

http://www.eurekalert.org/pub_releases/2013-01/ul-tpp010313.php

The pain puzzle: Uncovering how morphine increases pain in some people

Researchers discover new pathway to reduce paradoxical pain

Quebec City & Toronto - For individuals with agonizing pain, it is a cruel blow when the gold-standard medication actually causes more pain. Adults and children whose pain gets worse when treated with morphine may be closer to a solution, based on research published in the January 6 on-line edition of Nature Neuroscience.

"Our research identifies a molecular pathway by which morphine can increase pain, and suggests potential new ways to make morphine effective for more patients," says senior author Dr. Yves De Koninck, Professor at Université Laval in Quebec City. The team included researchers from The Hospital for Sick Children (SickKids) in Toronto, the Institut universitaire en santé mentale de Québec, the US and Italy.

New pathway in pain management

The research not only identifies a target pathway to suppress morphine-induced pain but teases apart the pain hypersensitivity caused by morphine from tolerance to morphine, two phenomena previously considered to be caused by the same mechanisms.

"When morphine doesn't reduce pain adequately the tendency is to increase the dosage. If a higher dosage produces pain relief, this is the classic picture of morphine tolerance, which is very well known. But sometimes increasing the morphine can, paradoxically, makes the pain worse," explains co-author Dr. Michael Salter.

Dr. Salter is Senior Scientist and Head of Neurosciences & Mental Health at SickKids, Professor of Physiology at University of Toronto, and Canada Research Chair in Neuroplasticity and Pain.

"Pain experts have thought tolerance and hypersensitivity (or hyperalgesia) are simply different reflections of the same response," says Dr. De Koninck, "but we discovered that cellular and signalling processes for morphine tolerance are very different from those of morphine-induced pain."

Dr. Salter adds, "We identified specialized cells – known as microglia – in the spinal cord as the culprit behind morphine-induced pain hypersensitivity. When morphine acts on certain receptors in microglia, it triggers the cascade of events that ultimately increase, rather than decrease, activity of the pain-transmitting nerve cells."

The researchers also identified the molecule responsible for this side effect of morphine. "It's a protein called KCC2, which regulates the transport of chloride ions and the proper control of sensory signals to the brain," explains Dr. De Koninck. "Morphine inhibits the activity of this protein, causing abnormal pain perception. By restoring normal KCC2 activity we could potentially prevent pain hypersensitivity." Dr. De Koninck and researchers at Université Laval are testing new molecules capable of preserving KCC2 functions and thus preventing hyperalgesia.

The KCC2 pathway appears to apply to short-term as well as to long-term morphine administration, says Dr. De Koninck. "Thus, we have the foundation for new strategies to improve the treatment of post-operative as well as chronic pain."

Dr. Salter adds, "Our discovery could have a major impact on individuals with various types of intractable pain, such as that associated with cancer or nerve damage, who have stopped morphine or other opiate medications because of pain hypersensitivity."

Cost of pain

Pain has been labelled the silent health crisis, afflicting tens of millions of people worldwide. Pain has a profound negative effect on the quality of human life. Pain affects nearly all aspects of human existence, with untreated or under-treated pain being the most common cause of disability.

The Canadian Pain Society estimates that chronic pain affects at least one in five Canadians and costs Canada \$55-60 billion per year, including health care expenses and lost productivity.

"People with incapacitating pain may be left with no alternatives when our most powerful medications intensify their suffering," says Dr. De Koninck, who is also Director of Cellular and Molecular Neuroscience at Institut universitaire en santé mentale de Québec.

Dr. Salter adds, "Pain interferes with many aspects of an individual's life. Too often, patients with chronic pain feel abandoned and stigmatized. Among the many burdens on individuals and their families, chronic pain is linked to increased risk of suicide. The burden of chronic pain affects children and teens as well as adults."

These risks affect individuals with many types of pain, ranging from migraine and carpal-tunnel syndrome to cancer, AIDS, diabetes, traumatic injuries, Parkinson's disease and dozens of other conditions.

Canadian funding for this international research included Canadian Institutes for Health Research, Krembil Foundation, Ontario Research Fund Research Excellence Program, Fonds de la recherche en santé du Québec, Canada Research Chair funding, The Anne and Max Tanenbaum Chair Program, SickKids Foundation, and Université Laval.

<http://www.scientificamerican.com/article.cfm?id=data-saved-quartz-glass-might-last-300-million-years>

Data Saved in Quartz Glass Might Last 300 Million Years

Sealed in quartz, information might be retained as long as 300 million years

By Timothy Hornyak

Most cultural institutions and research laboratories still rely on magnetic tape to archive their collections. Hitachi recently announced that it has developed a medium that can outlast not only this old-school format but also CDs, DVDs, hard drives and MP3s.

The electronics giant partnered with Kyoto University's Kiyotaka Miura to develop "semiperpetual" slivers of quartz glass that Hitachi says can preserve information for hundreds of millions of years with virtually no degradation. The prototype is made of a square of quartz two centimeters wide and two millimeters thick. It houses four layers of dots that are created with a femtosecond laser, which produces extremely short pulses of light.

Hitachi's new storage device Courtesy Of Planning Office Of The Central Research Laboratory, Hitachi, Ltd.

The dots represent information in binary form, a standard that should be comprehensible even in the distant future and can be read with a basic optical microscope. Because the layers are embedded, surface erosion would not affect them.

The medium has a storage density slightly better than that of a CD. Additional layers could be added, which would increase the density. But the medium is more remarkable for its durability. It is waterproof and resistant to chemicals and weathering, and it was undamaged when exposed to 1,000-degree heat for two hours in a test. The results of that experiment led Hitachi to conclude that the quartz data could last hundreds of eons.

"If both readers and writers can be produced at a reasonable price, this has the potential to greatly change archival storage systems," says Ethan Miller, director for the Center for Research in Intelligent Storage at the University of California, Santa Cruz. The medium could be ideal for safekeeping a civilization's most vital information, museum holdings or sacred texts. The question is whether the world as we know it would even last that long. "Pangaea broke up less than several hundred million years ago," Miller adds. "Many quartz-based rocks from that time are now sand on our beaches—how would this quartz medium fare any differently?"

http://www.eurekalert.org/pub_releases/2013-01/hcfa-alo010713.php

At least 1 in 6 stars has an Earth-sized planet

New analysis of Kepler data shows that about 17 percent of stars have an Earth-sized planet

The quest for a twin Earth is heating up. Using NASA's Kepler spacecraft, astronomers are beginning to find Earth-sized planets orbiting distant stars. A new analysis of Kepler data shows that about 17 percent of stars have an Earth-sized planet in an orbit closer than Mercury. Since the Milky Way has about 100 billion stars, there are at least 17 billion Earth-sized worlds out there.

Francois Fressin, of the Harvard-Smithsonian Center for Astrophysics (CfA), presented the analysis today in a press conference at a meeting of the American Astronomical Society in Long Beach, Calif. A paper detailing the research has been accepted for publication in *The Astrophysical Journal*.

Kepler detects planetary candidates using the transit method, watching for a planet to cross its star and create a mini-eclipse that dims the star slightly. The first 16 months of the survey identified about 2,400 candidates.

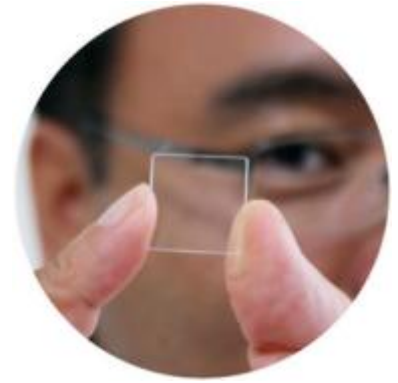
Astronomers then asked, how many of those signals are real, and how many planets did Kepler miss?

By simulating the Kepler survey, Fressin and his colleagues were able to correct both the impurity and the incompleteness of this list of candidates to recover the true occurrence of planets orbiting other stars, down to the size of Earth. "There is a list of astrophysical configurations that can mimic planet signals, but altogether, they can only account for one-tenth of the huge number of Kepler candidates. All the other signals are bona-fide planets," says Fressin.

Altogether, the researchers found that 50 percent of stars have a planet of Earth-size or larger in a close orbit. By adding larger planets, which have been detected in wider orbits up to the orbital distance of the Earth, this number reaches 70 percent. Extrapolating from Kepler's currently ongoing observations and results from other detection techniques, it looks like practically all Sun-like stars have planets.

The team then grouped planets into five different sizes. They found that 17 percent of stars have a planet 0.8 - 1.25 times the size of Earth in an orbit of 85 days or less. About one-fourth of stars have a super-Earth (1.25 - 2 times the size of Earth) in an orbit of 150 days or less. (Larger planets can be detected at greater distances more easily.) The same fraction of stars has a mini-Neptune (2 - 4 times Earth) in orbits up to 250 days long.

Larger planets are much less common. Only about 3 percent of stars have a large Neptune (4 - 6 times Earth), and only 5 percent of stars have a gas giant (6 - 22 times Earth) in an orbit of 400 days or less.



The researchers also asked whether certain sizes of planets are more or less common around certain types of stars. They found that for every planet size except gas giants, the type of star doesn't matter. Neptunes are found just as frequently around red dwarfs as they are around sun-like stars. The same is true for smaller worlds. This contradicts previous findings.

"Earths and super-Earths aren't pick. We're finding them in all kinds of neighborhoods," says co-author Guillermo Torres of the CfA.

Planets closer to their stars are easier to find because they transit more frequently. As more data are gathered, planets in larger orbits will come to light. In particular, Kepler's extended mission should allow it to spot Earth-sized planets at greater distances, including Earth-like orbits in the habitable zone.

http://www.eurekalert.org/pub_releases/2013-01/msu-ebi010713.php

Even brief interruptions spawn errors

Brief interruptions doubled the error rate for participants performing a sequential task.

EAST LANSING, Mich. — Short interruptions — such as the few seconds it takes to silence that buzzing smartphone — have a surprisingly large effect on one's ability to accurately complete a task, according to new research led by Michigan State University. The study, in which 300 people performed a sequence-based procedure on a computer, found that interruptions of about three seconds doubled the error rate.

Brief interruptions are ubiquitous in today's society, from text messages to a work colleague poking his head in the door and interrupting an important conversation. But the ensuing errors can be disastrous for professionals such as airplane mechanics and emergency room doctors, said Erik Altmann, lead researcher on the study.

"What this means is that our health and safety is, on some level, contingent on whether the people looking after it have been interrupted," said Altmann, MSU associate professor of psychology.

The study, funded by the U.S. Navy's Office of Naval Research, is one of the first to examine the effects of brief interruptions on relatively difficult tasks. The findings appear in the *Journal of Experimental Psychology: General*.

Study participants were asked to perform a series of tasks in order, such as identifying with a keystroke whether a letter was closer to the start or the end of the alphabet. Even without interruptions a small number of errors in sequence were made. Sometimes participants were interrupted and told to type two letters — which took 2.8 seconds — before returning to the task. When this happened, they were twice as likely to mess up the sequence. Altmann said he was surprised that such short interruptions had a large effect. The interruptions lasted no longer than each step of the main task, he noted, so the time factor likely wasn't the cause of the errors.

"So why did the error rate go up?" Altmann said. "The answer is that the participants had to shift their attention from one task to another. Even momentary interruptions can seem jarring when they occur during a process that takes considerable thought."

One potential solution, particularly when errors would be costly, is to design an environment that protects against interruptions. "So before you enter this critical phase: All cell phones off at the very least," Altmann said.

His co-authors are Gregory Trafton of the Naval Research Laboratory and Zach Hambrick of MSU.

http://www.eurekalert.org/pub_releases/2013-01/iu-sdw121412.php

Study defines when disclosing a whistle-blower's identity, like in an email, becomes retaliation

Legally, whistle-blowers are protected from direct reprisals on the job

BLOOMINGTON and INDIANAPOLIS, Ind. -- Under the law, whistle-blowers are supposed to be protected from direct reprisals on the job, including discrimination. But what if they and their actions becomes the subject of a widely distributed email? Is that a form of retaliation?

Two professors at Indiana University's Kelley School of Business set out to answer that question and determine when public disclosure of the whistle-blower's identity -- like in an email -- is sufficient to support such a claim, in a paper that has been accepted for publication in *North Carolina Law Review*.

"When someone makes a complaint of discrimination that's covered by federal anti-discrimination laws, you're automatically cloaked in protection from retaliatory actions that could come in response," said Jamie Prekert, associate professor of business law at the IU Kelley School of Business Bloomington and the study's lead author. "But what can be retaliatory is a broad-ranging continuum of actions that the courts don't specifically define." Prekert, who also is a Weimer Faculty Fellow, noted that simply the possibility of being publicly identified as a complainant is enough to discourage someone from becoming a whistle-blower. But Title VII of the Civil Rights Act of 1964, existing case law and EEOC regulatory documents provide little guidance on the use of email and similar, immediate forms of communication.

"It doesn't even provide a framework for how to consider these issues," he said. "To the extent that they've come up, the courts have been inconsistent and not made these determinations in a coherent way. The outcomes are fairly consistent, but the reasoning is not consistent, which is always a problem in the law."

The courts have been inclined to put a stop to retaliation so that employees who blow the whistle on discriminatory practices are not threatened or prevented from doing so, said Julie Manning Magid, associate professor of business law at the IU Kelley School of Business Indianapolis. "There's a lot of research about whistle-blowers -- why people blow the whistle, what influences them -- and anonymity is one reason to decide to blow the whistle," Magid said. Allison Fetter-Harrott, an assistant professor of political science at Franklin College, also was a co-author on the study.

In their paper, the professors discuss social science literature and analogous cases regarding when parties to litigation can remain anonymous to come up with a framework for defining retaliatory disclosure.

Also at the heart of their paper was a 2007 case involving Belmont Abbey College, a Catholic institution in North Carolina, and eight of its faculty members. When Belmont Abbey College chose to exclude contraceptives from its employee health care coverage, the faculty members filed a complaint with the U.S. Equal Employment Opportunity Commission, claiming religious and gender discrimination.

The college's president reacted by sending a mass email to faculty, students and staff detailing the complaint and identifying the faculty members, which resulted in an additional EEOC complaint against the college of retaliation.

In July 2009, the EEOC found reasonable cause to believe Belmont Abbey had discriminated against the charging parties based on gender but found "no cause" supporting the religious discrimination charge.

Separately, the EEOC indicated that the president's email constituted cause to find retaliation and was "intended to produce a 'chilling effect' on the campus and to create an environment where faculty and staff would hesitate before filing complaints against the college."

"Belmont Abbey did not discriminate against its employees based on religion, as the EEOC determined, despite outrage among many that might suggest otherwise," the professors wrote. "However, in publicly disclosing the names of the eight faculty members who sought to utilize the process established for asserting employee rights against discrimination, the college may have sought to discourage other employees from taking similar actions. "The facts of Belmont Abbey demonstrate a doctrinal gap in the competing interests of employers and employees."

While public disclosures can discourage employees from exercising rights established under Title VII, the authors also noted the need for a balance that includes the interests of employers in appropriate disclosures.

"We recommend a standard for retaliatory disclosure that considers disclosure an adverse action unless a 'need to know' defense exists," they said.

The authors noted that disclosure of very personal information, such as an employee's allegation of sexual harassment, may be retaliatory, as well as when the disclosure will directly lead to threats and punitive actions from co-workers or the community. An employee's vulnerability within an organization also should be a factor. The form and tone of the disclosure is another consideration. Unlike in the Belmont Abbey case, sometimes word may get out inadvertently, because one of the parties involved does not keep the matter confidential.

The paper, which was chosen as the best paper of 2012 by the Pacific Southwest Academy of Legal Studies in Business, noted that companies do maintain a right to disclose that there are employee complaints in order to report the matter to shareholders or expose a perceived injustice.

"It was an interesting case," Magid said. "We've adopted what we hope to be a balanced approach in order to understand the employer's interest in furthering their ability for communication, transparency and work-related issues while recognizing an employee's legal rights. It really has important implications, and I'm glad we were able to present a new way of approaching it."

http://www.eurekalert.org/pub_releases/2013-01/m-btw010413.php

Breastfeeding tips women share intrigue doctors

Researchers track folklore in US, find consistent advice from mom to mom

COLUMBUS, Ohio – Breastfeeding can be a difficult time for both mother and baby, so using cabbage leaves and tea bags to ease pain or eating oatmeal to increase milk production are among the folk remedies that women pass along to new mothers seeking help.

As experts in this field, lactation specialists were surveyed to see how often they pass along this folklore to breastfeeding mothers, despite a lack of research-based evidence to support these suggestions, according to a recent survey by Dr. Jonathan Schaffir, an obstetrician at The Ohio State University Wexner Medical Center. Results of the survey are published in *Breastfeeding Medicine*.

The online survey of 124 lactation consultants affiliated with U.S. medical centers in 29 states found that 69 percent reported hearing of folk remedies, and 65 percent had recommended at least one of these methods. Survey respondents were asked to provide examples of advice they had heard of, as well as advice they routinely passed on to breastfeeding mothers. Advice was broken into five categories: recommendations to promote lactation, to initiate breastfeeding, to treat pain associated with breastfeeding, to assist with weaning, and about substances to avoid for the baby's sake.

The survey found that certain folk remedies are widely discussed among experts, particularly herbal remedies to increase milk production and cabbage leaves to ease pain from breastfeeding. They suggest that recommending folk remedies that are outside of the medical mainstream is a common practice among lactation consultants who advise women about breastfeeding.

"Despite the frequency with which such advice is given, there is little empirical evidence to support the use of most of the remedies listed," said Schaffir. "But I'm all for anything that helps and is safe for the baby."

More than half of the lactation consultants who responded to the survey said they had heard of and passed on a folklore remedy intended to either increase milk production or ease/prevent pain associated with breastfeeding. Many respondents said they were aware of folklore recommendations to avoid certain foods to prevent infant gassiness, but only two educators relayed this advice to patients.

For example, using beer to promote milk production is a folk tradition of long standing that was in the spotlight when celebrity Mariah Carey was accused of endangering her twins for following it. This folk tradition began in the late 1800s, but no studies have demonstrated a positive impact in milk production.

In fact, maternal alcohol consumption has been demonstrated to decrease milk production, and may have an adverse effect on the baby, Schaffir said. Many cultures also encourage mothers to eat oatmeal to increase milk production, but no studies have been conducted to examine its use.

Folk traditions that aid with breast pain or engorgement were also mentioned, including using cabbage leaves, even though studies have questioned their effectiveness.

Several lactation consultants recommend tea bags to help women deal with nipple soreness, but a randomized trial of breastfeeding women with pain demonstrated that tea bags offered no additional benefit than a water compress, Schaffir said. A review of studies that examine treatment for nipple pain concluded that there was no significant benefit to the use of tea bags, lanolin or expressed milk on the nipple. The lactation consultants who made recommendations based on folklore compared with those who only made medical recommendations did not have any significant difference in relation to age, parity, education, experience or socioeconomic status.

The folk traditions communicated in this survey represent a particular culture in the United States, and folklore in general varies by culture and background. Surveys of lactation consultants in different countries and different ethnicities may yield different results, Schaffir notes. "With the attention given to these remedies, this survey may spur future research to objectively measure whether such recommendations are actually safe and effective, rather than relying solely on anecdotal evidence," Schaffir said.

Survey of lactation instructors on folk traditions in breastfeeding. Breastfeed Med. 2012 Aug;7:230-3. doi: 10.1089/bfm.2011.0054. Epub 2012 Mar 16.

<http://www.sciencedaily.com/releases/2013/01/130107082230.htm>?

Out of Sight, out of Mind?

How the Brain Codes Its Surroundings Beyond the Field of View

Jan. 7, 2013 — Even when they are not directly in sight, we are aware of our surroundings: so it is that when our eyes are fixed on an interesting book, for example, we know that the door is to the right, the bookshelf is to the left and the window is behind us. However, research into the brain has so far concerned itself predominantly with how information from our field of vision is coded in the visual cortex. To date it has not been known how the brain codes our surroundings beyond the field of view from an egocentric perspective (that is, from the point of view of the observer).

In the latest issue of the journal *Current Biology*, Andreas Schindler and Andreas Bartels, scientists at the Werner Reichardt Center for Integrative Neuroscience (CIN) of the University of Tübingen, present for the first time direct evidence of this kind of spatial information in the brain.

The participants in their study found themselves in the center of a virtual octagonal room, with a unique object in each corner. As the brain's activity was monitored by means of functional magnetic resonance imaging, the participants stood in front of one corner and looked at its object. Now they were instructed to determine the position of a second randomly chosen object within the room relative to their current perspective (for example, the object behind them). After a few trials the participant turned around so that the next object was brought into the field of view and the task was set up again. The whole procedure was repeated until every object had been looked at once.

The scientists discovered that patterns of activity in the parietal cortex code the participant's egocentric position, that is, the relative position to his or her surroundings. The spatial information discovered there proved to be independent of the particular object, its absolute position in the room or that of the observer -- i.e. it encoded egocentric spatial information of the three-dimensional surroundings. This result turns out to be particularly interesting because damage to the brain in the parietal cortex can lead to serious disruption of egocentric spatial awareness. Hence it is difficult for patients suffering from optical ataxia to carry out coordinated grasping movements. Lesions in the parietal cortex can also lead to a symptom called spatial neglect where patients have difficulties in perceiving their surroundings on the side opposite to the lesion. The brain areas identified in the present study coincided precisely with the areas of brain damage in such patients and provide for the first time insights regarding their function in the healthy brain.

Andreas Schindler, Andreas Bartels. *Parietal Cortex Codes for Egocentric Space beyond the Field of View*. *Current Biology*, 2012; DOI: 10.1016/j.cub.2012.11.060

http://www.eurekalert.org/pub_releases/2013-01/bmj-brc010713.php

BMJ raises concerns over the effectiveness of a costly and invasive procedure for melanoma

BMJ Editor says all trials must be registered and the results published

A special report published by the BMJ today finds that thousands of melanoma patients around the world are undergoing an expensive and invasive procedure called sentinel node biopsy, despite a lack of clear evidence and concerns that it may do more harm than good.

Although not recommended for routine use in England, it has become the standard care for melanoma patients in several countries including the United States, where it was estimated to cost over \$686m in 2012.

Melanoma is the fifth most common cancer in the UK, affecting one in 60 people. In the US it affects one in 50 people and, of the seven most common cancers, is the only one that is increasing. Sentinel node biopsy was developed in the US in the early 1990s to detect the early spread of cancer cells in patients with melanoma. It involves taking a small sample of the lymph node (gland) nearest to the melanoma for testing. If cancer cells are found, patients are advised to have surgery to remove some of the surrounding lymph nodes.

In 2006, a major trial (known as MSLT-I) published in the *New England Journal of Medicine* found that sentinel node biopsy did not improve overall survival after five years, yet the researchers claimed that disease-free survival was significantly higher in the biopsy group.

The results proved controversial, but further analyses of the data (expected around 2008 and 2011) that would have settled the question of effectiveness once and for all have not yet been published.

In 2007, the US National Cancer Institute, which funded the trial, accepted that it remained open to debate whether sentinel node biopsy should be standard care, but there has been no correction or clarification issued by the researchers or the journal. Nor has there been any public explanation about the delay in publishing the further analyses.

And when the BMJ contacted the lead researcher, he gave no timescale for when publication of the results could be expected.

Meanwhile, large numbers of patients are being exposed to unnecessary and potentially harmful surgery. It is thought that as many as 96% of patients who have sentinel node biopsy will have unnecessary surgery, which carries a risk of complications such as lymphoedema (severe swelling of the limbs), cellulitis (deep skin infection) and scarring.

In England, guidance from the National Institute for Health and Clinical Excellence (NICE) states that sentinel node biopsy should be performed only in centres with expertise in the context of clinical trials. Yet data obtained by the BMJ show that at least 19 trusts across England carried out sentinel node biopsy procedures on melanoma patients between 2006 and 2011.

The figures also suggest that in 2010-11, over 1,100 sentinel node biopsies could have been conducted at an estimated cost to the NHS of £7.6m. Given only two trials of sentinel node biopsy in melanoma are ongoing, this is likely to account for only a fraction of these biopsies.

The report concludes: "The full and final results of MSLT-I would clarify whether sentinel node biopsy is beneficial, and what, if any, its role in melanoma should be. It is time for the funders of MSLT-1 and those responsible for overseeing research to demand prompt publication of the full and final results of MSLT-I." Commenting on the report, BMJ Editor Dr Fiona Godlee, says the evidence that much research goes unreported is overwhelming, putting patients at risk and wasting healthcare resources. She calls on both industry and academia to clean up their act, and invites BMJ readers to sign up to www.alltrials.net – a campaign launched this week to ensure that all trials are registered and their results published.

<http://phys.org/news/2013-01-herschel-cosmic.html>

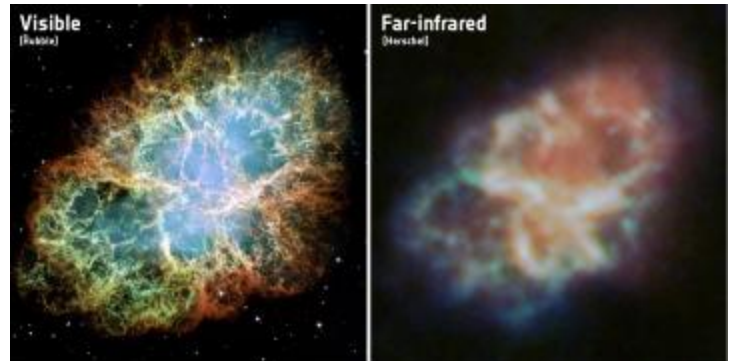
Herschel confirms the origin of cosmic dust

Further proof interstellar dust throughout our galaxy is created at the end of massive stars' lives

Phys.org - The Herschel space observatory has produced an intricate view of the remains of a star that died in a stellar explosion a millennium ago. It has provided further proof that the interstellar dust which lies throughout our Galaxy is created when massive stars reach the end of their lives.

The Crab Nebula lies about six and a half thousand light years away from Earth and is the remnant of a dramatic explosion, called a supernova, originally seen by Chinese Astronomers in 1054 AD. Starting out at 12-15 times more massive than the Sun, all that was left after the dramatic death of the star is a tiny, rapidly rotating neutron star and a complex network of ejected stellar material.

The Crab Nebula is well known for its intricate nature, with beautiful filamentary structures seen at visible wavelengths. Now, for the first time, thanks to Herschel's exquisite resolution, we can see these filaments of dust in the far-infrared region of the electromagnetic spectrum. After ruling out other sources, astronomers using Herschel showed that these filaments are made of cosmic dust, lying in exactly the same place that we see the densest clumps of supernova ejecta. This provides definitive evidence that the Crab Nebula is an efficient dust factory, containing enough dust to make around 30,000-40,000 planet Earths. The dust is made of a combination of carbon and silicate materials, which are crucial for the formation of planetary systems like our own Solar System.



The Crab Nebula as seen in visible (left), showing the glow from hot, energised gas, and far-infrared (right), showing warm dust (green/blue) and cooler dust (yellow/orange) shining in the remnant. ESA/Herschel/SPIRE/PACS/MESS (Far-IR); NASA/ESA/STScI (Visible).

Previous infrared images of the Crab Nebula, using the Spitzer Space Telescope, used much shorter wavelengths and so only showed the warmer dust. Spitzer found only a tiny amount of dust, simply because it missed the massive reservoir of colder dust now known to exist. Herschel, observing at longer wavelengths, is able to detect both warm dust (shown in green/blue in the image) and also cool dust (shown as yellow/orange), some as cold as -260 Celsius. This has allowed astronomers to measure the total mass of dust for the first time. Large amounts of dust have been seen in supernova remnants before, but the Crab Nebula is particularly exciting as it provides the cleanest view of what is going on. Unlike many other remnants there is almost no dusty Galactic material in front of or behind the Crab Nebula, so the image is uncontaminated by material in between it and the Earth. This also allows astronomers to rule out the possibility that the dust was swept up as the shockwave expanded throughout the surrounding region.

In most supernova remnants, much of the dust is destroyed as it ploughs into the surrounding interstellar gas and dust, crushed by violent shockwaves. A final treat is that the Crab Nebula is a much kinder environment for dust grains, so the dust does not seem to be destroyed. This may be the first observed case of dust being freshly-cooked in a supernova and surviving its outward journey carried along by the shock wave. We now have definitive evidence that supernovae created the raw materials for the first solid particles, the building blocks of rocky planets and life itself, in a blink of an eye. *Provided by United Kingdom Space Agency*

<http://www.bbc.co.uk/news/science-environment-20937910>

Pozzino shipwreck: Ancient medicine ingredients probed

Medicine that is more than 2,000 years old has been analysed by scientists.

By Rebecca Morelle Science reporter, BBC World Service

Six tablets were discovered in a tin box onboard an ancient Roman shipwreck, found off the coast of Italy. Samples of the fragile material revealed that the pharmaceuticals contained animal and plant fats, pine resin and zinc compounds.

Writing in the Proceedings of the National Academy of Sciences, the researchers said the medicine might have been used to treat eye infections. "I am surprised by the fact we have found so many ingredients and they were very well preserved considering it was under water for so much time," said Maria Perla Colombini, professor of chemistry from the University of Pisa.

The shipwreck that the tablets were found on dates to 140-130 BC, and was thought to have been a trading ship sailing from Greece across the Mediterranean. It was first discovered in 1974 off the coast of Tuscany, and explored during the 1980s and 1990s, but it is only now that the tablets have been fully investigated.

"We used a very thin scalpel to detach a small flake of substance to be analysed," explained Professor Maria Perla.

Mass spectrometry revealed the tablets contained an array of ingredients. The team found pine resin, which has antibacterial properties. Animal and vegetable fats were also detected, among them possibly olive oil which is known for its use in ancient perfumes and medicinal preparations.

They also found starch, which is thought to be an ingredient in early Roman cosmetics. The team also discovered zinc compounds, which they think may have been the active ingredient in the tablets. Given the composition of the medicine, the team believe it could have had an ophthalmic use.

Ancient writings

Finding ancient medicines is rare, especially those in as good condition as the Pozzino tablets.

Much of our understanding of the early medical world comes from writings from the time.

Gianna Giachi, from the Superintendence for the Archaeological Heritage of Tuscany, said: "We compared our results with what the ancient authors wrote, including Theophrastus (from 371-286 BC), Pliny the Elder and Dioscorides (both from the 1st Century AD) and we highlighted a large correspondence with the ancient ingredients - especially for the use of zinc compounds.

"In addition, recent scientific literature documents the utilisation in Roman pharmacology of zinc compounds, especially for the preparation of powder used for the treatment of eyes diseases."

She added that the study, which also involved work by scientists from the University of Florence's biology department, would help to shed more light on the ancient pharmaceutical world, which was surprisingly sophisticated. "The research highlights the care, even in ancient times, in the choice of the complex mixture of products in order to get the desired therapeutic effect and to help in the preparation and application of the same medicine," Dr Giachi said.

In an earlier study of the tablets, a US team carried out a genetic analysis of the plant material in the tablets. Robert Fleischer, from the Smithsonian's Center for Conservation and Evolutionary Genetics, found plant extracts including carrot, radish and parsley, which suggested the tablets could have been used for gastrointestinal trouble.

http://www.eurekalert.org/pub_releases/2013-01/rb-uw010813.php

Unlike we thought for 100 years: Molds are able to reproduce sexually

Researchers grow penicillin-producing fungi with new properties

For over 100 years, it was assumed that the penicillin-producing mould fungus *Penicillium chrysogenum* only reproduced asexually through spores. An international research team led by Prof. Dr. Ulrich Kück and Julia Böhm from the Chair of General and Molecular Botany at the Ruhr-Universität has now shown for the first time that the fungus also has a sexual cycle, i.e. two "genders". Through sexual reproduction of *P. chrysogenum*, the researchers generated fungal strains with new biotechnologically relevant properties - such as high penicillin production without the contaminating chrysogenin. The team from Bochum, Göttingen, Nottingham (England), Kundl (Austria) and Sandoz GmbH reports in PNAS. The article will be published in this week's Online Early Edition and was selected as a cover story.

Only penicillin producer

About 100 years ago, Alexander Fleming demonstrated the formation of penicillin in *Penicillium chrysogenum*. To date, there is no other known producer of the antibiotic penicillin, which has an annual global market value of about six billion Euros.

Combining genes and breeding offspring with new properties

Not only animals and plants, but also many microorganisms such as fungi and algae can reproduce sexually. The advantage: the progenies possess a combination of genes from both mating partners and thus have new properties. Sexual reproduction in fungi is, however, not the rule. Most reproduce via spores which, in the case of moulds, occur as white, green or black deposits on spoiled food. These spores only bear the genes of one parent fungus. "Five years ago we already detected the existence of so-called sex genes in *Penicillium chrysogenum*", says Prof. Kück. Now, the researchers have discovered specific environmental conditions in which the fungus actually reproduces sexually. The decisive thing was to breed fungal strains in the dark under oxygen deprivation conditions in a nutrient medium supplemented with the vitamin biotin. The offspring exhibited new properties, both at the molecular level, as well as in their phenotypes.

Results could be applicable to other fungi

Using so-called microarray analysis, the biologists also investigated the activity of all the approximately 12,000 genes of the mould fungus. The result: the sex genes control the activity of biologically relevant genes, for example those for penicillin production. "We presume that the findings can also be applied to other fungi", says

Ulrich Kück, "such as *Penicillium citrinum* and *Aspergillus terreus* that produce cholesterol-lowering statins, or *Penicillium brevicompactum* and *Tolypocladium inflatum*, which produce immunosuppressives that are used in all organ transplantations". The researchers conducted the work in the Christian Doppler Laboratory "Biotechnology of Fungi" at the Ruhr-Universität with funding from the Christian Doppler Society (Vienna). J. Böhm, B. Hoff, C.M. O'Gorman, S. Wolfers, V. Klíx, D. Binger, I. Zadra, H. Kürnsteiner, S. Pöggeler, P.S. Dyer, U. Kück (2013): *Sexual reproduction and mating-type – mediated strain development in the penicillin-producing fungus Penicillium chrysogenum*, PNAS, DOI: 10.1073/pnas.1217943110

http://www.eurekalert.org/pub_releases/2013-01/ru-rud010813.php

Rice University discovers that graphene oxide soaks up radioactive waste

Rice, Moscow State universities collaborate on solution to toxic groundwater woes

Graphene oxide has a remarkable ability to quickly remove radioactive material from contaminated water, researchers at Rice University and Lomonosov Moscow State University have found.

A collaborative effort by the Rice lab of chemist James Tour and the Moscow lab of chemist Stepan Kalmykov determined that microscopic, atom-thick flakes of graphene oxide bind quickly to natural and human-made radionuclides and condense them into solids. The flakes are soluble in liquids and easily produced in bulk. The experimental results were reported in the Royal Society of Chemistry journal *Physical Chemistry Chemical Physics*.

The discovery, Tour said, could be a boon in the cleanup of contaminated sites like the Fukushima nuclear plants damaged by the 2011 earthquake and tsunami. It could also cut the cost of hydraulic fracturing ("fracking") for oil and gas recovery and help reboot American mining of rare earth metals, he said.

Graphene oxide's large surface area defines its capacity to adsorb toxins, Kalmykov said. "So the high retention properties are not surprising to us," he said. "What is astonishing is the very fast kinetics of sorption, which is key."

"In the probabilistic world of chemical reactions where scarce stuff (low concentrations) infrequently bumps into something with which it can react, there is a greater likelihood that the 'magic' will happen with graphene oxide than with a big old hunk of bentonite," said Steven Winston, a former vice president of Lockheed Martin and Parsons Engineering and an expert in nuclear power and remediation who is working with the researchers. "In short, fast is good."

Determining how fast was the object of experiments by the Kalmykov group. The lab tested graphene oxide synthesized at Rice with simulated nuclear wastes containing uranium, plutonium and substances like sodium and calcium that could negatively affect their adsorption. Even so, graphene oxide proved far better than the bentonite clays and granulated activated carbon commonly used in nuclear cleanup.

Graphene oxide introduced to simulated wastes coagulated within minutes, quickly clumping the worst toxins, Kalmykov said. The process worked across a range of pH values.

"To see Stepan's amazement at how well this worked was a good confirmation," Tour said. He noted that the collaboration took root when Alexander Slesarev, a graduate student in his group, and Anna Yu. Romanchuk, a graduate student in Kalmykov's group, met at a conference several years ago.

The researchers focused on removing radioactive isotopes of the actinides and lanthanides – the 30 rare earth elements in the periodic table – from liquids, rather than solids or gases. "Though they don't really like water all that much, they can and do hide out there," Winston said. "From a human health and environment point of view, that's where they're least welcome."

Naturally occurring radionuclides are also unwelcome in fracking fluids that bring them to the surface in drilling operations, Tour said. "When groundwater comes out of a well and it's radioactive above a certain level, they can't put it back into the ground," he said. "It's too hot. Companies have to ship contaminated water to repository sites around the country at very large expense." The ability to quickly filter out contaminants on-site would save a great deal of money, he said.

He sees even greater potential benefits for the mining industry. Environmental requirements have "essentially shut down U.S. mining of rare earth metals, which are needed for cell phones," Tour said. "China owns the market because they're not subject to the same environmental standards. So if this technology offers the chance to revive mining here, it could be huge."

Tour said that capturing radionuclides does not make them less radioactive, just easier to handle. "Where you have huge pools of radioactive material, like at Fukushima, you add graphene oxide and get back a solid material from what were just ions in a solution," he said. "Then you can skim it off and burn it. Graphene oxide burns very rapidly and leaves a cake of radioactive material you can then reuse."

The low cost and biodegradable qualities of graphene oxide should make it appropriate for use in permeable reactive barriers, a fairly new technology for in situ groundwater remediation, he said.

Romanchuk, Slesarev, Kalmykov and Tour are co-authors of the paper with Dmitry Kosynkin, a former postdoctoral researcher at Rice, now with Saudi Aramco. Kalmykov is radiochemistry division head and a professor at Lomonosov Moscow State University. Tour is the T.T. and W.F. Chao Chair in Chemistry as well as a professor of mechanical engineering and materials science and of computer science at Rice.

The Office of Naval Research Multidisciplinary University Research Initiative, M-I SWACO and the Air Force Office of Scientific Research funded work at Rice. The Ministry of Education and Science of the Russian Federation, a Russian Federation President stipend to Romanchuk and the Russian Basic Research Foundation funded research at Moscow State. Read the abstract at <http://pubs.rsc.org/en/Content/ArticleLanding/2013/CP/C2CP44593J>.

http://www.eurekalert.org/pub_releases/2013-01/uoc--dmt010713.php

Drug-resistant melanoma tumors shrink when therapy is interrupted

'Intermittent dosing' strategy in lab mice suggests simple way to help people with late-stage melanoma

Researchers in California and Switzerland have discovered that melanomas that develop resistance to the anti-cancer drug vemurafenib (marketed as Zelboraf), also develop addiction to the drug, an observation that may have important implications for the lives of patients with late-stage disease.

The team, based at the University of California, San Francisco (UCSF), the Novartis Institutes for Biomedical Research (NIBR) in Emeryville, Calif., and University Hospital Zurich, found that one mechanism by which melanoma cells become resistant to vemurafenib also renders them "addicted" to the drug.

As a result, the melanoma cells nefariously use vemurafenib to spur the growth of rapidly progressing, deadly and drug-resistant tumors.

As described this week in the journal *Nature*, the team built upon this basic discovery and showed that adjusting the dosing of the drug and introducing an on-again, off-again treatment schedule prolonged the life of mice with melanoma.

"Remarkably, intermittent dosing with vemurafenib prolonged the lives of mice with drug-resistant melanoma tumors," said co-lead researcher Martin McMahon, PhD, the Efim Guzik Distinguished Professor of Cancer Biology in the UCSF Helen Diller Family Comprehensive Cancer Center.

It is therefore possible that a similar approach may extend the effectiveness of the drug for people – an idea that awaits testing in clinical trials.

Investigated through a public-private partnership, the research was spearheaded by the study's first author Meghna Das Thakur, PhD, a Novartis Presidential Postdoctoral Fellow, who was co-mentored by McMahon at UCSF and Darrin Stuart, PhD at NIBR. McMahon is supported by the Melanoma Research Alliance, the National Cancer Institute and the UCSF Helen Diller Family Comprehensive Cancer Center, which is one of the country's leading research and clinical care centers, and is the only comprehensive cancer center in the San Francisco Bay Area.

Melanoma: A Deadly Form of Skin Cancer

Melanoma is the most aggressive type of skin cancer, and in 2012 alone, an estimated 76,250 people in the United States were newly diagnosed with it. Some 9,180 people died last year from the disease, according to the National Cancer Institute.

As with all forms of cancer, melanoma starts with normal cells in the body that accumulate mutations and undergo transformations that cause them to grow aberrantly and metastasize. One of the most common mutations in melanoma occurs in a gene called BRAF, and more than half of all people with melanoma express mutated BRAF.

In 2011, the U.S. Food and Drug Administration (FDA) approved the drug vemurafenib for patients who have late-stage melanoma with mutations in BRAF after clinical trials showed a significant increase in survival for such patients when taking the drug. The drug's benefits do not last forever, though, and while their tumors may initially shrink, most people on vemurafenib suffer cancer recurrence in the long run with a lethal, drug-resistant form of melanoma.

In the laboratory, the same phenomenon can be observed in mice. When small melanoma tumor fragments are implanted in mice, the tumors will initially shrink in response to drug, but eventually the mice will cease to respond to the drug and their tumors will re-emerge in a resistant form.

Targeting the Mechanism of Resistance

Working with such laboratory models, the UCSF and NIBR research teams were able to determine the mechanism of resistance. They discovered that when melanoma cells are subjected to vemurafenib, they become resistant by making more of the BRAF protein – the very target of the drug itself.

The idea for intermittent dosing came directly from this insight. If by becoming resistant to vemurafenib's anti-cancer potency, melanoma also becomes addicted to it, Das Thakur and her colleagues reasoned, then drug-resistant tumors may shrink when the vemurafenib is removed. That's exactly what they observed.

The team discovered that when they stopped administering the drug to mice with resurgent, resistant tumors, the tumors once again shrank. In addition, mice continuously treated with vemurafenib all died of drug-resistant disease within about 100 days, whereas all the mice treated with vemurafenib but with regular "drug holidays" all lived past 100 days.

"Vemurafenib has revolutionized treatment of a specific subset of melanoma expressing mutated BRAF, but its long-term effectiveness is diminished by the development of drug resistance," said McMahon, the Efim Guzik Distinguished Professor of Cancer Biology in the UCSF Helen Diller Family Comprehensive Cancer Center. "By seeking to understand the mechanisms of drug resistance, we have also found a way to enhance the durability of the drug response via intermittent dosing."

The article, "Modeling vemurafenib resistance in melanoma reveals a strategy to forestall drug resistance" is authored by Meghna Das Thakur, Fernando Salangsang, Allison S. Landman, William R. Sellers, Nancy K. Pryer, Mitchell P. Levesque, Reinhard Dummer, Martin McMahon and Darrin Stuart. It appears in the Jan. 9, 2013, issue of the journal Nature. After publication, the article can be accessed at: <http://dx.doi.org/10.1038/nature11814>

http://www.eurekalert.org/pub_releases/2013-01/nlmc-dbm010813.php

Disappearing bacterium may protect against stroke

H. pylori isn't a major cause of death and may protect against stroke and some cancers

New York (January 9, 2013) -- A new study by NYU School of Medicine researchers reveals that an especially virulent strain of the gut bacterium *Helicobacter pylori* (*H. pylori*) isn't implicated in the overall death rate of the U.S. population, and may even protect against stroke and some cancers. The findings, based a nationwide health survey of nearly 10,000 individuals over a period of some 12 years, are published online, January 9, in the journal *Gut*.

Those individuals carrying the most virulent strain of *H. pylori*, the study found, had a 55 percent reduced risk of deaths from stroke compared with their counterparts who were not infected with *H. pylori*. Participants with the most virulent strain also had a 45 percent reduced risk of death from lung cancer.

These surprising findings emerged from an analysis by Yu Chen, PhD, MPH, associate professor of population health and environmental medicine, and Martin J. Blaser, MD, professor of internal medicine and professor of microbiology, of individuals who participated in a national survey designed to assess the health and nutritional status of adults and children in the United States. Previous studies by Dr. Blaser have confirmed the bacterium's link to gastric diseases ranging from gastritis to stomach cancer. He and Dr. Chen have more recently shown that *H. pylori* may protect against childhood asthma. The most virulent *H. pylori* strains have a gene called *cagA*.

"The significance of this study is that this is a prospective cohort of participants representative of the U.S. population with a long follow-up," says Dr. Chen. "We studied both the overall *H. pylori* as well as *cagA* strain of *H. pylori*, which is more interactive with the human body. We found that *H. pylori* is not related to the risk of death from all causes, despite it being related to increased risk of death from gastric cancer."

"This finding confirms earlier work, however, that gastric cancers are now uncommon in the United States," says Dr. Chen. "We also found that *H. pylori* was related to a reduced risk of stroke and lung cancer, and these effects were stronger for the *cagA* strain, suggesting its mixed role in human health," she says.

H. pylori, an ancient bacterium, lives in the mucous layer lining the stomach where, until recently, it survived for decades. More than half of the world's population harbor *H. pylori* in their upper gastrointestinal tract. Mainly transmitted in families, the bacterium is usually acquired before age 10. In developing countries *H. pylori* is still prevalent, but is vanishing in the developed world thanks to better sanitation and widespread use of antibiotics.

To better understand the relationship between *H. pylori* and the overall death rate, or all-cause mortality, the researchers analyzed data from 9,895 participants in the National Health and Nutrition Surveys (NHANES III), enrolled from 1988 to 1994. Test results for *H. pylori* and *cagA* were available on 7,384 subjects at the time of enrollment, and participants were followed until 2000.

There was no association of either *H. pylori*-positivity or *cagA*-positivity with all-cause mortality in the population, the researchers found. Participants with and without *H. pylori* experienced a similar risk of death from all causes. Consistent with past reports, a strong association was observed between *H. pylori* and gastric cancer mortality, according to the study. Individuals who were *H. pylori* positive were 40 times more likely to die from gastric cancer. The study also found that participants with *cagA*-positivity had a 55 percent reduced risk of deaths from stroke compared with their counterparts who were *H. pylori* negative/ *cagA*-negative. Participants with *cagA*-positivity also had a 45 percent reduced risk of deaths from lung cancer.

"The most interesting finding was that there is a strong inverse association with stroke which could be protective," says Dr. Blaser. "There is some precedent for this and it is possible that the same cells (T reg cells)

that *H. pylori* induces that protect against childhood asthma could be the protective agents, however, the findings need to be confirmed."

Authors: Yu Chen, PhD, MPH, associate professor, Departments of Population Health and Environmental Medicine; Stephanie Segers, MPH, statistician, Department of Population Health; Martin J. Blaser, MD, professor, Departments of Medicine and Microbiology.

Competing Interests: None reported.

Funding/Support: This work was supported in part by grants R01DK090989, R01GM63270, ES000260, and P30CA16087 from the National Institutes of Health, and by the Diane Belfer Program for Human Microbial Ecology.

<http://www.sciencedaily.com/releases/2013/01/130108162135.htm>

Hold the Diet Soda? Sweetened Drinks Linked to Depression, Coffee Tied to Lower Risk

New research suggests that drinking sweetened beverages, especially diet drinks, is associated with an increased risk of depression in adults while drinking coffee was tied to a slightly lower risk.

The study was released January 8 and will be presented at the American Academy of Neurology's 65th Annual Meeting in San Diego, March 16 to 23, 2013.

"Sweetened beverages, coffee and tea are commonly consumed worldwide and have important physical -- and may have important mental -- health consequences," said study author Honglei Chen, MD, PhD, with the National Institutes of Health in Research Triangle Park in North Carolina and a member of the American Academy of Neurology.

The study involved 263,925 people between the ages of 50 and 71 at enrollment. From 1995 to 1996, consumption of drinks such as soda, tea, fruit punch and coffee was evaluated. About 10 years later, researchers asked the participants whether they had been diagnosed with depression since the year 2000. A total of 11,311 depression diagnoses were made.

People who drank more than four cans or cups per day of soda were 30 percent more likely to develop depression than those who drank no soda. Those who drank four cans of fruit punch per day were about 38 percent more likely to develop depression than those who did not drink sweetened drinks. People who drank four cups of coffee per day were about 10 percent less likely to develop depression than those who drank no coffee. The risk appeared to be greater for people who drank diet than regular soda, diet than regular fruit punches and for diet than regular iced tea.

"Our research suggests that cutting out or down on sweetened diet drinks or replacing them with unsweetened coffee may naturally help lower your depression risk," said Chen. "More research is needed to confirm these findings, and people with depression should continue to take depression medications prescribed by their doctors."

The study was supported by the National Institutes of Health, the National Institute of Environmental Health Sciences and the National Cancer Institute.

<http://www.wired.com/wiredscience/2013/01/raccoon-cancer-outbreak/>

Brain Cancer-Causing Virus Strikes West Coast Raccoons

An outbreak of a previously unknown virus that causes fatal brain cancer in raccoons has been detected in northern California and southern Oregon.

By Brandon Keim

Tumors and the new virus were found in 10 raccoons autopsied between March 2010 and May 2012. Nothing like them had been seen before in raccoons, in which tumors are very rare.

There's no reason to think the virus could be contagious to humans. Its emergence does, however, raise fascinating questions about how it evolved and whether patterns of suburban development actually fueled its rise.



Image: Tambako the Jaguar/Flickr

"We need to understand how infectious pathogens are empowered by global changes," said veterinary pathologist Patty Pesavento of the University of California, Davis, leader of the team studying the new disease, which was reported in the January issue of *Emerging Infectious Disease*. "If there's a new niche, pathogens will find it."

Nine of the raccoons came from around Marin County, just north of San Francisco, and the 10th was sent from southern Oregon. The raccoons had been spotted wandering in daylight, approaching humans, falling unconscious and generally displaying signs of neurological distress.

Tumors appeared to have formed in their olfactory tracts, spread to their frontal lobes and compressed their mid-brains (see picture below). Reviews of scientific literature and calls to veterinary pathologists across North America found no precedents.

In each of the tumors, but not in brain tissue from raccoons tested for comparison, Pesavento's team found an unknown form of polyomavirus, one of a group of viruses known to cause a rare form of skin cancer in humans and tumors in other animals, including mice and birds. Pesavento's team called it raccoon polyomavirus.

"The connection between the novel polyomavirus and these raccoon brain tumors is strong," said disease ecologist Richard Ostfeld of the Cary Institute for Ecosystem Studies, who was not involved in the research. The exact virulence and contagiousness of the new virus is unknown, but there's reason to think it's high. Raccoons killed by the tumors accounted for more than one-fifth of all the raccoons Pesavento's group autopsied between March 2010 and May 2012, and the cases they saw are likely the disease's tip.

"Raccoons go and hide when they're sick," said Pesavento. "The reason we're seeing this at all is because they don't know what they're doing. They're neurological."

Also unknown is whether the virus is unique to raccoons, or if that species is a so-called dead-end host for a disease transmitted between other animals, such as skunks or opossums.

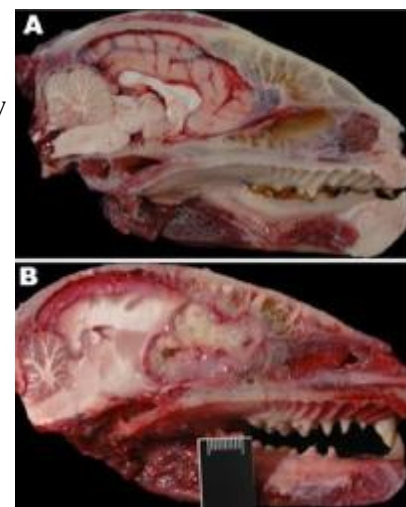
It's also possible that the virus is an opportunistic pathogen signaling some deeper problem in raccoons, just as outbreaks of Kaposi's sarcoma, a once-rare type of cancer that thrived in the compromised immune systems of people with AIDS, signaling the HIV epidemic's beginning.

Though much remains unknown about raccoon polyomavirus, preliminary examination by Pesavento's team has turned up some interesting information. Unlike other polyomaviruses, it doesn't seem to fuse with the DNA of its host cells, but instead floats outside the chromosomes, potentially representing a new mechanism by which the virus induces cancer.

"That's known to have happened in a dish, but nobody believed it happened in an animal," said Pesavento.

The new virus also appears to be more closely related to human than animal polyomaviruses, suggesting a possible origin in our own species. Raccoons are known to frequent sewage drains, and exposure to polyomavirus-laden human waste is almost inevitable.

That contact creates opportunities for a mammalian species-hopping polyomavirus to thrive. If the raccoons are physiologically stressed, or are isolated from other populations, it may become even easier for viruses to cross the species gap.



Autopsy cross-section of an unaffected raccoon's head (top) compared to an affected raccoon (below). Tumors have grown in the olfactory tract, extending into the frontal lobe and midbrain. Dela Cruz et al./Emerging Infectious Diseases

"Their immune systems are not as rich, not as deep," said Pesavento. "All of a sudden, we've created an evolutionary petri dish" for viruses that would otherwise have died out.

Fragmented suburban ecologies and stressed animal populations "create an environment where a virus can work towards species-jumping," said Pesavento.

Ostfeld cautioned against jumping to conclusions about the new virus's origins, which could instead be in rodents, bats or some other animal.

"There's really nothing in this paper to indicate what might have caused the outbreak," he said.

But disease ecologist Peter Daszak, president of the EcoHealth Alliance, sees the raccoons as a potential sentinel for changing conditions. "Urban development drives changes in ecology that promote the emergence of disease," he said.

A variation on this type of evolution is the lethal Hendra virus in Australia, which jumped to humans as a consequence of development-driven changes in the habits of flying foxes, its traditional animal hosts.

Unlike the Hendra virus, it's extremely unlikely that the raccoon polyomavirus could infect humans. And unlike influenza viruses, it's unlikely that genes from the new virus will be transferred into human-infecting strains, said Pesavento.

"Polyomaviruses have never been shown to recombine like influenza does," said Pesavento. But, "as humans, we have the responsibility to these animals to understand how we're affecting them," she said.

Daszak echoed her reassurances that the new virus won't infect people, but warned that creating reservoirs of any new disease is an unnecessary risk. "The message from this is not that wildlife are scary," Daszak said.

"The lesson is that we need to protect wildlife."

Citation: "Novel Polyomavirus associated with Brain Tumors in Free-Ranging Raccoons, Western United States." By Florante N. Dela Cruz, Federico Giannitti, Linlin Li, Leslie W. Woods, Luis Del Valle, Eric Delwart, and Patricia A. Pesavento. Emerging Infectious Disease, Vol. 19 No. 1, January 2013.

http://www.eurekalert.org/pub_releases/2013-01/aaon-asg010313.php

A saliva gland test for Parkinson's disease?

New research suggests that testing a portion of a person's saliva gland may be a way to diagnose Parkinson's disease.

SAN DIEGO – The study was released today and will be presented at the American Academy of Neurology's 65th Annual Meeting in San Diego, March 16 to 23, 2013.

"There is currently no diagnostic test for Parkinson's disease," said study author Charles Adler, MD, PhD, with the Mayo Clinic Arizona and a Fellow of the American Academy of Neurology. "We have previously shown in autopsies of Parkinson's patients that the abnormal proteins associated with Parkinson's are consistently found in the submandibular salivary glands, under the lower jaw, and this is the first study demonstrating the value of testing a portion of the saliva gland to diagnose a living person for Parkinson's disease. Making a diagnosis in living patients is a big step forward in our effort to understand and better treat patients."

The study involved 15 people with an average age of 68 who had Parkinson's disease for an average of 12 years, responded to Parkinson's medication and did not have known salivary gland disorders. Biopsies were taken of two different salivary glands: the gland under the lower jaw and the minor salivary glands in the lower lip. The biopsied tissues were stained and reviewed for evidence of the abnormal Parkinson's protein.

In four of the initial lower jaw biopsies, while researchers were still perfecting the technique, not enough tissue was available to complete the tests. The abnormal Parkinson's protein was detected in nine of the 11, or 82 percent, of the patients with enough tissue to study.

"While still under analysis, the rate of positive findings in the biopsies of the lower lip glands appears to be much lower than for the lower jaw gland. This study provides the first direct evidence for the use of lower jaw gland biopsies as a diagnostic test for living patients with Parkinson's disease," said Adler. "This finding may be of great use when needing tissue proof of Parkinson's disease, especially when considering performing invasive procedures such as deep brain stimulation surgery or gene therapy."

This study was funded by the Michael J. Fox Foundation for Parkinson's Research.

http://www.eurekalert.org/pub_releases/2013-01/cchm-ksr010713.php

Kidneys sometimes removed unnecessarily due to misdiagnosis of genetic disorder

Study shows drug can shrink tumors and save kidneys

Thousands of individuals have had kidneys removed unnecessarily because doctors misdiagnosed their disease. A new, international study published in *The Lancet* indicates that approximately one of every five individuals with kidney tumors common in patients with tuberous sclerosis complex (TSC), a genetic disorder, has had a kidney removed. Moreover, 40 percent had some kind of surgical procedure performed.

Proper diagnosis could have led to treatment that would have made surgery or kidney removal unnecessary, according to John Bissler, MD, a nephrologist at Cincinnati Children's Hospital Medical Center and lead author of the study.

"I can't tell you how many times I've heard from patients who say their doctors told them a kidney looks bad, is full of tumors, isn't working and has to come out," says Dr. Bissler, who co-directs the Tuberous Sclerosis Clinic at Cincinnati Children's. "But you can do studies on these patients and find out that they have normal kidney function. The kidney looks bad, but it works. Doctors are unfamiliar with tuberous sclerosis, so when they see tumors, they think it's renal cell carcinoma, perform surgeries trying to help, but before long the kidney is gone. This approach is unnecessary. Fortunately, many people come to us from around the world for a second opinion."

In TSC, it is common for tumors to grow on vital organs. As many as 80 percent of TSC patients have these tumors, called angiomyolipomas, or AMLs. The new Cincinnati Children's study shows that everolimus, marketed by Novartis under the tradename Afinitor®, successfully shrinks AMLs in patients with TS. (Watch the story of a TS patient whose life was changed by taking the drug.)

The Food and Drug Administration in April approved everolimus to treat noncancerous kidney tumors (renal angiomyolipomas) not requiring immediate surgery in patients with TSC, based on the research led by the Cincinnati Children's team. TSC affects approximately 40,000 children and adults in the United States, with 70 to 80 percent developing kidney problems. TSC can cause multiple tumors in both kidneys that compress normal tissue as they grow, leading to kidney failure and bleeding due to uncontrolled blood vessel growth. One of five who bleeds winds up in the emergency department in shock.

The Cincinnati Children's study involved 118 TSC patients at 24 treatment centers in 11 countries. Everolimus substantially reduced angiomyolipoma tumor size in 42 percent of those treated after just a few months of treatment. Tumor reduction lasted, on average, more than five months.

For years, the primary treatment for angiomyolipomas was arterial embolization, which uses a catheter to block the artery and stop blood flow to the tumor. Embolization, however, can also damage healthy tissue.

Studies in the 1990s traced the cause of TSC to defects in two genes, TSC1 and TSC2. When these genes malfunction, the cell has higher activity of mTOR, a protein known to trigger uncontrolled tumor cell and blood vessel growth. Everolimus, a medication already approved as an antirejection agent in organ transplant, emerged as a prime candidate to treat TSC.

Some TSC patients at Cincinnati Children's have been on the drug for several years, and tumor reduction has not subsided. Novartis is sponsoring a four-year follow-up study to track longer-term effects.

Cincinnati Children's has what is believed to be the largest TSC clinic in the world, treating more than 839 children and adults. Cincinnati Children's also is a major TSC research center. David Neal Franz, MD, a neurologist who cares for TS patients, was senior author of a 2010 study published in *The New England Journal of Medicine* demonstrating the ability of everolimus to shrink SEGAs, a kind of brain tumor common in patients with TSC.

http://www.eurekalert.org/pub_releases/2013-01/w-hfp010913.php

Herbal treatments for postmenopausal symptoms can be recommended as an alternative to HRT

Herbal and complementary medicines could be recommended as an alternative to hormone replacement therapy

Herbal and complementary medicines could be recommended as an alternative to hormone replacement therapy (HRT) for treating postmenopausal symptoms says a new review published today in *The Obstetrician and Gynaecologist (TOG)*. The review outlines the advantages and limitations of both pharmacological and herbal and complementary treatments for women with postmenopausal symptoms.

The menopause is defined as the time after a woman's menstrual periods have ceased (12 months after a woman's final menstrual period). It is associated with an estrogen deficiency and can cause an increase in vasomotor symptoms (hot flashes), genitourinary symptoms (vaginal dryness, sexual dysfunction, frequent urinary tract infections, urinary incontinence), and musculoskeletal symptoms (joint pain) as well as sleep and mood disturbance.

One of the most common menopausal symptoms is hot flashes; approximately two-thirds of postmenopausal women will experience them, and 20% of women can experience them for up to 15 years, states the review. Estrogen deficiency can also lead to longer-term health issues such as cardiovascular disease and osteoporosis. While pharmacological agents are available to treat postmenopausal symptoms, many non-pharmacological treatment options are also available.

HRT is the most effective treatment of hot flashes, improving symptoms in 80 – 90% of women, says the review. However, the author notes that there are possible health risks associated with HRT, such as links to breast cancer, blood clots, stroke, and cardiovascular problems. Due to these possible risks, other treatment options may be equally effective, such as behaviour modification and herbal and complimentary medicines, says the author.

The review states that as many as 50 - 75% of postmenopausal women use herbal options to treat hot flashes, and of the complimentary therapies, soy, red clover and black cohosh have been the most investigated.

Soy is the most common plant containing estrogen, found naturally in food and supplements. Previous research has shown a reduction in hot flush symptoms with soy ranging from 20 - 55%. Red clover, a legume also containing estrogen, and black cohosh, a plant originating from the eastern United States and Canada, have also been reported to ease postmenopausal symptoms.

The author of the review recommends these herbal treatments as there are no significant adverse side effects associated with them, as long as they are used in women who do not have a personal history of breast cancer, are not at high risk for breast cancer, and are not taking tamoxifen. However, the review notes that herbal medicines are not regulated in many countries, and therefore the contents of a given product may vary from sample to sample.

Iris Tong, Director of Women's Primary Care at the Women's Medicine Collaborative, The Warren Alpert Medical School of Brown University, Rhode Island, and author of the review said: "Up to 75% of women use herbal and complimentary medicines to treat their postmenopausal symptoms. Therefore, it is vitally important for healthcare providers to be aware of and informed about the non-pharmacological therapies available for women who are experiencing postmenopausal symptoms and who are looking for an alternative to HRT." TOG's Editor-in-Chief, Jason Waugh said: "Postmenopausal symptoms can be very distressing and it is important to review the advantages and limitations of the non-pharmacological treatments available as well as

the pharmacological ones. Even simple behaviour modification can make a difference to postmenopausal symptoms, including keeping the room temperature cool, wearing layered clothing, relaxation techniques and smoking cessation."

http://www.eurekalert.org/pub_releases/2013-01/afps-wss011013.php

Which study strategies make the grade?

New report finds several popular study strategies are ineffective; effective study strategies are underused
Students everywhere, put down those highlighters and pick up some flashcards! Some of the most popular study strategies — such as highlighting and even rereading — don't show much promise for improving student learning, according to a new report published in *Psychological Science in the Public Interest*, a journal of the Association for Psychological Science.

In the report, John Dunlosky of Kent State University and a team of distinguished psychological scientists review the scientific evidence for ten learning techniques commonly used by students.

"Schools and parents spend a great deal of money on technology and programs to improve student achievement, even though evidence often isn't available to firmly establish that they work," says Dunlosky. "We wanted to take a comprehensive look at promising strategies now, in order to direct teachers, students and parents to the strategies that are effective, yet underused."

Based on the available evidence, the researchers provide recommendations about the applicability and usefulness of each technique.

While the ten learning techniques vary widely in effectiveness, two strategies — practice testing and distributed practice — made the grade, receiving the highest overall utility rating.

Most students are probably familiar with practice testing, having used flash cards or answered the questions at the end of a textbook chapter. Students who prefer last-minute cram sessions, however, may not be as familiar with the idea of distributed practice.

Dunlosky and colleagues report that spreading out your studying over time and quizzing yourself on material before the big test are highly effective learning strategies. Both techniques have been shown to boost students' performance across many different kinds of tests, and their effectiveness has been repeatedly demonstrated for students of all ages.

In contrast, five of the techniques received a low utility rating from the researchers. Notably, these techniques are some of the most common learning strategies used by students, including summarization, highlighting and underlining, and rereading.

"I was shocked that some strategies that students use a lot — such as rereading and highlighting — seem to provide minimal benefits to their learning and performance. By just replacing rereading with delayed retrieval practice, students would benefit," says Dunlosky.

So why don't they? Why aren't students and teachers using the learning strategies that have been shown to be effective and inexpensive?

Dunlosky and colleagues found that the answer may have to do with how future teachers are taught.

"These strategies are largely overlooked in the educational psychology textbooks that beginning teachers read, so they don't get a good introduction to them or how to use them while teaching," Dunlosky explains. As a result, teachers are less likely to fully exploit some of these easy-to-use and effective techniques.

To help address this gap, the researchers organized their report in distinct modules, so that teachers can quickly decide whether each technique will potentially benefit his or her students and researchers can easily set an agenda on what we still need to know about the efficacy of these strategies.

"The learning techniques described in this monograph will not be a panacea for improving achievement for all students, and perhaps obviously, they will benefit only students who are motivated and capable of using them," Dunlosky and colleagues note. "Nevertheless, when used properly, we suspect that they will produce meaningful gains in performance in the classroom, on achievement tests, and on many tasks encountered across the life span."

The report, "Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology," is published in the January 2013 issue of Psychological Science in the Public Interest and is authored by John Dunlosky and Katherine A. Rawson of Kent State University, Elizabeth J. Marsh of Duke University, Mitchell J. Nathan of the University of Wisconsin-Madison, and Daniel T. Willingham of the University of Virginia. The research included in the report was supported by a Bridging Brain, Mind and Behavior Collaborative Award through the James S. McDonnell Foundation's 21st Century Science Initiative.

The report also features an editorial written by Henry L. Roediger III of Washington University in St. Louis.

<http://www.bbc.co.uk/news/world-africa-20976277>

Nigerian texters to take on the drug counterfeiters

Consumers of the medicine are being armed with exactly what they need to outwit the counterfeiters

By Will Ross BBC News, Lagos

The steel door of the shipping container in Nigeria's Lagos port swings open to reveal hundreds of cardboard boxes packed with sachets of anti-malaria medicine. But these pills would be of no use to someone suffering from the life-threatening condition. The packaging may be identical to an Indian-manufactured drug which sells well in Nigeria, but when the pills were examined in a laboratory they were found to contain nothing more than chalk. These fake drugs were produced in China and were seized by Nigeria's National Agency for Food and Drug Administration and Control (Nafdac).

The war against counterfeit medicine has been on for more than 20 years in Nigeria. "With the crackdown on illegal narcotics, drug barons have redirected their resources to manufacturing counterfeit medical products because it is more lucrative and less risky," says Dr Paul Orhii, the director general of Nafdac.

Comprehensive surveys have not been carried out for some years, but a report by the World Health Organization in 2011 suggested the war is far from won. It said more than two-thirds of malaria medicine in Nigeria was fake or substandard.

Now the consumers of the medicine are being armed with exactly what they need to outwit the counterfeiters. More and more packs of medicine produced by pharmaceutical companies have a small strip added to the packaging - similar to the scratch panel people are used to seeing on a mobile phone charge-card.

"When the patient picks the medicine off the shelf they scratch the panel to reveal a unique number or code," says the Ghanaian entrepreneur Bright Simons. "The consumer takes out a mobile phone and sends the code to a toll-free number," he explains.

Standing in a market in Lagos, the founder of the organisation mPedigree tests out the technology. Within two seconds of texting the number from a pack of anti-malaria medicine, a message appears on his phone with the word "YES" - a simple response meaning the drug is genuine. "This allows even illiterate people to latch on," says Mr Simons. "If they receive the word 'NO' there will also be a local number so they can alert the authorities about this encounter with a potentially toxic or fatal chemical masquerading as medicine."

Valuable data

mPedigree is now operating in eight countries including Ghana, Kenya, Nigeria and India. Cameroon and Rwanda are next. For the service to work, the national drug regulators, mobile phone networks and pharmaceutical companies have to come on board. For them the technology has the potential to provide valuable data about the demand for their medicine in order to plan their distribution more efficiently and precisely. "Imagine just-in-time deliveries of rare medicines to specialist clinics or even direct delivery of doses to chronic patients periodically," Mr Simons says.

Most of the packets of medicine with the scratch panel are currently available in hospitals to allow doctors and nurses to be sure of what they are giving patients. But by the end of February mPedigree hopes there will be 10 million packets in pharmacies across the world.

In a \$30m (£18.6m) state-of-the-art pharmaceutical factory just outside Lagos, laboratory technicians keep a close eye on digital readouts as huge steel containers mix up the ingredients for an antibiotic pill.

With Nigeria's population of about 170 million and its ambitions to become a major exporter, this is potentially an extremely lucrative business for the company May and Baker which has operated in Nigeria for 70 years. Profits are dented by a lack of electricity, making huge diesel-thirsty generators a necessity.

The business is also threatened by the counterfeiters, so mPedigree is a welcome partner. "I can estimate that over 20% of our top line is lost to the activities of these guys," says Nnamdi Okafor, the managing director May and Baker Nigeria PLC. "They are very smart people. Usually they wait for you to come up with a new product," says Mr Okafor, standing next to machines which spit out two million antibiotic pills a day.

"And the moment they see that the product has got some good equity in the market, they move quickly.

"They copy everything from the physical product to the packaging and the logo," he says.

"Everything will be exact and sometimes they even come out looking better than the original product.

"It is impossible for anybody to know even for the manufacturers themselves - unless you go to the lab."

Enemies

Of course the key difference is the content of the medicine. Sometimes the fake drugs include 20% of the active ingredient - enough to produce a characteristic taste or smell. Patients have also been duped into swallowing capsules full of sawdust as well as pills of chalk.

For one woman, the war on fake medicine became a personal fight. "My younger sister, Vivian, our last born, was one of the nicest human beings that ever lived," recalls Dora Akunyili, the former head of Nafdac. "She

became diabetic and was taking insulin. "We noticed she would not react to the insulin from some shops and the blood sugar kept going up," she said. "It didn't sink in that this was fake medicine." Vivian died in her mid-20s.

After taking up the leadership of Nafdac in 2001, Ms Akunyili made plenty of enemies as she tried to smash the lucrative fake drug industry. "My car was shot from behind on 26 December 2003," she said. "The bullet went through my headscarf and passed through the windscreen of the car, leaving my hair burnt." Despite threats against her family and violent attacks on her colleagues, she did not give up, heading the agency for seven years. "When the drug counterfeiters heard I might be quitting the job they started popping champagne in Onitsha market, rejoicing that this wicked woman would soon quit the scene," she told the BBC.

"But I felt if I left the job that would be victory for the drug counterfeiters," she said.

'Running them out of town'

Whilst welcoming the mPedigree technology, she has concerns that high illiteracy rates could undermine the initiative and believes the best way to end the deadly crime is to stop the importation of the fake drugs from China and India.

The authorities in Nigeria had ordered that by 2 January 2013 all anti-malaria medicine should include the mobile phone verification scratch panels. The deadline was not met but the current Nafdac director general believes with the new initiative, the war will be won.

"We are putting the power of detection of counterfeit medicine into the hands of the Nigerian consumer," says Dr Orhii. "With 80 million Nigerians using cellphones, it is like we have 80 million staff in Nafdac.

"Every Nigerian who walks into a pharmacy store with a cellphone in hand is a potential Nafdac informer."

Rolling out the technology is slow but the founder of mPedigree knows that the invention has the potential to finish the fake drug manufacturers. "We are collating data to allow the law enforcement authorities to track them because we know exactly where these problems occur," Mr Simons says. "We are putting pressure on them from every angle. We are not only squeezing them we are running them out of town," he says, with his weapon, the mobile phone, in hand.

<http://phys.org/news/2013-01-softbank-staff-mn-yen-good.html>

Softbank offers staff one mn yen to learn good English

Japanese mobile carrier Softbank, which made headlines over a \$20 billion takeover of US-based Sprint Nextel, is offering employees an incentive to master English—one million yen.

The firm said Friday it is giving the cash reward, worth about \$11,200, to workers who get top marks in an English-proficiency test for non-native speakers, known as TOEIC, or Test of English for International Communications. A mark above 900—on a scale from 10 to 990—will make the grade, Softbank said, adding the offer applied to about 17,000 employees. Those who score 800 or higher will get 300,000 yen, it said. The company said it has been training employees to give presentations in English, but figured cold hard cash would be an extra incentive. "We decided to boost (employees') motivation with money," said a spokeswoman. The move comes as a strong yen and shrinking domestic market have sent Japanese firms on a buying spree abroad. But the level of English spoken at Japanese companies tends to be far lower than in other regional business hubs such as Hong Kong and Singapore.

Japan's online shopping giant Rakuten, as well as Fast Retailing, operator of Uniqlo cheap-chic clothing chain, are swapping Japanese for English as the working language in their offices as they expand overseas.

Little known outside Japan, Softbank is perhaps the country's most colourful and dynamic among the major mobile carriers and was the first to carry Apple's popular iPhone. Its well-known television commercials star a talking snow-white dog and have featured American actor Tommy Lee Jones.

<http://www.wired.com/wiredscience/2013/01/almost-untreatable-gonorrhea/>

Almost-Untreatable Gonorrhea: Proof That It's Here

Control of gonorrhea now hinges on a single remaining drug; there are no others lined up

By Maryn McKenna

If you've been following this blog for a while, you might have noticed a thread on health authorities' growing concern over gonorrhea not responding to the drugs used against it. (And if you didn't notice you can find [those posts here](#).) A paper published Wednesday evening shows that worry has not been misplaced.

The concern is this: Treatment of STDs in infected people, and programs that aim to keep STDs from spreading from those people to others, rely on drugs that are inexpensive to buy, simple to administer, and work after a single dose and clinic visit. Since the late 1990s, there have been only two drugs that fulfill those criteria: an oral drug called cefixime and an injectable called ceftriaxone (both belonging to the same broader drug family called third-generation cephalosporins). Since the early 2000s, there have simultaneously been signs that

resistance to cefixime has been spreading from the Pacific Rim - Japan and Hawaii - to North America, Europe and the rest of the world.

The earliest signs of this were spotted in California in 2008, and in the rest of the US in 2011. Last June, the World Health Organization called the situation an emergency; in August, the European CDC alerted its member countries to cases in Europe; and also in August, the US CDC advised doctors here that they should stop using that oral drug and stick only to the injectable.

In that several-year progression, though, there have been relatively few reports of clinics actually confronting cases of gonorrhea which simply did not respond to drug treatment. That is mostly because many of the public-health warnings were based, not on observations of individual patients, but on after-the-fact assessments of collections of bacterial isolates. Plus, since the expectation was “single dose equals cure,” someone who returned to a clinic with symptoms was assumed to have gotten reinfected, rather than being continuously infected because their treatment had not worked.

Now, though, comes a report from researchers in Canada — including personnel at the superbly named Hassle Free Clinic of Toronto — of standard cefixime treatment just not working in some patients there. As they describe in this week’s *Journal of the American Medical Association*, some of the men were eventually treated with double the standard dose of cefixime (800mg instead of 400mg); others were treated with ceftriaxone (250mg as an intramuscular injection).

The numbers of patients are small, but the percentages of diminished susceptibility and resistance still exceed what the WHO previously set at the point where we should start being worried, and there are interesting details that hint at further trouble to come.

The researchers decided to assess every lab-confirmed case of gonorrhea that came through the clinic in a 12-month period, May 2010 through April 2011. At that clinic at the time (and still, throughout Canada), standard treatment for gonorrhea was the 400-mg oral dose of cefixime.

As part of its standard STD care, this clinic did two things that are not common, though the US CDC at least would like to see then happen. First, they did culture confirmation of gonorrhea infections, not just the DNA-based rapid tests that are now routine. This is important because culture tests, but not the DNA-based tests, preserves intact bacteria, allowing lab personnel to perform a test for antibiotic susceptibility — which this clinic did. Second, the clinic also asked every patient to return for a “test of cure” to make sure the infection had been cleared, so that they could be sure that people who returned with symptoms had been reinfected, as opposed to having a persistent, resistant strain.

In that 12-month, 291 patients were confirmed to have gonorrhea:

59 of them - 20 percent - were infected with strains that showed some diminished response to cefixime.

Of the 291, 158 (54 percent) did not return for their “test of cure” visit, including 31 whose isolates showed that diminished susceptibility.

133 (45 percent), including 28 whose isolates originally showed diminished susceptibility, did return.

Of those 133, 13 had a second positive culture, failing the “test of cure.”

Of those 13, four were ruled out as possibly having been re-infected, even though their original infections did show diminished susceptibility.

That left nine patients whose infections were non-susceptible enough to be classified as “treatment failure” - 6.77 percent of those who returned for test of cure. The WHO’s threshold for reconsidering the efficacy of cefixime is 5 percent.

Of those nine patients, the infections in three responded to the double-sized dose of cefixime. Six required injectable ceftriaxone instead.

There is a lot in that breakdown that is worrisome. The first is the rate of treatment failure. The second is the proportion of patients, including some with strains that were not responding to the standard drug dose, who did not return to be checked even though they were explicitly asked to do so. And the third is that we only know any of these percentages because this clinic happens to follow practices that are not routine in many of the STD clinics in the US — which is to say, our rates could be this bad, or worse, and we would not know.

Balancing that discouraging assessment, it is worth noting that the treatment used in the Toronto clinic is not now recommended in the US; and, in addition, the CDC also recommends that patients be brought back for a test of cure. The problem with those recommendations, as the National Coalition of STD Directors has been warning for a while, is that they make STD care more expensive in a time of austerity. STD programs are run by states, with CDC assistance; the coalition said last August: “the vast majority of health department STD programs have seen significant budget reductions in recent years, some to the point where state and local contributions are zero.”

The reality remains: As these Canadian cases show, control of gonorrhoea now hinges on a single remaining drug; there are no others lined up. (I once asked a friend who runs an STD clinic what comes after ceftriaxone, thinking she would say, "Well, an IV drug," or "Well, checking into a hospital." Instead, she made a face and said: "What comes afterward is clinical trials.") And because that remaining drug is an injectable, control of gonorrhoea is not only precarious, it is also already more expensive than it was.

There are not many options left, to keep gonorrhoea from getting to untreatable. But in their statement from last fall, the STD directors' coalition underlined why it is so important that we do:

...the following could occur as a result of resistance over the next seven years: gonorrhoea incidence could increase four-fold to nearly 6 million additional cases; nearly 800 additional HIV infections; a quarter million cases of pelvic inflammatory disease in women; and ultimately, over that seven year window, cost over three-quarter of a billion dollars in lifetime medical costs.

Cite: Allen VG, Mitterni L, Seah C et al. Neisseria gonorrhoeae Treatment Failure and Susceptibility to Cefixime in Toronto, Canada. Jan. 9, 2013. JAMA. 2013;309(2):163-170. doi:10.1001/jama.2012.176575.

<http://bit.ly/UYsJSJ>

Straitjacket drug halts herpes virus's escape stunt

New drug denies the herpes virus its means of escape and could lead to treatments that keep it locked up

17:34 11 January 2013 by Douglas Heaven

As anyone who suffers from recurrent cold sores knows, herpes is a master escapist. This family of viruses – including strains that cause lesions on the genitals, infectious mononucleosis (glandular fever) and, in some cases, blindness and birth defects – is able to wriggle free of the body's defences, reactivating after lying dormant for long periods. Now a new drug that denies the virus its means of escape could lead to treatments that keep herpes locked up for good.

When the virus infects cells, the body defends itself by wrapping up the viral genome in a structure that blocks its genes from being expressed. The virus can escape this straitjacket, though, by hijacking some of the cell's own enzymes to unwrap itself. Once freed, the virus takes hold and spreads.

Thomas Kristie at the National Institute of Allergy and Infectious Diseases in Bethesda, Maryland, and colleagues have developed a drug that inhibits the enzymes the virus uses to free itself – stopping it from escaping. "The virus becomes silent," says Kristie.

The team tested their treatment on mice infected with either Cytomegalovirus, a herpes virus which can cause birth defects, or herpes simplex type 1, which causes lesions on the mouth and eye.

About a month after infection, once the virus had entered its dormant stage, the researchers removed neurons from a brain region behind the eye where herpes lurks, and cultured the cells. They found they were unable to reactivate the virus. "You don't ever get the virus coming back," says Kristie. The drug also appears to limit the spread of the initial infection.

New drug arena

This approach of inhibiting the enzyme that the virus hijacks could lead to new treatments that shut down the herpes family of viruses at an early stage of infection. It might even work on other viruses that take over cells in a similar way, such as HIV. "This could open up a new arena of antiviral drugs that hit a number of viruses," says Kristie.

"It's neat that they got such a potent effect," says Robert White at Imperial College London, UK, who was not involved in the study. But more work is needed to investigate possible side effects, he says, since the drug is likely to be knocking out more than just the host enzymes used by the virus. "It's a bit of a sledgehammer."

Journal reference: Science Translational Medicine, doi.org/j64

http://www.eurekalert.org/pub_releases/2013-01/uom-tso011013.php

The secrets of a tadpole's tail and the implications for human healing

Scientists at The University of Manchester have made a surprising finding after studying how tadpoles re-grow their tails which could have big implications for research into human healing and regeneration.

It is generally appreciated that frogs and salamanders have remarkable regenerative capacities, in contrast to mammals, including humans. For example, if a tadpole loses its tail a new one will regenerate within a week. For several years Professor Enrique Amaya and his team at The Healing Foundation Centre in the Faculty of Life Sciences have been trying to better understand the regeneration process, in the hope of eventually using this information to find new therapies that will improve the ability of humans to heal and regenerate better.

In an earlier study, Professor Amaya's group identified which genes were activated during tail regeneration. Unexpectedly, that study showed that several genes that are involved in metabolism are activated, in particular those that are linked to the production of reactive oxygen species (ROS) - chemically reactive molecules

containing oxygen. What was unusually about those findings is that ROS are commonly believed to be harmful to cells.

Professor Amaya and his group decided to follow up on this unexpected result and their new findings will be published in the next issue of Nature Cell Biology.

To examine ROS during tail regeneration, they measured the level of H₂O₂ (hydrogen peroxide, a common reactive oxygen species in cells) using a fluorescent molecule that changes light emission properties in the presence of H₂O₂. Using this advanced form of imaging, Professor Amaya and his group were able to show that a marked increase in H₂O₂ occurs following tail amputation and interestingly, they showed that the H₂O₂ levels remained elevated during the entire tail regeneration process, which lasts several days.

Talking about the research Professor Amaya says: "We were very surprised to find these high levels of ROS during tail regeneration. Traditionally, ROS have been thought to have a negative impact on cells. But in this case they seemed to be having a positive impact on tail re-growth."

To assess how vital the presence of ROS are in the regeneration process, Professor Amaya's team limited ROS production using two methods. The first was by using chemicals, including an antioxidant, and the second was by removing a gene responsible for ROS production. In both cases the regeneration process was inhibited and the tadpole tail did not grow back.

Professor Amaya says: "When we decreased ROS levels, tissue growth and regeneration failed to occur. Our research suggests that ROS are essential to initiate and sustain the regeneration response. We also found that ROS production is essential to activate Wnt signalling, which has been implicated in essentially every studied regeneration system, including those found in humans. It was also striking that our study showed that antioxidants had such a negative impact on tissue regrowth, as we are often told that antioxidants should be beneficial to health."

The publication of Professor Amaya's study comes just days after a paper from the Nobel Prize winner and co-discoverer of the structure of DNA, James Watson, who has suggested antioxidants could be harmful to people in the later stages of cancer.

Professor Amaya comments: "It's very interesting that two papers suggesting that antioxidants may not always be beneficial have been published recently. Our findings and those of others are leading to a reversal in our thinking about the relative beneficial versus harmful effects that oxidants and antioxidants may have on human health, and indeed that oxidants, such as ROS, may play some important beneficial roles in healing and regeneration."

The next step for the team at the Healing Foundation Centre will be to study ROS and their role in the healing and regenerative processes more closely. With a better understanding, Professor Amaya and his team hope to apply their findings to human health to identify whether manipulating ROS levels in the body could improve our ability to heal and regenerate tissues better. Thus these findings have very important implications in regenerative medicine.

http://www.eurekalert.org/pub_releases/2013-01/ghri-lrt010913.php

Less reaction to DTaP vaccine given in kids' thighs than arms

Vaccine Safety Datalink study of 1.4 million children at Group Health, etc., in Pediatrics

SEATTLE—Children age 12 to 35 months who receive DTaP vaccine in their thigh muscle rather than their arm are around half as likely to be brought in for medical attention for an injection-site reaction. So says a new study of 1.4 million children at Group Health and seven other Vaccine Safety Datalink (VSD) centers across the country, e-published on January 14 in Pediatrics.

"These local reactions are the most common side effect of vaccinations," said study leader Lisa A. Jackson, MD, MPH, a senior investigator at Group Health Research Institute. "But we have known relatively little about how to prevent them." Local reactions go away after a day or two, but they can be painful, and the associated redness and swelling can concern parents. This study focused on "medically attended" local reactions: ones that resulted in a visit to a doctor, nurse, or emergency room. Ideally, medically attended local reactions would happen less often than the current nearly one in 100 vaccinated children.

"Our findings support current recommendations to give intramuscular vaccinations in the thigh for children younger than 3 years," Dr. Jackson said. Since 2011, the U.S. Advisory Committee on Immunization Practices (ACIP) has recommended that intramuscular vaccinations be given to toddlers aged 12 to 35 months preferably in the thigh muscle (or in the deltoid muscle of the arm only if it's big enough)—and to children age 3 years older in the deltoid muscle of the arm. But in practice, health care providers tend to vary in their choice of vaccine injection sites for children; and parents can influence that decision.

The research team also tracked local reactions in children age 3 to 6 years and from intramuscular vaccines other than DTaP, including inactivated influenza and hepatitis A. But they found no statistically significant differences between vaccinating in the thigh and arm in the older age group or for the other intramuscular vaccines.

Previous evaluations of local reactions after the fifth DTaP vaccine in children age 4 to 6 years found that vaccination in the thigh was linked to a lower risk of local reactions than was vaccination in the arm. Dr. Jackson also led an earlier study that showed that neither ibuprofen (Advil) nor acetaminophen (Tylenol) help prevent local reactions after that vaccine.

The current research followed children age 1 to 6 years who received intramuscular vaccines from 2002 to 2009 at the eight VSD sites: Group Health; Harvard Pilgrim Health Care in Boston; HealthPartners in Minneapolis; Marshfield Clinic in Wisconsin; Kaiser Permanente Colorado in Denver; Kaiser Permanente Northwest in Portland; Kaiser Permanente Northern California in Oakland; and Kaiser Permanente Southern California in Los Angeles. The VSD project is a collaborative effort between the Centers for Disease Control and Prevention (CDC)'s Immunization Safety Office and 10 managed care organizations, including these eight (whose research institutes also happen to be members of the HMO Research Network).

This study was supported by the CDC (contract 200-2002-00732), through America's Health Insurance Plans.

Dr. Jackson had five coauthors at Group Health Research Institute: Biostatistician Do Peterson, MS; Associate Investigator Jennifer C. Nelson, PhD; and Programmer Analysts Tracey Marsh, MS, and Lawrence Madziwa, MAS. Dr. Jackson also holds appointments at the University of Washington Schools of Public Health and Medicine. Her other coauthors were S. Michael Marcy, MD, of Kaiser Permanente Southern California's Department of Research and Evaluation, in Pasadena; Allison L. Naleway, PhD, of Kaiser Permanente Northwest's Center for Health Research, in Portland, OR; James D. Nordin, MD, MPH, of HealthPartners Institute for Education and Research, in Minneapolis; James G. Donahue, DVM, PhD, of Marshfield Clinic Research Foundation, in Marshfield, WI; Simon J. Hambidge, MD, PhD, of Kaiser Permanente Colorado's Institute for Health Research and Denver Health Community Health Services, in Denver; Carolyn Balsbaugh, MPH, of the Department of Population Medicine, Harvard Pilgrim Health Care Institute and Harvard Medical School, in Boston; Roger Baxter, MD, of the Kaiser Permanente Vaccine Study Center at the Division of Research in Oakland, CA; and Eric Weintraub, MPH, the CDC's Immunization Safety Office, in Atlanta.

<http://www.bbc.co.uk/news/world-latin-america-21002191>

Cholera fear in Cuba as officials keep silent

Doctors are now making door-to-door enquiries in Havana and anyone displaying possible cholera symptoms is being tested

By Sarah Rainsford BBC News, Havana

Uvaldo Pino was a neighbourhood barber in Cerro, one of the poorer and more overcrowded districts of Cuba's capital, Havana. In late December, the 46-year-old fell sick with vomiting and diarrhoea and died in hospital on 6 January. The barber's family say he had two separate tests and both came back positive - for cholera.

"We don't know how he was infected," his sister, Yanisey Pino, told the BBC at the family's home, a few blocks from the capital's Revolution Square. "He was treated, he had all the medicine, but his organs didn't respond. It was too late."

Yanisey added that her brother was a heavy drinker and had checked himself out of hospital the first time he was admitted. A week after Uvaldo's death, Cuba's health ministry has not yet made any public pronouncement. But there are increasing signs that the barber's case is not an isolated one.

'Dozens' of admissions

Doctors are now making door-to-door enquiries in Havana and anyone displaying possible cholera symptoms is being tested. Suspected cases are being sent to the Tropical Medicine Institute, the IPK. "All our wards are dealing with this issue - they are almost full," an IPK employee told the BBC by telephone, before saying she was not authorised to comment further. Another staff member, contacted later and also not authorised to speak to the media, said the IPK did not have any confirmed cases of cholera at this point.

But Yanisey Pino says her brother was diagnosed with cholera both by his local hospital and the IPK.

The day Uvaldo died, health workers visited the family where they live - in several cramped houses around a small yard. Relatives and neighbours were issued antibiotics as a precaution.

The area has been disinfected and water samples were taken for testing. Meanwhile, nearby bars and cafeterias have been closed or instructed not to sell food or drink that is not pre-packed.

Elsewhere in the neighbourhood, there are similar scenes. One resident, Yudermis, fell sick just before the New Year, along with four other relatives including her seven-year-old son. The family assumed they had food poisoning but Yudermis says her cousin then tested positive for cholera at their local clinic.

"The health workers then came here asking questions, like if we had diarrhoea," she explains inside their rundown family home as her son, now fully recovered, plays nearby. "They sent us all to hospital by ambulance

and the tests came back positive. "There were a lot of people at the IPK," Yudermis adds, describing dozens of admissions while she was being treated, and not all from her own district of Cerro. "I was in a bad way. It was frightening. But we're fine now."

Before she fell sick, Yudermis had never even heard of cholera, which is rare in Cuba.

Cold grills

The World Health Organisation (WHO) describes cholera as "extremely virulent". Carried by contaminated water or food, it causes severe dehydration through diarrhoea and can prove fatal if untreated.

Until last summer, there had been no significant outbreak on the island since well before the revolution.

But in July the health ministry confirmed that three people had died of cholera in the east of the country. A contaminated well was identified as the source.

In Havana, Cuba's bustling and crowded capital and a key tourist centre, strict measures are in place to contain the latest suspected outbreak. "We can't sell anything that's not in sealed bottles until further notice and all food sales have been suspended," explains Tony, at the Cerro Moderno cafe, a short walk from the home of Yudermis. Its fridge is now empty and the grills cold.

Local doctors confirmed this is standard procedure for several blocks around every location where someone tests positive for cholera. "If they take all the right measures, we'll be fine," Tony shrugs, adding that everyone has been given antibiotics as a precaution.

"I took my pills straight away!" says Angel, as he buys cigarettes at the cafe. "I don't know what cholera is and I don't want to find out. People here are using chlorine and boiling their water. You have to take care."

Rumour mill

Pharmacies across the city are now selling water purification drops, rationed to two small bottles per person. But in the tourist heart of Old Havana, cafes and restaurants remain open and the streets are still full of mobile food and drink vendors. Most say they have heard rumours of a cholera outbreak in Cerro and are taking extra precautions, but none have received any official instructions.

The WHO stresses "public communication" as a key tool in controlling any cholera outbreak.

In Havana, that task has so far been left to local doctors who are very connected to their communities.

But as rumours fill the information void, concern on the streets is growing.

"I'm racking my brains trying to understand why there's nothing on TV about this," says Yanisey Pino, echoing many peoples' comments. "Why don't they say something? Inform people, like in other countries, so they're not afraid and can protect themselves! But there's no information at all."

<http://phys.org/news/2013-01-china-pollution-anger-state-media.html>

China pollution anger spills into state media

Public anger in China at dangerous levels of air pollution spread Monday as state media editorials queried official transparency and the nation's breakneck development.

Public anger in China at dangerous levels of air pollution, which blanketed Beijing in acrid smog, spread Monday as state media editorials queried official transparency and the nation's breakneck development. State media joined Internet users in calling for a re-evaluation of China's modernisation process, which has seen rapid urbanisation and economic development achieved at the expense of the environment.

Dense smog shrouded large swathes of northern China at the weekend, cutting visibility to 100 metres (yards) in some areas and forcing flight cancellations. Reports said dozens of building sites and a car factory in the capital halted work as an anti-pollution measure. Beijing authorities said readings for PM2.5—particles small enough to deeply penetrate the lungs—hit 993 micrograms per cubic metre at the height of the pollution, almost 40 times the World Health Organization's safe limit.

Experts quoted by state media blamed low winds for the phenomenon, saying fog had mixed with pollutants from vehicles and factories and been trapped by mountains north and west of Beijing. Coal burning in winter was also a factor, they added. In an editorial on Monday the state-run Global Times newspaper called for more transparent figures on pollution, urging Beijing to change its "previous method of covering up the problems and instead publish the facts".

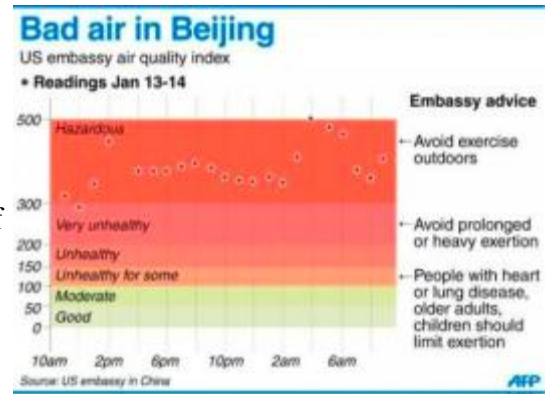
Officials in China have a long history of covering up environmental and other problems by not releasing information. Earlier this month a chemical spill into a river was only publicly disclosed five days after it happened, and the authorities were widely criticised for initially denying the existence of the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003.

"The choice between development and environmental protection should be made by genuinely democratic methods," the Global Times said. "Environmental problems shouldn't be mixed together with political problems."

The paper ran a story on differences between air quality figures given by Chinese authorities and the US embassy in Beijing. Official PM2.5 figures have only been released for China's biggest conurbations since the beginning of last year, and expanded to cover 74 cities earlier this month.

China's tightly-controlled media have previously raised concerns over health problems linked to industrialisation, but observers say the increasing availability of the statistics has forced them to confront the issue more directly.

An editorial in the China Daily blamed the pollution on the pace of urbanisation, adding that "China's process of industrialisation has not finished". "In the middle of a rapid urbanisation process, it is urgent for China to think about how such a process can press forward without compromising the quality of urban life with an increasingly worse living environment," it said.



Graphic showing air pollution readings in Beijing.

The paper also called on Beijing's five million car owners and government officials who use state-owned cars to rethink their driving habits and urged the government to tackle industrial pollution.

Meanwhile, share prices of environment-related companies surged. authorities said readings for PM2.5—particles small enough to deeply penetrate the lungs—hit 993 micrograms per cubic metre at the height of the pollution.

Face mask producer Shanghai Dragon Corp soared by its 10 percent daily limit shortly after the Shanghai market opened, while air purification equipment maker Create Technology & Science rose 7.80 percent.

"The widespread smoggy weather has led to the increase in respiratory patients, so there are investment opportunities in stocks related to air purification equipment and anti-bacterial masks," said Sui Guoming, an analyst at Kaimenhong Investment Management company, on his microblog.

Smog levels eased in the capital on Monday, with the monitoring centre putting the PM2.5 reading at 400 in central Beijing, but the crisis still dominated discussion on Sina Weibo, China's hugely popular version of Twitter. "This pollution is making me so angry," said one web user, who also posted a picture of herself wearing a face mask.