutrino detectors in Canada and Italy become able to collect more sensitive data.

THE sun may not be the only star with a potentially dark heart. We could soon find out whether dark matter helped form the enormous stars that turned into the supermassive black holes at the centre of most galaxies.

The origin of such black holes is a mystery. One theory says they are the remnants of the universe's first stars, thought to have formed inside massive dark matter clouds. These stars may have had cores rich in dark matter particles of a type that would have annihilated one another in bursts of radiation. This extra power could have allowed these stars to grow larger than ordinary ones, resulting in the formation of supermassive black holes when the stars died. But it was not clear whether there was any hope of detecting dark stars.

Then in June, a study led by Katherine Freese of the University of Michigan in Ann Arbor indicated that dark stars could attain up to 10 million times the sun's mass (The Astrophysical Journal, DOI: 10.1088/0004-637X/716/2/1397).

In a subsequent study, Erick Zackrisson of Stockholm University in Sweden and colleagues have worked out the apparent brightness of such stars. They conclude that they should be within sight of NASA's infrared James Webb Space Telescope, due to be launched in 2013 (www.arxiv.org/abs/1006.0481).

The first malaria-proof mosquito

Scientists at the University of Arizona have achieved a breakthrough in the fight against malaria: a mosquito that can no longer give the disease to humans

For years, researchers worldwide have attempted to create genetically altered mosquitoes that cannot infect humans with malaria. Those efforts fell short because the mosquitoes still were capable of transmitting the disease-causing pathogen, only in lower numbers.

Now for the first time, University of Arizona entomologists have succeeded in genetically altering mosquitoes in a way that renders them completely immune to the parasite, a single-celled organism called Plasmodium. Someday researchers hope to replace wild mosquitoes with lab-bred populations unable to act as vectors, i.e. transmit the malaria-causing parasite.

"If you want to effectively stop the spreading of the malaria parasite, you need mosquitoes that are no less than 100 percent resistant to it. If a single parasite slips through and infects a human, the whole approach will be doomed to fail," said Michael Riehle, who led the research effort, the results of which will be published July 15 in the journal Public Library of Science Pathogens. Riehle is a professor of entomology in the UA's College of Agriculture and Life Sciences and is a member of the BIO5 Institute.

Riehle's team used molecular biology techniques to design a piece of genetic information capable of inserting itself into a mosquito's genome. This construct was then injected into the eggs of the mosquitoes. The emerging generation carries the altered genetic information and passes it on to future generations. For their experiments, the scientists used Anopheles stephensi, a mosquito species that is an important malaria vector throughout the Indian subcontinent.

The researchers targeted one of the many biochemical pathways inside the mosquito's cells. Specifically, they engineered a piece of genetic code acting as a molecular switch in the complex control of metabolic functions inside the cell. The genetic construct acts like a switch that is always set to "on," leading to the permanent activity of a signaling enzyme called Akt. Akt functions as a messenger molecule in several metabolic functions, including larval development, immune response and lifespan.

When Riehle and his co-workers studied the genetically modified mosquitoes after feeding them malaria-infested blood, they noticed that the Plasmodium parasites did not infect a single study animal.

"We were surprised how well this works," said Riehle. "We were just hoping to see some effect on the mosquitoes' growth rate, lifespan or their susceptibility to the parasite, but it was great to see that our construct blocked the infection process completely."

Of the estimated 250 million people who contract malaria each year, 1 million – mostly children – do not survive. Ninety percent of the number of fatalities, which Riehle suspects to be underreported, occur in Sub-Saharan Africa. Each new malaria case starts with a bite from a vector – a mosquito belonging to the genus Anopheles. About 25 species of Anopheles are significant vectors of the disease.

Only the female Anopheles mosquitoes feed on blood, which they need to produce eggs. When they bite an infected human or animal, they ingest the malaria parasite.

Once the Plasmodium cells find themselves in the insect's midgut, they spring into action. They leave the insect's digestive tract by squeezing through the midgut lining. The vast majority of Plasmodium cells do not survive this journey and are eliminated by the mosquito's immune cells. A tiny fraction of parasite cells, usually not more than a handful, make it and attach themselves on the outside of the midgut wall where they develop into brooding cells called oocysts.

Within 10-12 days, thousands of new Plasmodium cells, so-called sporozoites, sprout inside the oocyst. After hatching from the oocyst, the sporozoites make their way into the insect's salivary glands where they lie in wait until the mosquito finds a victim for a blood meal. When the mosquito bites, some sporozoites are flushed into the victim's bloodstream. "The average mosquito transmits about 40 sporozoites when it bites," said Riehle, "but it takes only one to infect a human and make a new malaria victim."

Several species of Plasmodium exist in different parts of the world, all of which are microscopically small single-celled organisms that live in their hosts' red blood cells. Each time the parasites undergo a round of multiplication, their host cells burst and release the progeny into the bloodstream, causing the painful bouts of fever that malaria is known and feared for.

Malaria killed more soldiers in the Civil War than the fighting, according to Riehle. In fact, malaria was prevalent in most parts of the U.S. until the late 1940s and early 1950, when DDT spraying campaigns wiped the vectors off the map. Today, a new case of malaria occurs in the U.S. only on rare occasions.

The severity of the disease depends very largely on the species of the Plasmodium parasite the patient happens to contract. "Only two species of Plasmodium cause the dreaded relapses of the disease," said Riehle. "One of them, Plasmodium vivax, can lie dormant in the liver for 10 to 15 years, but now drugs have become available that target the parasites in the liver as well as those in the blood cells."

That said, there are no effective or approved malaria vaccines. A few vaccine candidates have gone to clinical trials but they were shown to either be ineffective or provide only short-term protection. If an effective vaccine were to be developed, distribution would be a major problem, Riehle said.

Researchers and health officials put higher hopes into eradication programs, which aim at the disease-transmitting mosquitoes rather than the pathogens that cause it.

"The question is 'What can we do to turn a good vector into a bad vector?'" Riehle said.

"The eradication scenario requires three things: A gene that disrupts the development of the parasite inside the mosquito, a genetic technique to bring that gene into the mosquito genome and a mechanism that gives the modified mosquito an edge over the natural populations so they can displace them over time."

"The third requirement is going to be the most difficult of the three to realize," he added, which is why his team decided to tackle the other two first.

"It was known that the Akt enzyme is involved in the mosquito's growth rate and immune response, among other things," Riehle said. "So we went ahead with this genetic construct to see if we can ramp up Akt function and help the insects' immune system fight off the malaria parasite."

The second rationale behind this approach was to use Akt signaling to stunt the mosquitoes' growth and cut down on its lifespan. “In the wild, a mosquito lives for an average of two weeks," Riehle explained. "Only the oldest mosquitoes are able to transmit the parasite. If we can reduce the lifespan of the mosquitoes, we can reduce the number of infections."

His research team discovered that mosquitoes carrying two copies of the altered gene had lost their ability to act as malaria vectors altogether. "In that group of mosquitoes, not a single Plasmodium oocyst managed to form."

At this point, the modified mosquitoes exist in a highly secured lab environment with no chance of escape. Once researchers find a way to replace wild mosquito populations with lab-bred ones, breakthroughs like the one achieved by Riehle's group could pave the way toward a world in which malaria is all but history.

This study was funded by the National Institutes of Health.

Reference: Corby-Harris et al. Activation of Akt Signaling Reduces the Prevalence and Intensity of Malaria Parasite Infection and Lifespan in Anopheles stephensi Mosquitoes. Public Library of Science (PLoS) Pathogens, July 2010 issue: www.plospathogens.org

Small fish exploits forbidding environment

Jellyfish moved into the oceans off the coast of southwest Africa when the sardine population crashed. Now another small fish is living in the oxygen-depleted zone part-time and turning the once ecologically dead-end jellyfish into dinner, according to an international team of scientists.

This is a bearded Goby from the ocean off the southwest coast of Africa. **Victoria Braithwaite; Penn State**

"Originally there were sardines in the area but over fishing caused the sardine population to collapse in the 1960s and 1970s," said Victoria A. Braithwaite, professor of fisheries and biology, Penn State. "The sardines never recovered and jellyfish became a huge and serious problem, eating what the sardines had eaten."

Jellyfish are considered a dead end food source because, while they eat lots of small fish and other sea creatures, they have few predators. However, the research team found that the bearded goby, Sufflogobius bibarbatus, a 4-to-6-inch long, 1.5 inch-wide fish, eats jellyfish. Larger fish like hake and mackerel, sea mammals like sea lions and porpoises, and sea birds, like gannets and gulls, eat gobies, putting jellyfish back into the food cycle.

"We don't know if they are eating dead jellyfish from the bottom, or if they are coming up to oxygen-filled layers to eat jellyfish, but they are eating jellyfish," said Braithwaite.

Even stranger than a jellyfish diet is the gobies' use of the dead zone in the area. One reason there were so many sardines and now so many jellyfish is a large area of up-welling water off the southwest coast of Africa from Namibia to South Africa. This deep cold water brings with it large amounts of nutrients. When plankton voraciously eat the nutrients, their populations increase massively. Excess nutrients and dead plankton then fall to the ocean floor.

"A horrible toxic sludge forms, and very few things can live in it except for some bacteria and nematodes," said Braithwaite. "Somehow the gobies can withstand the toxic environment, but we don't know exactly how they are doing it." Remarkably, the gobies cope without oxygen for hours at a time while they rest on the muddy seabed but remain alert. "When we touch them with a rod, they show rapid escape responses," said Braithwaite.

Gobies can stay in the anoxic or oxygen-depleted area for at least 10 to 12 hours at a time. The researchers suggest they may be able to remain there even longer. The mud is not just lacking oxygen, but the bacteria that live there use sulfur for energy and produce high levels of hydrogen sulfide, a toxic gas. The researchers report the results of their study in today's (July) 16 issue of Science.

"Normally, other animals cope with anoxia by anaerobic respiration, which causes a build up in lactate," said Braithwaite. "But something else is going on in these gobies as the lactate build up declines after an hour or so without oxygen. Our next step is to look to see what they are doing to cope with anoxia."

For the goby, the anoxic, toxic mud is a perfect hiding place because no predators are willing to enter that environment. The gobies, however, are happy fish in the mud. "It is a win-win situation where the gobies are using a resource that is usually a dead end in the ocean, the jellyfish," said Braithwaite. "And they are using the toxic mud as a refuge. Together this seems to explain why their population is growing despite the fact that they are now being the main prey species in this unusual ecosystem."

Other researchers on the project were Anne C. Utne-Palm, Anne G.V. Salvanes, Matthias Hundt and Karin Pittman, University of Bergen, Norway; Bronwen Currie, National Marine Information and Research Centre, Namibia; Stein Kaartvedt, King Abdullah University of Science and Technology, Saudi Arabia; Göran E. Nilsson, Jonathan A. W. Stecyk, Guro K. Sandvik, Ida G. Lund, Rønnaug A.U. Strandabø and Thor A. Klevjer, University of Oslo, Norway; Megan van der Bank, Bradley Flynn and Mark J. Gibbons, University of Western Cape, South Africa; Andrew K. Sweetman, Norwegian Institute for Water Research,

Bergen, Norway; Volker Brüchert, Stockholm University, Sweden; and Kathleen R. Peard, Ministry of Fisheries and Marine Resources, Namibia. The South African Research Council and the Research Council of Norway supported this work.

Bright stars of the brain regulate breathing

Astrocytes - brain cells named after their characteristic star-shape and previously thought to act only as the 'glue' between neurons, have a central role in the regulation of breathing, according to scientists.

The finding provides a new dimension for research into fundamental principles of brain organization and function and may be relevant for understanding causes of devastating conditions associated with respiratory failure such as Sudden Infant Death Syndrome.

The research, funded by the Wellcome Trust and published today in Science Express, was carried out by scientists at UCL and the University of Bristol. They demonstrate that brain astrocytes are able to sense the levels of carbon dioxide in the blood. They then activate brain neuronal respiratory networks to increase our breathing in accord with prevailing metabolism and activity.

Astrocytes are a subtype of a group of brain cells known as glia (which means 'glue' in Greek). Glial cells are the most abundant cells in the human brain – outnumbering neurons by a factor of ten to one. Until very recently, glial cells have been thought to be the less exciting sisters of neurones, merely providing them with structural and nutritional support.

Now, astrocytes have been found to have a unique ability to "taste" the composition of arterial blood entering the brain by sensing increases in arterial levels of carbon dioxide. When activated they release a chemical messenger called ATP which stimulates brain respiratory centres to increase our breathing in order for extra carbon dioxide to be removed from the blood and exhaled.

This observation places astrocytes at the centre of a fundamental regulatory reflex which subconsciously continually adjusts our breathing according to ever changing metabolic and behavioural needs.

Dr Alexander Gourine, a Wellcome Trust Senior Research Fellow in the UCL Department of Neuroscience, Physiology and Pharmacology, who led the study, said: "This research identifies brain astrocytes as previously unrecognized crucial elements of the brain circuits controlling fundamental bodily functions vital for life, such as breathing, and indicates that they are indeed the real stars of the brain.

"This basic science information has to be used rapidly in order to determine whether glial dysfunction contributes to serious disorders of central control of breathing underlying Sudden Infant Death Syndrome and/or congenital central hypoventilation syndrome (Ondine's curse). If this hypothesis is correct astrocytes may be considered as potential targets for therapy in preventing respiratory failure".

The research was carried out in rats using revolutionary gene transfer techniques that allow scientists to observe and control the activity of astrocytes in living brains using light.

Notes for Editors

1. For more information or to interview Dr Alexander Gourine, please contact Clare Ryan in the UCL Media Relations Office on tel: +44 (0)20 7679 9726, mobile: +44 07747 565 056, out of hours +44 (0)7917 271 364, e-mail: clare.ryan@ucl.ac.uk.

2. 'Astrocytes Control Breathing Through pH-dependent Release of ATP' is published in Science Express. Journalists can obtain copies of the paper by contacting UCL Media Relations.

Air pollution could increase risk of suicide

*** 17:48 15 July 2010 by Peter Aldhous**

Air pollution doesn't just make it hard to breathe – it may also increase the risk that people will take their own lives.

A new study in seven cities across South Korea has uncovered a clear association between suicide and spikes of particulate pollution. Meanwhile, researchers who in the 1990s linked air pollution to asthma in a large group of Taiwanese children have now found that those with the condition were subsequently more likely to have killed themselves. Suicide is a big problem for South Korea, where the rate per 100,000 people rose from 14 in 1996 to 23 in 2006 – the largest increase in the developed world.

Soot and suicide

To examine the role of pollution, researchers led by Chang Soo Kim of Yonsei University in Seoul linked records of more than 4000 suicides to measurements of PM10 – airborne particles with a diameter of 10 micrometres or less, which include the soot from vehicle exhausts.

Kim's team found that suicides were more common in the two days following a spike in pollution. They considered PM10 measurements on a scale from the highest and lowest levels recorded, calculating that people were 9 per cent more likely to kill themselves following a spike in pollution rising across the middle 50 per cent of recorded values. For people with cardiovascular disease, which has already been linked with particulate pollution, the increase was almost 19 per cent.

South Korea's cities, like many in Asia, are badly blighted by air pollution, and it is unclear whether the effect would be so dramatic in cities that have tighter pollution controls. "Further investigations of low-level exposure to particular matter are needed," says Kim.

Breath and mind

The Korean study appears alongside one from a team led by Ying-Chin Ko of Khaohsiung Medical University in Taiwan. In the late 1990s, Ko and his colleagues found that high levels of air pollution were associated with asthma in more than 160,000 schoolchildren.

Following up the same group more than a decade later, the researchers show that suicides were more than twice as common among those with asthma – and the more severe their symptoms at the start of the study, the higher the risk.

Scientists have only recently started to study the relationship between respiratory disease and mental health, says David Callahan at the Centers for Disease Control and Prevention in Atlanta, Georgia. Last year, his team revealed that 7.5 per cent of people with asthma in the US reported suffering serious psychological distress, compared with just 3 per cent of the population as a whole.

That's a concern, Callahan explains, because people with depression are known to be worse at managing chronic diseases by taking prescribed drugs and following other medical advice – potentially causing a spiral of physical and mental deterioration. "Now it is recognised that there is a relationship, we need to work out the chain of causality and the opportunity for intervention," he says.

Where air pollution is involved, the problem may not only be that as people's physical symptoms worsen, they become more distressed. Kim suggests that PM10s may also cause nerve inflammation, affecting mental health through a direct biological mechanism.

Journal references: American Journal of Psychiatry, Kim, DOI: 10.1176/appi.ajp2010.09050706, Ko, DOI: 10.1176/appi.ajp.2010.09101455

New Arsenic Nanoparticle Blocks Aggressive Breast Cancer

New technology targets cancer prevalent in young women

By Marla Paul

CHICAGO - You can teach an old drug new chemotherapy tricks. Northwestern University researchers took a drug therapy proven for blood cancers but ineffective against solid tumors, packaged it with nanotechnology and got it to combat an aggressive type of breast cancer prevalent in young women, particularly young African-American women.

That drug is arsenic trioxide, long part of the arsenal of ancient Chinese medicine and recently adopted by Western oncologists for a type of leukemia. The cancer is triple negative breast cancer, which often doesn't respond well to traditional chemotherapy and can't be treated by potentially life-saving targeted therapies. Women with triple negative breast cancer have a high risk of the cancer metastasizing and poor survival rates.

Prior to the new research, arsenic hadn't been effective in solid tumors. After the drug was injected into the bloodstream, it was excreted too rapidly to work. The concentration of arsenic couldn't be increased, because it was then too toxic.

A new arsenic nanoparticle -- designed to slip undetected through the bloodstream until it arrives at the tumor and delivers its poisonous cargo -- solved all that. The nanoparticle, called a nanobin, was injected into mice with triple negative breast tumors. Nanobins loaded with arsenic reduced tumor growth in mice, while the non-encapsulated arsenic had no effect on tumor growth. The arsenic nanobins blocked tumor growth by causing the cancer cells to die by a process known as apoptosis.

The nanobin consists of nanoparticulate arsenic trioxide encapsulated in a tiny fat vessel (a liposome) and coated with a second layer of a cloaking chemical that prolongs the life of the nanobin and prevents scavenger cells from seeing it. The nanobin technology limits the exposure of normal tissue to the toxic drug as it passes through the bloodstream. When the nanobin gets absorbed by the abnormal, leaky blood vessels of the tumor, the nanoparticles of arsenic are released and trapped inside the tumor cells.

"The anti-tumor effects of the arsenic nanobins against clinically aggressive triple negative breast tumors in mice are extremely encouraging," said Vince Cryns, associate professor of medicine and an endocrinologist at Northwestern Medicine and a member of the Robert H. Lurie Comprehensive Cancer Center of Northwestern University. "There's an urgent need to develop new therapies for poor prognosis triple negative breast cancer."

Cryns and Tom O'Halloran, director of the Chemistry of Life Processes Institute at Northwestern, are senior authors of a paper on the research, which will be published July 15 in Clinical Cancer Research and featured on the journal cover. Richard Ahn, a student in the medical scientists training program at Northwestern, is lead author.

"Everyone said you can't use arsenic for solid tumors," said O'Halloran, also associate director of basic sciences at the Lurie Cancer Center. "That's because they didn't deliver it the right way. This new technology delivered the drug directly to the tumor, maintained its stability and shielded normal cells from the toxicity. That's huge."

The nanoparticle technology has great potential for other existing cancer drugs that have been shelved because they are too toxic or excreted too rapidly, Cryns noted. "We can potentially make those drugs more effective against solid tumors by increasing their delivery to the tumor and by shielding normal cells from their toxicity," he said. "This nanotechnology platform has the potential to expand our arsenal of chemotherapy drugs to treat cancer."

"Working with both professors O'Halloran and Cryns has enabled us to develop the nanobins and hopefully create a new platform for the effective treatment of triple negative breast cancer," Ahn said. "Having both a basic science mentor and breast cancer mentor is ideal training for me as a future physician-scientist."

Looking ahead, the challenge now is to refine and improve the technology. "How do we make it more toxic to cancer cells and less toxic to healthy cells?" asked Cryns, also the director of SUCCEED, a Northwestern Medicine program to improve the quality of life for breast cancer survivors.

Northwestern scientists are working on decorating the nanobins with antibodies that recognize markers on tumor cells to increase the drug's uptake by the tumor. They also want to put two or more drugs into the same nanobin and deliver them together to the tumor.

"Once you fine-tune this, you could use what would otherwise be a lethal or highly toxic dose of the drug, because a good deal of it will be directly released in the tumor," O'Halloran said.

The research was supported by the National Cancer Institute-funded Northwestern University Center of Cancer Nanotechnology Excellence. Northwestern has one of seven such centers in the United States.

Study: Skilled immigrants boost US innovation

A study published in the latest issue of the Journal of Labor Economics finds that highly skilled temporary immigrants boost technological innovation in the U.S. without displacing U.S.-born workers in the process.

The study, by William Kerr of the Harvard Business School and William Lincoln of the University of Michigan, looked at fluctuations over the last 15 years in the number of immigrants admitted to the U.S. under the H-1B visa program, which governs immigration of highly skilled temporary workers. The researchers found that when more H-1B visas are granted, the number of U.S. patent applications filed by people with Chinese and Indian names increased substantially in cities and firms dependent upon the program. Much of that increase can be attributed to H-1B immigrants.

Meanwhile, the number of applications filed by people with Anglo-Saxon names—a proxy for U.S.-born workers—did not vary with fluctuations in H-1B admissions. “We conclude that total invention increased with higher [H-1B] admissions primarily through the direct contributions of immigrant inventors," the authors write. "We are also able to rule out displacement [of native workers]."

The study used data gathered from 1995 to 2008. Patent applications do not record inventors' nationalities, so the researchers used an algorithm to determine probable nationalities based on the inventors' names. They then compared those data with the number of H-1B visas granted in a given year. The number of visas fluctuated widely over the study period, due to changes in a government-mandated cap on the program. At its lowest, visas were capped at 65,000 per year, and peaked at 195,000.

"This study quantifies the impact of changes in H-1B admission levels on the pace and character of U.S. invention …," the authors write. "We hope that this assessment aids policy makers in their current decisions about appropriate admission rates in the future."

William R. Kerr and William F. Lincoln, "The Supply Side of Innovation: H‐1B Visa Reforms and U.S. Ethnic Invention." Journal of Labor Economics 28:3 (July 2010).

Chew on this: thank cooking for your big brain

*** 16 July 2010 by Catherine Brahic, Portland, Oregon**

THE French have elevated it to an art form, and even the British have got better at it - but chimps can't cook at all. According to one controversial evolutionary theory, early humans developed a taste for cooked food around 2 million years ago, and this set in motion a series of changes that made us utterly different from any other animal. Now the proponents of the cooked-food hypothesis are presenting fresh evidence in support of the idea - and it all comes down to how you chew.

The theory, championed by Richard Wrangham at Harvard University, has divided palaeoanthropologists. In an attempt to convince the doubters, Wrangham and his colleagues have been amassing empirical evidence, including evolutionary adaptations consistent with a diet of heated food, such as the small size of our guts.

At the Evolution 2010 conference in Portland, Oregon, at the end of June, Christopher Organ of Harvard and Brown University in Providence, Rhode Island, presented what he and Wrangham say is the best evidence yet

that we are adapted to eating cooked food, and that this is the result of events that occurred early on in human evolution.

Organ and Charles Nunn, also of Harvard, had predicted that if humans are uniquely adapted to eating cooked food, then we should spend far less time chewing than other primates, as cooked food tends to be softer than raw food. To test this, they gathered data from various primate species and looked at the correlation between chewing time and body size, taking into account how the different species were related to each other.

A primate species of our size should, in theory, spend 48 per cent of the waking day chewing, they found. Yet on average we chew for less than 10 per cent of the day, says Organ.

The pair then did a comparison of molar size and found that humans fall well outside the normal range for primates: we have small molars for our body size. When they included teeth from fossils of extinct hominins, the analysis revealed that Homo habilis and its contemporary H. rudolfensis fit well with the average for similarly sized primates. But Neanderthals and our direct ancestor, H. erectus, had small teeth for their body size.

This confirms what palaeoanthropologists have long known, says Leslie Aiello, president of the Wenner Gren Foundation for Anthropological Research in New York. "In H. erectus the molars are considerably smaller than in the earlier hominids," she says. "It's something that nobody has been able to explain."

For Wrangham, cooking is the explanation. Around 1.8 to 2 million years ago, he says, H. erectus or perhaps an immediate ancestor acquired a taste for food that had accidentally fallen into a fire. These early humans then learned to use fire for cooking, unwittingly getting more nourishment as a result.

Because the cell walls in cooked food are already partially broken down, it needs less chewing and is easier to digest. Wrangham argues the additional energy humans gained allowed them to evolve bigger brains and build complex social relationships. He points out that the fossil record suggests the size of hominin brains grew rapidly around this time.

Still, other explanations cannot be ruled out, such as a transition to meat-eating 1.5 to 2 million years ago. Although raw meat is hard to digest, early humans may have been able to extract more energy with less chewing if they had pounded the meat or focused on eating softer, richer tissues like the liver and heart.

The key stumbling block for the theory that our early ancestors cooked their food is that as yet there is no convincing evidence that hominins could control fire more than a million years ago. The oldest direct evidence for fire at a site of human habitation only goes back to 790,000 years ago at Gesher Benot Ya'agov in Israel, where charred flints, seeds and stone tools have been found, says Richard Potts of the Smithsonian Institution in Washington DC.

Aiello says that if Wrangham is right, cooking hearths would have had to be widespread around 1.5 to 2 million years ago, otherwise "it would have been an 'oh shit' moment when the fire went out and our ancestors had to wait 10,000 years to get fire again," she says.

Single star count ups odds of ET

*** 17:48 16 July 2010 by David Shiga**

Solitary suns like ours are not as rare as we once thought, boosting the likelihood that there are other life-friendly solar systems in the universe.

It is not always easy to tell if a star has a companion, since they are often too close together to distinguish as separate objects with a telescope. But astronomers can look for other clues, such as periodic changes in the star system's light spectrum caused by the motion of the stars as they orbit one another.

Previous surveys had suggested that most systems containing a star the same mass as our sun have two or more stars orbiting each other, in contrast to our solar system. Now that has been thrown into doubt.

When Deepak Raghavan of Georgia State University in Atlanta and colleagues looked at 454 sun-like stars, they found that 56 per cent were single like our sun and just 44 per cent had a stellar companion. Their study will be published in The Astrophysical Journal.

Stable singles

The team's finding is at odds with a survey completed in 1991, which found that the majority of systems containing a sun-like star were multiple star systems. So why the conflicting results?

One point is that the 1991 survey was based on a smaller sample. Also, its authors assumed that some stars in the sample had companions that were below the survey's detection threshold. This may have led them to overestimate the number of companion systems, suggests Raghavan's team.

Single stars provide a stable planetary system, which makes them suitable for life. Planets can form in multiple star systems, but the gravity of the additional stars can hurl planets into their parent star, says John Chambers of the Carnegie Institution for Science based in Washington DC, who was not involved in the study.

Stellar companions may also interfere with the formation of comets in the outer reaches of a planet-forming disc, Chambers says, thereby eliminating a potential source of water for rocky planets through comet impacts.
Journal Reference: arxiv.org/abs/1007.0414

US army heat-ray gun in Afghanistan

By Dan Cairns

Newsbeat reporter Active Denial System The ADS heats up a person's skin 'intolerably' says the US military

A newly-developed heat-ray gun that burns the skin but doesn't cause permanent injury is now with US troops in Afghanistan. The Active Denial System (ADS) is a non-lethal weapon designed to disperse violent crowds and repel enemies.

It uses a focused invisible beam that causes an "intolerable heating sensation", but only penetrates the skin to the equivalent of three sheets of paper. The discomfort causes whoever it's pointed at to immediately start moving away. They often scream but the US military says the chance of injury from the system is 0.1%. It's already been tested more than 11,000 times on around 700 volunteers. Even reporters have faced the heat-ray.

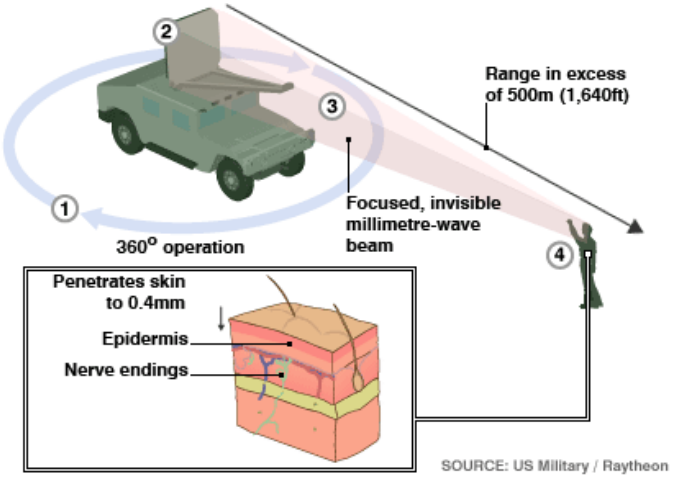
The ADS heats up a person's skin 'intolerably' says the US military

Limit deaths

Lt. Col. John Dorrian, a US military spokesperson, says the kit is now in Afghanistan but no decision has yet been made on its use. There's been much talk about the need to keep civilian casualties in Afghanistan to a minimum. The heat-ray gun could help.

The beam produced by the ADS can travel more than 500m (1,640ft) and is seen as an important new way to limit unnecessary deaths and minimise war zone casualties. Developers also say it could also be adapted to other operations, like fighting drug smuggling at sea and general peacekeeping operations.

Research is continuing to make the system smaller, lighter and less expensive, says the Pentagon's Joint Non-Lethal Weapons Program.



Heartburn Headache: Overuse of Acid Blockers Poses Health Risks

Proton-pump inhibitors such as Nexium, Prevacid and Protonix treat acid reflux, but their use as a preventative to bleeding can lead to problems

By Melinda Wenner Moyer

In 2008 americans spent more than $14 billion on heartburn treatments called proton pump inhibitors—such as Nexium, Prevacid and Protonix—making them second only to lipid regulators as the best-selling drug class in the country. But recent research suggests that the popularity of these drugs in part results from unnecessary prescriptions that may be putting millions of people at risk. Long-term use has been linked to withdrawal symptoms, an increased risk of bacterial infection, hip fracture and even possibly nutritional deficiencies.

Proton pump inhibitors, or PPIs, work just as their name implies: they block an enzyme system in the stomach's cells essential for pumping out acid. Although they are meant to treat only gastroesophageal reflux and peptic ulcer disease, "a number of people who have gastrointestinal symptoms that are not due to acid are given PPIs," perhaps because of misdiagnoses or because "the physician didn't have any better alternative," says Colin W. Howden, a gastroenterologist at the Northwestern University School of Medicine.

Doctors also give PPIs to hospital patients who have serious injuries to prevent gastrointestinal bleeding and stress ulcers. But not only are such prescriptions questionable—only one intensive care patient is saved from serious bleeding for every 900 treated—they are also frequently given to patients who do not need them, despite the fact that the American Society of Health System Pharmacists released guidelines in 1999 delineating who specifically to treat. "This spilled out into, 'Let's do this for all or most of our hospitalized patients,' " explains Joel Heidelbaugh, an associate professor of family medicine at the University of Michigan at Ann Arbor. He co-authored a 2006 study reporting that his university's health system annually spends about $110,000 on unnecessary PPI prescriptions. A more recent 2009 study published in the American Journal of Medicine concluded that up to 60 percent of PPI prescriptions for hospitalized patients are unnecessary.

Bizarrely, Heidelbaugh has also found that people admitted to hospitals for gastrointestinal symptoms are less likely to be put on PPIs than people admitted for other problems, such as rheumatological disorders.* And approximately one third of patients who start taking the drugs refill their prescriptions without needing to. “We know that people are put on them and left on them; we know it costs something; and we know it’s not without risk,” Heidelbaugh says.

Indeed, multiple studies suggest that long-term use of PPIs can cause problems. A 2006 study in the Journal of the American Medical Association reported that people taking long-term, high-dose proton pump inhibitors are 2.65 times as likely as controls to experience hip fractures, possibly because the drugs inhibit calcium absorption. By increasing the pH of the stomach, PPIs also boost the risk of infection: studies published in JAMA in 2004 and 2005 reported that subjects on acid-suppressing drugs are nearly twice as likely to develop pneumonia, and nearly three times as likely to acquire a potentially deadly infection from the bacterium Clostridium difficile, as unmedicated subjects (although the overall risk is low). And in March researchers reported in Clinical Gastroenterology and Hepatology that half the subjects taking PPIs at an Italian hospital, compared with only 6 percent of healthy subjects not taking the drugs, suffered from an infection of the small intestine caused by bacteria from the colon. The condition can trigger diarrhea and impede nutrient absorption.

Most worrisome, long-term use of PPIs may cause the very symptoms the drugs are designed to treat. In a 2009 study published in Gastroenterology, researchers split 120 healthy patients into two groups. Half received a placebo for 12 weeks, while the other half received a PPI for eight weeks, followed by a placebo for the last four weeks. At the end of the trial, 22 percent of subjects who had taken the drugs reported suffering from heartburn and acid reflux, compared with only 2 percent of those who had never taken the drugs.

Howden points out that because the trial was conducted in healthy subjects, knowing whether PPIs would worsen symptoms in patients with existing acid problems is impossible. But “there is no reason to believe that this should not be the case,” says trial co-author Peter Bytzer, a professor of medicine at the University of Copenhagen in Denmark. “I would even anticipate that the effects might be more pronounced in patients who already suffer from heartburn.” And if that’s true, then no wonder PPIs are so popular, he says: they may well be addictive.

Currently no national move exists to curb PPI overuse, but “there are many efforts, mostly specific to institutions, to raise awareness about this issue and to try to limit nonjudicious PPI use,” Heidelbaugh says. The Carolinas Medical Center in Charlotte, N.C., saved about $100,000 in annual drug costs after setting such guidelines, and a similar move by St. Paul’s Hospital in Vancouver cut daily medication costs nearly in half without worsening clinical outcomes.

**Clarification (6/23/10): This statistic refers to PPIs given for stress ulcer prophylaxsis.*

How Psychiatric Risk Gene Disrupts Brain Development

ScienceDaily (July 16, 2010) — Scientists are making progress towards a better understanding of the neuropathology associated with debilitating psychiatric illnesses like bipolar disorder and schizophrenia. New research, published in the July 15 issue of the journal Neuron, reveals mechanisms that connect a known psychiatric risk gene to disruptions in brain cell proliferation and migration during development.

A research group led by Dr. Li-Huei Tsai from the Massachusetts Institute of Technology had recently discovered that the psychiatric risk gene, Disrupted in Schizophrenia-1 (DISC1), is an essential regulator of the proliferation of early brain cells (known as neural progenitor cells) via inhibition of a molecule called GSK3? and modulation of the Wnt signaling pathway. Disruptions in the Wnt pathway, which is critical for embryonic development, have previously been linked with developmental defects and with various human diseases.

"Our recent finding was particularly interesting because one of the actions of lithium, the most common mood disorder drug, is to inhibit GSK3?." explains Dr. Tsai. "Although DISC1 was one of the first psychiatric illness risk genes to be identified and we know that it plays a key role in brain development, the mechanisms by which DISC1 is regulated remain unknown." In this study, Dr. Tsai and colleagues built on earlier work and investigated how DISC1 is regulated during cortical development by looking for novel DISC1-interacting proteins.

The researchers discovered a key interaction between DISC1 and a protein called Dixdc1 which is the mammalian version of a nonmammalian Wnt signaling molecule. Dixdc1 and DISC1 interacted to regulate neural progenitor proliferation via modulation of Wnt/GSK3? signaling. Interestingly, although DISC1 and Dixdc1 were both essential for neural migration, the Wnt/GSK3? pathway was not required for migration. It appears as if Dixdc1 integrates DISC1 into Wnt-dependent and -independent signaling pathways.
"Our findings identify the novel Wnt signaling pathway gene, Dixdc1, as a critical regulator of DISC1 function during cortical development. This discovery suggests that Dixdc1 and DISC1 are involved in Wnt signaling at many levels in the nervous system and that mutations in DISC1 likely contribute to disease pathology by

disrupting Wnt signaling during neural development and in the adult brain," concludes Dr. Tsai. "Future studies are needed to determine whether other candidate psychiatric risk genes also interact with Wnt signaling."

The researchers include Karun K. Singh, Howard Hughes Medical Institute, Massachusetts Institute of Technology, Cambridge, MA, Broad Institute, Cambridge, MA; Xuecai Ge, Howard Hughes Medical Institute, Massachusetts Institute of Technology, Cambridge, MA Yingwei Mao, Howard Hughes Medical Institute, Massachusetts Institute of Technology, Cambridge, MA, Broad Institute, Cambridge, MA; Laurel Drane, Howard Hughes Medical Institute, Massachusetts Institute of Technology, Cambridge, MA, Broad Institute, Cambridge, MA; Konstantinos Meletis, Howard Hughes Medical Institute, Massachusetts Institute of Technology, Cambridge, MA, Broad Institute, Cambridge, MA; Benjamin A. Samuels, Howard Hughes Medical Institute, Massachusetts Institute of Technology, Cambridge, MA, Columbia University, New York, NY; and Li-Huei Tsai, Howard Hughes Medical Institute, Massachusetts Institute of Technology, Cambridge, MA, Broad Institute, Cambridge, MA.

Researchers Cut Years from Drug Development With Nanoscopic Bead Technology

ScienceDaily (July 16, 2010) — New research accepted by the Journal of Molecular Recognition confirms that a revolutionary technology developed at Wake Forest University will slash years off the time it takes to develop drugs -- bringing vital new treatments to patients much more quickly.

Lab-on-Bead uses tiny beads studded with "pins" that match a drug to a disease marker in a single step, so researchers can test an infinite number of possibilities for treatments all at once. When Lab-on-Bead makes a match, it has found a viable treatment for a specific disease -- speeding up drug discovery by as much as 10,000 times and cutting out years of testing and re-testing in the laboratory.

"It helps the most interesting new drugs work together to stick their heads up above the crowd," said Jed C. Macosko, Ph.D., an associate professor of Physics at Wake Forest and primary inventor of the Lab-on-Bead technology. "Each type of drug has its own molecular barcode. Then, with the help of matching DNA barcodes on each nanoscopic bead, all the drugs of a certain type find their own 'home' bead and work together to make themselves known in our drug discovery process. It's kind of like when Dr. Seuss's Whos down in Whoville all yelled together so that Horton the elephant and all of his friends could hear them."

Macosko and Martin Guthold, Ph.D., an associate professor of physics at Wake Forest and the co-inventor of Lab-on-Bead, will work with the biotechnology startup NanoMedica Inc. to test how drug companies will use the new tool. The company has relocated to Winston-Salem from New Jersey; Macosko serves as the company's chief innovation officer and Guthold is its chief science officer. The company has one year to work with the technology to bring it to market or relinquish the rights to the

Lab-on-Bead screens millions of chemicals simultaneously using plastic beads so small that 1,000 of them would fit across a human hair. Pharmaceutical companies would use the technology to identify treatments and diagnostics for conditions ranging from cancer to Alzheimer's.

One of the targets the research team has focused on is a breast cancer cell called HER2.

"We want to find a molecule that detects that cancer cell," Guthold said. "In that circumstance, you could use Lab-on-Bead as a diagnostic tool."

The North Carolina Biotechnology Center, a private, nonprofit corporation funded by the N.C. General Assembly, provided $75,000 in funding for the project. Harvard University in Boston and Université de Strasbourg in Strasbourg, France, are providing the chemicals being screened in the Lab-on-Bead process.

"There are an infinite number of possibilities for combining carbon, nitrogen, hydrogen and other elements into different shapes that interact differently in the cells," Macosko said. "Those shapes could block cancer -- they could block all kinds of things.

"If there's some cure to a disease or way to diagnose it, we're going to find it faster."

The Journal of Molecular Recognition is the peer-reviewed publication of the International Society of Molecular Recognition. The Lab-on-Bead study will be in the September/October issue; it appears online in advance of publication. Co-authors of the study include Natalie R. Gassman, J. Patrick Nelli, Samrat Dutta, Adam Kuhn and Keith Bonin, all of Wake Forest; and Zbigniew Pianowski and Nicolas Winssinger, of Université de Strasbourg.

Tough Love: Some Marriages Thrive on Blame and Criticism

By Rachael Rettner, LiveScience Staff Writer

While a successful marriage is not an exact science, science (and common sense) suggests thinking and behaving in a positive way toward one's partner is beneficial. However, one psychologist proposes that for some couples, negative thoughts and actions may actually be better in the long run.

For couples who experience frequent, serious problems, such negative behavior as placing blame on one’s spouse, commanding him or her to change, and being less forgiving seem to be the best way to breed a happy marriage.

Such advice seems counterintuitive, but James McNulty, a psychologist at the University of Tennessee, says what works for happy couples may not work for those with more problems.

"Happy couples do behave certain ways and think more positively, but this might not be creating their happiness necessarily, it may just reflect their happiness," McNulty said. "Because when unhappy couples behave and think the same way, over time they actually seem to get worse."

His recent research suggests marital therapies that encourage couples with major issues to be more critical of one another are potentially beneficial.

Great expectations

McNulty's theory is based on four studies conducted over the past decade. In the first, 82 newlywed couples were asked to report eight times over the course of four years on how satisfied they were with their marriage.

The couples had been asked at the beginning of their marriage whether they expected to grow stronger in their relationship or to experience rough patches along the way.

The results, published in 2004, showed that having positive expectations about the relationship helped only if the couples met these expectations, McNulty said. Couples with more problems did better if they had expected to encounter obstacles.

"I like to think about this finding like I would think about a student," McNulty said. "Some students are capable of getting A's, some students have to settle for B's and C's. If a student just doesn't have the skills to get A's, they're probably going to be disappointed if they always expect to get A's. And so that student might do better to expect B's and C's."

Attributing blame

McNulty and his colleagues also looked at whether people tended to hold their partners accountable for negative behavior or excused that behavior, attributing it to something outside the partner's control. (For example: If your partner ignored you, was it because of who your partner is, or because of some outside influence, such as an enormous workload?)

Using data from the previous study and from a second study of 169 couples, published in 2008, the researchers found that, among couples with fewer problems, the ones more satisfied with their marriage usually wrote off negative behaviors as something outside their partner's control. Among couples with more problems, the ones with higher marital satisfaction directly blamed the spouse for his or her bad acts.

"If your partner on average is rarely engaging in negative behaviors, if you don't have very many problems, then it's best to give the partner the benefit of the doubt," McNulty said. "Even if your partner deserves to be held accountable for a specific event, if it doesn't happen very often, it's better to sort of look the other way, to look at the bright side."

But, he added, "if you have a partner who's constantly getting into trouble, having problems outside the relationship, inside the relationship, if they're big problems, then it's not such a good idea to look the other way."

Problem solving

In another study, McNulty examined how couples' problem-solving behavior related to the quality of their marriage. When discussing a problem, did they blame or reject the partner or command their partner to change, and did that help or harm their marriage?

The study involved 72 newlywed couples reporting on their marital satisfaction eight times over five years, as well as 135 newlyweds who reported marital satisfaction three times in one year.

"The couples that faced severe problems did better to the extent that they were slightly more negative" in their behavior, McNulty said. But why would such acrimonious exchanges be beneficial?

There's evidence to suggest negative exchanges motivate partners to change and avoid the bad behavior in the future, McNulty said. "The downside obviously is that it doesn't make couples feel good in the moment to do that," McNulty said. "But it may motivate them to strengthen their relationship over time."

Forgiveness

McNulty also showed in a 2008 study that couples who were extremely likely to forgive each other did well only if their partners did not engage in "bad" behavior, such as bestowing insults, often.

If such negative behavior was common, a tendency to be less forgiving was better for the marriage.

However, McNulty notes he didn't define exactly what it means to be "more likely to forgive" or "less likely to forgive," a limitation that he said needs to be addressed by future research. While he doesn't think the results mean couples should never forgive each other, "maybe it means, don't forgive so quickly," he said.

Future research should also look into ways for couples to get the benefits of forgiveness (the good feelings that come with it) without the side effects (the partner simply commits the offensive act again).

"I don't want to walk around feeling a grudge all the time, but I also don't want my partner to continue engaging in these negative behaviors," McNulty said.

Future outlook

These studies suggest researchers and clinicians should not necessarily look to happy couples as models for how to help couples who have more problems. The results may also explain why therapy seems to be the least effective for couples with the most severe problems.

"We need to rethink the role of positivity in relationships," McNulty said. "It's likely to be more nuanced in its benefits — it may benefit only some couples, and further, most importantly, it actually may harm other couples." Research examining the outcomes of treatments that encourage couples to be more negative to one another will need to be conducted before these ideas can be put into clinical practice, McNulty said.

A review of McNulty's studies was published in the June issue of the journal Current Directions in Psychological Science.