http://www.bbc.com/news/science-environment-32656743

70 million animal mummies: Egypt's dark secret

Scientists say they have exposed a scandal at the heart of Ancient Egypt's animal mummy industry.

By Rebecca Morelle Science Correspondent, BBC News

A scanning project at Manchester Museum and the University of Manchester has revealed that about a third of the bundles of cloth are empty inside. Researchers believe there was a huge appetite for these religious offerings, and demand for the mummies may have outstripped supply. The project has been followed by the BBC's Horizon programme.

The research team has been conducting the largest scanning project of its kind. More than 800 mummies, ranging from cats and birds to crocodiles, have so far been analysed using X-rays and CT scans. About a third of those scanned contain complete animals, which have been remarkably well preserved. Another third contain partial remains - but the rest have been empty.

Dr Lidija McKnight, an Egyptologist from the University of Manchester, said: "There have been some surprises. "We always knew that not all animal mummies contained what we expected them to contain, but we found around a third don't contain any animal material at all - so no skeletal remains."

Instead, she explained, the linen was padded out with other items. "Basically, organic material such as mud, sticks and reeds, that would have been lying around the embalmers' workshops, and also things like eggshells and feathers, which were associated with the animals, but aren't the animals themselves." Unlike human mummies, which were created to preserve the body for the afterlife, animal mummies were a religious offering.

"We know the Egyptians worshipped gods in animal forms, and an animal mummy allowed you some connection with the world of the gods, " explained Dr Campbell Price, curator of Egypt and Sudan, at Manchester Museum, which will have an exhibition on animal mummies in October. "Animal mummies were votive gifts. Today you'd have a candle in a cathedral; in Egyptian times you would have an animal mummy. "You would go to a special site, buy an animal mummy, using a system of barter. You'd then give it to a priest, who would collect a group of animal mummies and bury them."

Excavations have revealed that demand for these sacred gifts was high.

About 30 vast catacombs have been discovered in Egypt, packed from floor to ceiling with millions of mummies. Each tomb is dedicated to a single creature, such as dogs, cats, crocodiles, ibis and monkeys. Scientists estimate that up 70 million animals may have been mummified by the Egyptians.

"The scale of animal mummification between about 800 BC and into the Roman period was huge," said Dr Price. "In terms of how many animals were reared and killed, it would have been on an industrial scale. The animals were young and killed when they were quite small. To achieve those numbers you had to have a very specific breeding programme."

The researchers believe that despite the fact that animals were mass-bred, the mummy makers probably struggled to keep up with the demand.

However, they do not think that the partial or empty mummies were a scam, and the pilgrims may have known they were not burying a complete creature.

"We think there is probably more to it than that," Dr McKnight told the BBC.

"We think they were mummifying pieces of animals that were lying around, or materials associated with the animals during their lifetime - so nest material or eggshells. "They were special because they had been in close proximity with the animals - even though they weren't the animals themselves.

"So we don't think it's forgery or fakery. It's just that they were using everything they could find. And often the most beautifully wrapped mummies don't contain the animal remains themselves."

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Study: World population-food supply balance is becoming increasingly unstable

Researchers report that as the world population increases and food demand has grown, globalization of trade has made the food supply more sensitive to environmental and market fluctuations.

This leads to greater chances of food crises, particularly in nations where land and water resources are scarce and therefore food security strongly relies on imports.

The study assesses the food supply available to more than 140 nations (with populations greater than 1 million) and demonstrates that food security is becoming increasingly susceptible to perturbations in demographic growth, as humanity places increasing pressure on use of limited land and water resources.

"In the past few decades there has been an intensification of international food trade and an increase in the number of countries that depend on food imports," said Paolo D'Odorico, a professor of environmental sciences at the University of Virginia and one of the study's authors. "On average, about one-fourth of the food we eat is available to us through international trade. This globalization of food may contribute to the spread of the effects of local shocks in food production throughout the world."

D'Odorico's paper is published this week in the online early edition of the journal Proceedings of the National Academy of Sciences.

Food security, D'Odorico said, is typically defined as the availability of and access to a sufficient amount of food to meet the requirements of human societies at all places and all times.

"In order to have food security, food availability and accessibility need to be sustainable and resilient to perturbations associated with shocks in production and price spikes," he said. "We're finding that as the globalization of food increases, the coupled population/food system becomes more fragile and susceptible to conditions of crisis."

D'Odorico, doctoral student Joel Carr of U.Va. and colleagues at the University of Padova in Italy and the Swiss Federal Polytechnic of Lausanne used computer modeling to reconstruct the global network of food trade between 1986 and 2011 in conjunction with a population growth model, factoring in the constraints of food availability through domestic production and trade, and examined the response of the system to perturbations.

They found that the coupled dynamics of population and access to food are becoming less resilient and increasingly prone to instability. Countries that strongly depend on trade for their food supply appear to be more susceptible to instability and episodic food crises than exporting countries. These findings are consistent with the food insecurity that has affected trade-dependent countries during recent food crises.

Previous studies by D'Odorico, who, in addition to his faculty position at U.Va., is a sabbatical fellow with the National Socio-Environmental Synthesis Center at the University of Maryland, have suggested that the coupling of population and food dynamics might be becoming increasingly unbalanced and that, because of trade dependency, exposure to food insecurity is increasing. This finding provides further evidence that that indeed is happening, and already has happened and accelerated during the past two decades.

http://www.eurekalert.org/pub_releases/2015-05/uoc - ai051115.php

An important step in artificial intelligence

Researchers in UCSB's Department of Electrical and Computer Engineering are seeking to make computer brains smarter by making them more like our own

In what marks a significant step forward for artificial intelligence, researchers at UC Santa Barbara have demonstrated the functionality of a simple artificial neural circuit. For the first time, a circuit of about 100 artificial synapses was proved to perform a simple version of a typical human task: image classification.

"It's a small, but important step," said Dmitri Strukov, a professor of electrical and computer engineering. With time and further progress, the circuitry may eventually be expanded and scaled to approach something like the human brain's, which has 1015 (one quadrillion) synaptic connections.

For all its errors and potential for faultiness, the human brain remains a model of computational power and efficiency for engineers like Strukov and his colleagues, Mirko Prezioso, Farnood Merrikh-Bayat, Brian Hoskins and Gina Adam. That's because the brain can accomplish certain functions in a fraction of a second what computers would require far more time and energy to perform.

What are these functions? Well, you're performing some of them right now. As you read this, your brain is making countless split-second decisions about the letters and symbols you see, classifying their shapes and relative positions to each other and deriving different levels of meaning through many channels of context, in as little time as it takes you to scan over this print. Change the font, or even the orientation of the letters, and it's likely you would still be able to read this and derive the same meaning.

In the researchers' demonstration, the circuit implementing the rudimentary artificial neural network was able to successfully classify three letters ("z", "v" and "n") by their images, each letter stylized in different ways or saturated with "noise". In a process similar to how we humans pick our friends out from a crowd, or find the right key from a ring of similar keys, the simple neural circuitry was able to correctly classify the simple images.

"While the circuit was very small compared to practical networks, it is big enough to prove the concept of practicality," said Merrikh-Bayat. According to Gina Adam, as interest grows in the technology, so will research momentum.

"And, as more solutions to the technological challenges are proposed the technology will be able to make it to the market sooner," she said.

Key to this technology is the memristor (a combination of "memory" and "resistor"), an electronic component whose resistance changes depending on the direction of the flow of the electrical charge. Unlike conventional transistors, which rely on the drift and diffusion of electrons and their holes through semiconducting material, memristor operation is based on ionic movement, similar to the way human neural cells generate neural electrical signals.

"The memory state is stored as a specific concentration profile of defects that can be moved back and forth within the memristor," said Strukov. The ionic memory mechanism brings several advantages over purely electron-based memories, which makes it very attractive for artificial neural network implementation, he added.

"For example, many different configurations of ionic profiles result in a continuum of memory states and hence analog memory functionality," he said.

"Ions are also much heavier than electrons and do not tunnel easily, which permits aggressive scaling of memristors without sacrificing analog properties."

This is where analog memory trumps digital memory: In order to create the same human brain-type functionality with conventional technology, the resulting device would have to be enormous - loaded with multitudes of transistors that would require far more energy.

"Classical computers will always find an ineluctable limit to efficient brain-like computation in their very architecture," said lead researcher Prezioso. "This memristor-based technology relies on a completely different way inspired by biological brain to carry on computation."

To be able to approach functionality of the human brain, however, many more memristors would be required to build more complex neural networks to do the same kinds of things we can do with barely any effort and energy, such as identify different versions of the same thing or infer the presence or identity of an object not based on the object itself but on other things in a scene.

Potential applications already exist for this emerging technology, such as medical imaging, the improvement of navigation systems or even for searches based on images rather than on text.

The energy-efficient compact circuitry the researchers are striving to create would also go a long way toward creating the kind of high-performance computers and memory storage devices users will continue to seek long after the proliferation of digital transistors predicted by Moore's Law becomes too unwieldy for conventional electronics.

"The exciting thing is that, unlike more exotic solutions, it is not difficult to imagine this technology integrated into common processing units and giving a serious boost to future computers," said Prezioso.

In the meantime, the researchers will continue to improve the performance of the memristors, scaling the complexity of circuits and enriching the functionality of the artificial neural network. The very next step would be to integrate a memristor neural network with conventional semiconductor technology, which will enable more complex demonstrations and allow this early artificial brain to do more complicated and nuanced things. Ideally, according to materials scientist Hoskins, this brain would consist of trillions of these type of devices vertically integrated on top of each other.

"There are so many potential applications - it definitely gives us a whole new way of thinking," he said.

Konstantin Likharev from the Department of Physics and Astronomy at Stony Brook University also conducted research for this project. The researchers' findings are published in the journal Nature.

http://www.eurekalert.org/pub_releases/2015-05/uoc - phu051115.php

Photosynthesis has unique isotopic signature, UCLA researchers report

The research could help assess the health of oceans

Photosynthesis leaves behind a unique calling card in the form of a chemical signature that is spelled out with stable oxygen isotopes, UCLA geochemists reported April 24 in the journal Science. The findings suggest that similar isotopic signatures could exist for many biological processes, including some that are difficult to observe with current tools.

The isotopic signature could be used, for example, to assess the health of oceans, said lead author Laurence Yeung, formerly a UCLA postdoctoral scholar in the laboratory of Edward Young, UCLA professor of geochemistry and cosmochemistry in the department of earth, space and planetary sciences. Photosynthesis by microscopic plants forms the base of the oceanic food chain, but it is difficult to measure how productive these plants are in natural settings. This research will make it easier to do so.

"We've found a new type of biosignature," said Yeung, now an assistant professor of Earth science at Rice University. "We show that plants and plankton impart this type of biosignature on the oxygen they produce during photosynthesis."

Most oxygen atoms contain eight protons and eight neutrons and are represented by the symbol O-16. More than 99.9 percent of Earth's oxygen is O-16, but two heavier oxygen isotopes exist in trace amounts: O-17, with one extra neutron, and O-18, with two.

Scientists know that plants and animals sometimes process heavy isotopes like O-17 and O-18 at a different pace than O-16. For instance, when sea temperatures decrease, corals and mollusks produce calcium carbonate - the raw material of ocean reefs and clam shells - that contains greater amounts of heavy oxygen isotopes. As a result, scientists have used isotopic ratios from carbonate fossils to estimate global temperatures in the distant past.

In the new study, the researchers examined "clumped" oxygen isotopes, oxygen molecules that contain two heavy isotopes. Such molecules, which have masses of 35 or 36, are exceptionally rare; less than a handful exist in every trillion oxygen molecules. Today's mass spectrometers, however, are sophisticated enough to tally them and allow scientists the opportunity to compare their relative abundance in various circumstances.

The new research shows that biological assembly of molecules produces molecules that have pairings of isotopes that violate expectations from both thermodynamics and sheer chance.

Young, the study's senior author, said the new research elucidates a general principle that may apply to a wide range of processes in nature.

"This study introduces an entirely new way of determining how oxygen specifically, and other gases more generally, are produced in nature," Young said. "Our work demonstrates that the propensity of different isotopes to bond with one another in a molecule is a heretofore unrecognized, yet powerful tracer of the biological origin of that molecule."

Looking at oxygen through the lens of clumped isotopes will provide a great deal of new information about how oxygen is made and consumed by plants, said co-lead author Jeanine Ash, a UCLA graduate student in Young's laboratory.

"There are so many other gases that the biosphere utilizes," she said. "This is only the beginning."

The research was funded by the National Science Foundation, NASA, and the Deep Carbon Observatory.

http://www.eurekalert.org/pub_releases/2015-05/cmc-8po051115.php

80 percent of cervical cancers found to be preventable with latest 9-valent HPV vaccine

The newest human papillomavirus vaccine, 9-Valent, can potentially prevent 80 percent of cervical cancers in the United States if given to all 11- or 12-year-old children before they are exposed to the virus.

LOS ANGELES - In addition to protecting against 80 percent of cervical cancers, the new 9-Valent human papillomavirus vaccine has the potential to protect against approximately 19,000 other cancers diagnosed in the United States - including anal, oropharyngeal and penile cancers. This is an 11.1 percent point increase in protection against HPV-related cancers in comparison to the first vaccines on the market, Gardasil and Cervarix.

These findings come from a seven-center study published in the *Journal of the National Cancer Institute*. The Centers for Disease Control and Prevention initiated the research effort, in conjunction with Cedars-Sinai.

"This is the first comprehensive study of its kind and shows the potential to not only reduce the global cancer burden, but guide clinical decision-making with regard to childhood vaccinations," said Marc T. Goodman, PhD, MPH, senior author of the study and director of Cancer Prevention and Genetics at the Cedars-Sinai Samuel Oschin Comprehensive Cancer Institute.

The study found the 9-Valent vaccine, under the trademark of Gardasil-9, also has the potential to protect against an additional 5.7 percent of oropharyngeal cancers, which include the base of the tongue and tonsils. This disease is the second-most-common HPV-associated cancer.

"We found that 70 percent of patient DNA tissue samples with cancer of the oropharynx harbored HPV," added Goodman. "This is a much higher percentage of HPV than observed in other studies, likely because of changes in sexual behaviors, such as increased oral-genital contact."

The 9-Valent vaccine was also found to potentially increase protection from other HPV-related cancers including those of the vulva, from 48.6 to 62.8 percent; vagina, from 55.1 percent to 73.3 percent; the penis, 47.9 percent to 56.9 percent; and the anus, 79.4 percent to 87.6 percent.

To compile these data, researchers examined 2,670 HPV DNA tissue samples from seven population-based cancer registries. Study authors intend to perform additional research in the future to follow up on their estimate of how well the current vaccines protect against HPV-associated cancers.

Additional authors include first author Mona Saraiya, MD, MPH, from the Centers of Disease Control, Elizabeth R. Unger, Trevor D. Thompson, Charles F. Lynch, Brenda Y. Hernandez, Christopher W. Lyu, Martin Steinau, Meg Watson, Edward J. Wilkinson, Claudia Hopenhayn, Glenn Copeland, Wendy Cozen, Edward S. Peters, Youjie Huang, Maria Sebum Saber and Sean Altekruse.

This work was supported by the Centers for Disease Control and Prevention via in-kind funds, intramural funds to CDC human papillomavirus (HPV) lab, and contract (#200- 2002-00573, Task Order 0018). The support for coordination of genotyping data and genotyping was largely supported by CDC intramural funds via a contract. The collection of routine cancer registry data from California was supported by the California Department of Health Services as part of the statewide cancer reporting program mandated by California Health and Safety Code Section 103885; by the National Cancer Institute, National Institutes of Health, Department of Health and Human Services under Contract N01-PC-2010-00035, and cooperative agreement number 1U58DP000807-3. The support of the repositories and staff came from the SEER Program, National Institutes of Health, Department of Health and Human Services, under Contracts N01-PC-35139 (Los Angeles), N01-PC-35143 (Iowa), and N01-PC-35137 (Hawaii).

Citation: Journal of the National Cancer Institute: 2015 May: US Assessment of HPV Types in Cancers: Implications for Current and 9-Valent HPV Vaccines.

http://www.eurekalert.org/pub_releases/2015-05/ki-hct050815.php

How cancer tricks the lymphatic system into spreading tumors

Cancer cells can infiltrate the lymphatic system by 'disguising' themselves as immune cells

Swollen lymph nodes are often the earliest sign of metastatic spread of cancer cells. Now cancer researchers and immunologists at Sweden's Karolinska Institutet have discovered how cancer cells can infiltrate the lymphatic system by 'disguising' themselves as immune cells (white blood cells). The researchers hope that this finding, which is published in the scientific journal Oncogene, will inform the development of new drugs.

The main reason why people die of cancer is that the cancer cells spread to form daughter tumours, or metastases, in vital organs, such as the lungs and liver. A route frequently used by cancer cells for dissemination is the lymphatic system. Upon entering lymphatic vessels, they migrate to nearby lymph nodes, which then swell up, and from there, to other organs via the blood. The details of how and why cancer cells use the lymphatic system for spread are, however, relatively unknown.

"It's not clear whether there are signals controlling this or whether it's just random," says principal investigator Jonas Fuxe, cancer researcher and Associate Professor at Karolinska Institutet's Department of Medical Biochemistry and Biophysics. "However, in recent years it has become evident that inflammation is a factor that can promote metastasis and that anti-inflammatory drugs may have a certain inhibitory effect on the spread of cancer."

The study is based on an interdisciplinary collaboration between cancer researchers and immunologists, which the researchers point out has has contributed to the new, exciting results. What they discovered was that an inflammatory factor known as TGF-beta (transforming growth factor-beta) can give cancer cells properties of immune cells by supplying the surface of the cancer cell with a receptor that normally only exists on the white blood cells that travel through the lymphatic system.

Equipped with this receptor, the cancer cells are able to recognise and migrate towards a gradient of a substance that is secreted from the lymphatic vessels and binds to the receptor. In this way, the cancer cells can effectively target lymphatic vessels and migrate on to lymph nodes, just like immune cells. According to the researchers, their results link inflammation and cancer in a novel way and make possible the development of new treatment models.

"With this discovery in our hands, we'd now like to try to find out which additional immune-cell properties cancer cells have and study how they affect the metastatic process," says Dr Fuxe. "The possibility of preventing or slowing down the spread of cancer cells via the lymphatic system is an attractive one, as it could reduce the risk of metastasis to other organs."

Mikael Karlsson, Associate Professor and group leader at the Department of Microbiology, Tumour and Cell Biology at Karolinska Institutet was in charge of the immunological aspects of the study. In addition to the researchers at Karolinska Institutet, the study involved researchers from Umeå University, Sweden, Louisiana State University Health Sciences Centre and Princeton University in the USA and Nihon University School of Medicine in Tokyo, Japan. The study was financed by the Swedish Research Council, the Swedish Cancer Society, the Children's Cancer Foundation, the Swedish Society for Medical Research (SSMF), Karolinska Institutet's strategic research programme in cancer (StratCan), and the Nordic Cancer Union.

Publication: "TGF-β1-induced EMT promotes targeted migration of breast cancer cells through the lymphatic system by activation of CCR7/CCL21-mediated chemotaxis", Mei-Fong Pang, Anna-Maria Georgoudaki, Laura Lambut, Joel Johansson, Vedrana Tabor, Kazuhiro Hagikura, Yi Jin, Malin Jansson, Jonathan S. Alexander, Celeste M. Nelson, Lars Jakobsson, Christer Betsholtz, Malin Sund, Mikael C. I. Karlsson & Jonas Fuxe, Oncogene, online 11 May 2015.

http://www.eurekalert.org/pub_releases/2015-05/cru-mwh051115.php

Men with high estrogen levels could be at greater risk of breast cancer

Men with naturally high levels of oestrogen may have a greater risk of developing breast cancer

Men with naturally high levels of the female hormone oestrogen may have a greater risk of developing breast cancer, according to research by an international collaboration including Cancer Research UK published today in the Journal of Clinical Oncology.

This is the first time a link between oestrogen levels in the blood and male breast cancer has been identified, despite its connection to breast, womb and ovarian cancers in women.

Men with the highest levels of oestrogen were two and a half times more likely to develop breast cancer than men with the lowest levels of the hormone**.

Male breast cancer is very rare with one man in every 100,000 diagnosed with breast cancer each year in the UK. Around 350 male cases are diagnosed each year in the UK compared with nearly 50,000 cases of breast cancer in women.

The research at the National Cancer Institute in the United States was part of an international collaboration between Cancer Research UK, the National Cancer Institute and others***.

The aim was to study a large international pool of men with breast cancer. The research compared oestrogen levels in 101 men who went on to develop breast cancer with 217 healthy men.

Mark Cross, 46, a police officer from Cambridgeshire, was diagnosed with breast cancer in 2009. He had a mastectomy and then follow-up treatment of chemotherapy and radiotherapy. His treatment ended in September 2010. He said: "The police sometimes get a bit of a reputation for being macho but I had great support from everyone within the Metropolitan police service. Not many people know that men get breast cancer too and it was a complete surprise to be diagnosed. My advice to all men is if you develop a lump on your chest - or anywhere else on your body - get it checked by your doctor as soon as possible. I hope my experience will raise awareness for other men."

Study author Professor Tim Key, Cancer Research UK's hormone and nutrition expert at the University of Oxford, said: "We've shown for the first time that just like some forms of the cancer in women, oestrogen has a big role to play in male breast cancer. So now the challenge is to find out exactly what this hormone is doing to trigger this rare form of the disease in men, and why some men have higher levels of oestrogen in their blood. Our discovery is a crucial step forward in understanding the factors behind male breast cancer."

The symptoms, diagnosis and treatment of male breast cancer are very similar to breast cancer in women. The main risk of developing the disease in men is age and almost eight in 10 cases are diagnosed in those aged 60 and older.

Dr Julie Sharp, head of health information at Cancer Research UK, said: "Breast cancer in men isn't discussed very often, so a diagnosis can be a big shock for the small group of men who develop the disease.

"Some of the oestrogen variation in men will simply be natural, but for others there may be a link to being overweight. Fat cells in the body are thought to drive up the body's level of this hormone in men and women, so this is another good reason to try and keep a healthy weight.

"This early research is crucial in understanding why these men get breast cancer - so that one day we can treat it more effectively."

http://nyti.ms/1K8cJsZ

More Consensus on Coffee's Benefits Than You Might Think

Potential health benefits are surprisingly large

Aaron E. Carroll

Aaron E. Carroll answered readers' questions about this article in a follow-up here.

When I was a kid, my parents refused to let me drink coffee because they believed it would "stunt my growth." It turns out, of course, that this is a myth. Studies have failed, again and again, to show that coffee or caffeine consumption are related to reduced bone mass or how tall people are.

Coffee has long had a reputation as being unhealthy. But in almost every single respect that reputation is backward. The potential health benefits are surprisingly large.

When I set out to look at the research on coffee and health, I thought I'd see it being associated with some good outcomes and some bad ones, mirroring the contradictory reports you can often find in the news media. This didn't turn out to be the case.

Just last year, a systematic review and meta-analysis of studies looking at long-term consumption of coffee and the risk of cardiovascular disease was published. The researchers found 36 studies involving more than 1,270,000 participants. The combined data showed that those who consumed a moderate amount of coffee, about three to five cups a day, were at the lowest risk for problems. Those who consumed five or more cups a day had no higher risk than those who consumed none.

Of course, everything I'm saying here concerns coffee - black coffee. I am not talking about the mostly milk and sugar coffee-based beverages that lots of people consume. These could include, but aren't limited to, things like a McDonald's large mocha (500 calories, 17 grams of fat, 72 grams of carbohydrates), a Starbucks Venti White Chocolate Mocha (580 calories, 22 grams of fat, 79 grams of carbs), and a Large Dunkin' Donuts frozen caramel coffee Coolatta (670 calories, 8 grams of fat, 144 grams of carbs).

I won't even mention the Cold Stone Creamery Gotta-Have-It-Sized Lotta Caramel Latte (1,790 calories, 90 grams of fat, 223 grams of carbs). Regular brewed coffee has 5 or fewer calories and no fat or carbohydrates.

Back to the studies. Years earlier, a meta-analysis - a study of studies, in which data are pooled and analyzed together - was published looking at how coffee consumption might be associated with stroke. Eleven studies were found, including almost 480,000 participants. As with the prior studies, consumption of two to six cups of coffee a day was associated with a lower risk of disease, compared with those who drank none. Another meta-analysis published a year later confirmed these findings.

Rounding out concerns about the effect of coffee on your heart, another meta-analysis examined how drinking coffee might be associated with heart failure. Again, moderate consumption was associated with a lower risk, with the lowest risk among those who consumed four servings a day. Consumption had to get up to about 10 cups a day before any bad associations were seen.

No one is suggesting you drink more coffee for your health. But drinking moderate amounts of coffee is linked to lower rates of pretty much all cardiovascular disease, contrary to what many might have heard about the dangers of coffee or caffeine. Even consumers on the very high end of the spectrum appear to have minimal, if any, ill effects.

But let's not cherry-pick. There are outcomes outside of heart health that matter. Many believe that coffee might be associated with an increased risk of cancer. Certainly, individual studies have found that to be the case, and these are sometimes highlighted by the news media. But in the aggregate, most of these negative outcomes disappear.

A meta-analysis published in 2007 found that increasing coffee consumption by two cups a day was associated with a lower relative risk of liver cancer by more than 40 percent. Two more recent studies confirmed these findings. Results from

meta-analyses looking at prostate cancer found that in the higher-quality studies, coffee consumption was not associated with negative outcomes.

The same holds true for breast cancer, where associations were statistically not significant. It's true that the data on lung cancer shows an increased risk for more coffee consumed, but that's only among people who smoke. Drinking coffee may be protective in those who don't. Regardless, the authors of that study hedge their results and warn that they should be interpreted with caution because of the confounding (and most likely overwhelming) effects of smoking.

A study looking at all cancers suggested that it might be associated with reduced overall cancer incidence and that the more you drank, the more protection was seen.

Drinking coffee is associated with better laboratory values in those at risk for liver disease. In patients who already have liver disease, it's associated with a decreased progression to cirrhosis. In patients who already have cirrhosis, it's associated with a lower risk of death and a lower risk of developing liver cancer. It's associated with improved responses to antiviral therapy in patients with hepatitis C and better outcomes in patients with nonalcoholic fatty liver disease. The authors of the systematic review argue that daily coffee consumption should be encouraged in patients with chronic liver disease.

The most recent meta-analyses on neurological disorders found that coffee intake was associated with lower risks of Parkinson's disease, lower cognitive decline and a potential protective effect against Alzheimer's disease (but certainly no harm).

A systematic review published in 2005 found that regular coffee consumption was associated with a significantly reduced risk of developing Type 2 diabetes, with the lowest relative risks (about a third reduction) seen in those who drank at least six or seven cups a day. The latest study, published in 2014, used updated data and included 28 studies and more than 1.1 million participants. Again, the more coffee you drank, the less likely you were to have diabetes. This included both caffeinated and decaffeinated coffee.

Is coffee associated with the risk of death from all causes? There have been two meta-analyses published within the last year or so. The first reviewed 20 studies, including almost a million people, and the second included 17 studies containing more than a million people. Both found that drinking coffee was associated with a significantly reduced chance of death. I can't think of any other product that has this much positive epidemiologic evidence going for it.

I grant you that pretty much none of the research I'm citing above contains randomized controlled trials. It's important to remember that we usually conduct those trials to see if what we are observing in epidemiologic studies holds up.

Most of us aren't drinking coffee because we think it will protect us, though. Most of us are worrying that it might be hurting us. There's almost no evidence for that at all.

If any other modifiable risk factor had these kind of positive associations across the board, the media would be all over it. We'd be pushing it on everyone. Whole interventions would be built up around it. For far too long, though, coffee has been considered a vice, not something that might be healthy.

That may change soon. The newest scientific report for the U.S.D.A. nutritional guidelines, which I've discussed before, says that coffee is not only O.K. - it agrees that it might be good for you. This was the first time the dietary guideline advisory committee reviewed the effects of coffee on health.

There's always a danger in going too far in the other direction. I'm not suggesting that we start serving coffee to little kids. Caffeine still has a number of effects parents might want to avoid for their children. Some people don't like the way caffeine can make them jittery. Guidelines also suggest that pregnant women not drink more than two cups a day.

I'm also not suggesting that people start drinking coffee by the gallon. Too much of anything can be bad. Finally, while the coffee may be healthy, that's not necessarily true of the added sugar and fat that many people put into coffee-based beverages.

But it's way past time that we stopped viewing coffee as something we all need to cut back on. It's a completely reasonable addition to a healthy diet, with more potential benefits seen in research than almost any other beverage we're consuming. It's time we started treating it as such.

http://nyti.ms/1B2TlW1

Reverse Engineering Birds' Beaks Into Dinosaur Bones

Birds evolved from dinosaurs 150 million years ago, a slow but thorough transformation.

Carl Zimmer

Their bodies gained aerodynamic feathers, their digits fused into wings, and they acquired a beak used to gather food. We can see some details of this evolutionary marvel in the fossil record. Yet even the most exquisitely preserved fossil can't tell us which pieces of DNA had to change in order to turn ground-running dinosaurs into modern birds.

Some researchers are now trying to pinpoint those genetic changes with experiments on chicken embryos. If the scientists succeed, they should eventually be able to reverse the evolution of birds - and then they may be able to engineer animals more at home in "Jurassic Park" than in a henhouse.

One group of these scientists, led by Bhart-Anjan Bhullar of Yale University and Arhat Abzhanov of Harvard University, has spent the past eight years investigating one piece of bird anatomy in particular: the beak. Now, in a study published in the journal Evolution, they report that they have found a way to turn the beaks of chicken embryos back into dinosaur-like snouts.

An artist's rendition of a non-avian dinosaur, Anchiornis, and a primitive modern bird, the tinamou. The snouts were made transparent to show the development of beaks as birds evolved from dinosaurs. **John Conway**

In interviews, some experts hailed the new research for providing insights into the evolution of birds. But others were skeptical, arguing that the real genetic changes behind the bird beak have yet to be discovered.

The beak evolved fairly late in bird evolution, after early birds had already evolved feathers and powered flight. It originated from a pair of small, separate plates of bone sitting at the front of the upper jaw. In our own skulls, these bones - called premaxillae - anchor some front teeth.

During the evolution of early birds, the premaxillae stretched out and fused together to form a strong, lightweight beak. Muscles that anchored the new beak to the back of the head allowed birds to control this sophisticated tool. Since then, birds have evolved many uses for beaks. Woodpeckers hammer into trees to find insects. Pelicans use their beaks like fishnets. Hummingbirds evolved slender sipping straws.

Dr. Bhullar and Dr. Abzhanov set out to find some of the genetic changes that turned the dinosaur premaxillae into a beak. To find clues, they looked at earlier experiments on chicken embryos.

These studies have documented how embryonic cells make certain proteins at certain times. The scientists were struck by the fact that even before the embryo has a developed, recognizable face, a large patch of cells in the middle of what will become the bird's face makes a protein called Fgf8. Later, the region produces different proteins, called Lef1.

Mice, other studies have shown, also make Fgf8 and Lef1. But mice produce them in a pair of small, separate cell patches, not a single large patch. Like the embryos of chickens, those of emus produce the proteins in a single patch of cells, the scientists learned. But in animals other than birds - such as turtles, lizards and crocodiles - the proteins are usually made in a pair of small cell patches.

Was it possible, the scientists wondered, that a key step in the evolution of beaks was a shift from small protein-producing patches to a single large one? That change might have allowed birds to develop big, fused premaxillae - the precursors of beaks.

If the hypothesis was correct, the researchers figured, they might be able to turn back the clock on evolution. If they caused a chicken embryo to use Fgf8 and Lef1 the way other animals do, it should turn out to be a bird without a beak.

"It shouldn't produce some kind of monster," said Dr. Bhullar. Instead, he and Dr. Abzhanov predicted, the chickens should develop skulls more like those of their dinosaur ancestors.

To reverse evolution, the scientists gently wedged a microscopic bead into the middle of what would become the faces of chicken embryos. The bead released chemicals into the surrounding tissue that interfere with Fgf8 and Lef1.

As they had predicted, the chicken embryos failed to develop beaks. Instead, the embryos gained a pair of rounded, unfused bones - more like what you might have found on a dinosaur's head. "I think it's fantastic," John R. Horner, a paleontologist at Montana State University, said of the finding.

In 2009, Dr. Horner predicted that scientists would someday be able to turn chickens into dinosaur-like forms in a book entitled "How to Build a Dinosaur: The New Science of Reverse Evolution" (co-authored with James Gorman, a science reporter at The New York Times).

Now researchers are using experiments on embryos not just to understand the origin of birds, he said, but also a number of major evolutionary transitions. "It's an exciting time, and I envy people in the beginnings of their careers," Dr. Horner said.

Ralph S. Marcucio, a developmental biologist at the University of California, San Francisco, agreed with Dr. Horner that these experiments held promise, but said he was not persuaded by the new study. Dr. Marcucio noted that the scientists used chemicals to block Fgf8 and Lef1 proteins that have toxic side effects and can kill cells. The altered anatomy of the chicken skulls might not be an example of reverse evolution, he said, just dying tissue.

Dr. Marcucio also doubted that Fgf8 and Lef1 could have such a big impact on the beak. Fgf8, for example, disappears from the region that will become the face

long before the premaxillae develop. “It really makes me suspicious that it’s not involved in some kind of switch,” he said.

Dr. Marcucio predicted that the true story of the origin of beaks would turn out to be much more complicated than the new experiment suggests, involving other genes. “It’s a simple kind of thing, but when you look at the actual pieces of data, it tends to fall apart,” he said. “It takes away from the complexity that’s the reality.”

More sophisticated experiments one day may settle this disagreement. If Dr. Bhullar and Dr. Abzhanov are right, birds must have some special sequence of DNA that regulates Fgf8 and Lef1 in a peculiar way. Ultimately, it should be possible to find that sequence.

By looking at alligators and other close living relatives of birds, scientists may be able to infer the original sequence in the ancestor of birds. If the ancient DNA can be restored, chicken embryos could once again develop dinosaur-like snouts instead of beaks.

“I’m enormously eager to find the regulatory changes themselves,” Dr. Bhullar said. “These techniques were in their infancy when I started the project, which shows you how fast the field is changing.”

http://bit.ly/1KcbUzn

Uncovering a Hidden Epidemic

An antibiotic-resistant strain of typhoid has swept across Asia and Africa over the last three decades.

Kate Wheeling

Salmonella is perhaps most well-known for its ability to cause food poisoning. It can be more deadly though: One variation of the bacteria - Salmonella typhi - is the cause of typhoid fever. Dozens of researchers from the world’s leading typhoid laboratories have teamed up to study the bacteria’s genome, and find that a single, multi-drug resistant lineage, known as H58, has spread across Asia and Africa in just the last 30 years.

“The study shows the H58 clade of Typhi is displacing other typhoid fever strains that have been established over decades and centuries throughout the typhoid endemic world,” says Vanessa Wong, an infectious disease specialist at the United Kingdom’s Wellcome Trust Sanger Institute and lead author of the study, published yesterday in Nature Genetics.

Salmonella typhi is a strictly human pathogen. It spreads between people via feces-tainted food. Consider, for example, the most infamous of typhoid spreaders: Mary Mallon (a.k.a. Typhoid Mary), the New York City cook that infected at least 50 people with the disease at the turn of the 20th century. As many as 30 percent of those infected - Typhoid Mary included - have no symptoms at all, but the strain can cause a range of problems for humans, from stomach pain to death. While there are still tens of millions of cases of typhoid fever worldwide (mostly in developing nations), deaths have seen a steady decline, thanks in large part to antibiotics. But the emergence of antibiotic-resistant strains of bacteria is changing the delicate balance between man and microbe.

"In H58 the genes that result in antimicrobial resistance have become a stable part of the genome, which means antibiotic-resistant typhoid is here to stay."

Wong and her colleagues sequenced the genomes of 1,832 samples of Salmonella typhi, collected from 63 countries spanning six continents between 1905 and 2013. The large distribution across time and geographic space allowed the researchers to make fairly accurate calculations about the patterns of the disease over the last century.

Nearly half of the samples - 47 percent - were found to be the H58 strain, which first appeared in samples from 1992. Comparing the genomes of the H58 samples revealed that South Asia was a hub for the drug-resistant variant 25 to 30 years ago, and from there, the strain likely radiated out to Southeast and Western Asia, Africa, and Fiji. Isolated reports of typhoid have been increasing across Africa, but this study allowed the authors to identify the scale of this previously unreported wave of H58 expansion across the continent - evidence of an ongoing epidemic in Eastern and South Africa, according to Wong.

The drug-resistant characteristics of H58 no doubt give the strain an advantage that contributed in part to its rapid spread. “In H58 the genes that result in antimicrobial resistance have become a stable part of the genome,” Wong says, “which means antibiotic-resistant typhoid is here to stay.”

The study provides a framework for monitoring this drug-resistant pathogen and others in the future, Wong says. “It allows us to better understand how antimicrobial resistance emerges and spreads globally and thus will enable us to develop effective strategies to control typhoid.”

http://www.eurekalert.org/pub_releases/2015-05/esoa-ndp051215.php

New device provides chikungunya test results in an hour

Assay tests whether or not a sample of mosquitoes harbors the virus responsible for the disease known as chikungunya

Scientists at a U.S. Army research center have modified an assay that tests whether or not a sample of mosquitoes harbors the virus responsible for the disease known as chikungunya (CHIKV), long a problem in the Old World tropics but recently established in the Americas. Their assay is described in an article in the Journal of Medical Entomology.

Health workers now have a quick way to detect the presence of the CHIKV virus within an hour, rather than waiting for results of laboratory tests that take days, or

even weeks. It's done with a chemical dipstick, the same kind of simple tool used in a pregnancy test. If the test is positive, measures to control and contain the disease can be mobilized and started immediately, which is important because no vaccine or specific treatment for chikungunya exists.

"Chikungunya" is a term used by people of the Makonde Plateau, between Tanzania and Mozambique, where the disease was discovered in 1952. It means, "that which bends up," referring to the way arthritis caused by the disease crooks posture of the victim's body. Symptoms of chikungunya can be as brutal as its name is to pronounce, although it is seldom fatal. Victims experience fever and pain and swelling of muscles and joints. Headache and rash may occur. The disabling impact can last for months.

To date, tests for CHIKV require expensive equipment in a laboratory setting and technicians who have undergone extensive training. Not so the dipstick test. It can be done on site by a neophyte and, importantly, does not require electricity. The field worker simply has to dip the stick and look for a colored line.

If an outbreak of chikungunya occurs, the test "could enable public health workers to detect CHIKV in infected mosquitoes rapidly without the need for specialized equipment, expertise, or training, making virus surveillance more expedient," according to the authors of the Journal of Medical Entomology article. It would mean the difference between nipping an outbreak in the bud and a major public health crisis.

The full article, "Immuno-chromatographic Wicking Assay for the Rapid Detection of Chikungunya Viral Antigens in Mosquitoes (Diptera: Culicidae)," is available at http://dx.doi.org/10.1093/jme/tjv047.

http://www.eurekalert.org/pub_releases/2015-05/uoc - phd051215.php

Psychotic hallucinations, delusions rarely precede violence

Study challenges media-fueled stereotype of homicidal mayhem

Mass shootings at the hands of unhinged loners - such as those in Aurora, Colorado; Santa Barbara, California, and Newtown, Connecticut - perpetuate a commonly held belief that mental illness triggers violent crimes.

But a new study from the University of California, Berkeley, shows that hallucinations and delusions associated with psychiatric disorders seldom foreshadow acts of aggression.

In a painstaking review of 305 violent incidents in the United States, the researchers found that only 12 percent were preceded by psychosis. While numerous studies have found that brutality and bloodshed are more likely to be sparked by anger, access to firearms and substance abuse, this latest analysis is the first to look at the regularity of psychosis-induced violence among the mentally ill. The results, recently reported in the online edition of the journal, Clinical Psychological Science, challenge the media-fueled stereotype of homicidal mayhem.

"High-profile mass shootings capture public attention and increase vigilance of people with mental illness. But our findings clearly show that psychosis rarely leads directly to violence," said study lead author Jennifer Skeem, a clinical psychologist and associate dean of research at UC Berkeley's School of Social Welfare.

Skeem and fellow researchers at the University of Virginia and Columbia University focused on the most violent patients tracked in the MacArthur Violence Risk Assessment study, a major 1998 analysis of more than 1,100 offenders who had been discharged from psychiatric facilities.

Specifically, the researchers looked at a subgroup of 100 high-risk patients, who had been involved in two or more violent incidents in the year after they were discharged from a psychiatric facility, to establish their mental states at the time they committed acts of violence.

"We wanted to examine the small group of people with repeated violence and see how consistently these violent incidents were caused by hallucinations and delusions," Skeem said.

In addition to reviewing records, they interviewed former patients about what they were thinking and feeling immediately before they engaged in violence, and sought the perspectives of their friends and family members. The results revealed that psychosis preceded only 12 percent of the violent acts they committed following their release. Moreover, while psychosis drove one violent incident, it was rarely implicated in subsequent ones, the study found.

The study defines violence as battery resulting in physical injury, sexual assault, and assaults or threats with a weapon. Mental illnesses ranged from schizophrenia and bipolar disorder to severe anxiety and depression.

While mass shootings account for a fraction of U.S. gun deaths, each one can influence public policy. For example, the 2014 shooting spree in Isla Vista near Santa Barbara, in which 24-year-old Elliot Rodgers killed six people, spurred the U.S. House of Representatives to pass an amendment to boost funding to add more mental health records to the nation's background check system for firearm purchases.

And, after the 2013 Sandy Hook Elementary shooting in Newtown, in which 20-year-old Adam Lanza killed his mother, 20 children and six school staff members, New York passed the Secure Ammunition and Firearms Enforcement Act, which requires mental health professionals to report clients who could harm themselves or others so those names can be matched against a gun permit database.

Meanwhile, a murder trial is currently under way for 27-year-old James Holmes, who opened fire on a Batman movie audience in Aurora in 2012, killing 12. He has pleaded not guilty by reason of insanity. In the wake of that mass shooting, Colorado Gov. John Hickenlooper signed a bill allocating $20 million for an expansion of mental health services, including walk-in crisis centers and a 24-hour hotline. That bill also created a task force to look at strengthening existing laws for involuntary commitment for mental health treatment.

Mental health professionals and advocates warn that these high-profile cases perpetuate the stigma of mental illness, and keep people who are suffering from psychiatric disorders from disclosing their condition and seeking help. In fact, they say, people with mental illness are more likely to be victims of violence than vice versa.

A study published in February in the American Journal of Public Health found that fewer than 5 percent of the 120,000 gun-related killings in the United States between 2001 and 2010 were perpetrated by people diagnosed with mental illness, and that the mentally ill are far more likely than the average person to be the victims of violent crime.

"None of this detracts from the message that people with mental illness need access to psychiatric services," Skeem said. "But it's important to remember that risk factors for violence - such as substance abuse, childhood maltreatment, neighborhood disadvantage - are mostly shared by people with and without mental illness, and that's what we should be focused on if maximizing public safety is our goal."

Other co-authors and researchers on the study are Patrick Kennealy of the University of South Florida, John Monahan of the University of Virginia, Gillian Peterson of Metropolitan State University and Paul Appelbaum of Columbia University.

http://www.bbc.com/news/health-32687313

Seasons affect 'how genes and immune system work'

The seasons appear to have a profound effect on how human genes work, according to scientists.

By Michelle Roberts Health editor, BBC News online

This may explain why some illnesses are aggravated in the winter, they say in Nature Communications. They found genes involved with immunity - the body's defence against infection - were more active in cold months. And while this helps fight off viruses such as flu, it may trigger or worsen conditions, such as arthritis, where the body attacks itself, they say.

Seasonal shift

The international team of researchers analysed blood and tissue samples from more than 16,000 people living around the world. Of the 22,000 genes they scrutinised - which is nearly all the genes humans possess - a quarter showed clear signs of seasonal variation.

The gene changes that interested the researchers the most were ones involved with immunity and, specifically, inflammation. During cold, winter months - December to February for people living north of the equator and June to August for those in the southern hemisphere - these genes were more active.

When they studied people living close to the equator, where the temperatures are fairly high all year round, they noticed a different pattern. Immunity and inflammation was linked to the rainy season, when diseases such as malaria are more rife.

In Iceland, where it is cold most of the time, they found fewer seasonal changes.

Prof John Todd, one of the study authors, who is based at Cambridge University in the UK, said the findings could explain why people were prone to certain diseases at particular times of year.

Inflammation plays a significant role in conditions such as rheumatoid arthritis, type-1 diabetes and heart disease, which peak in the winter in countries such as the UK. "In the UK, we see a rise in new cases of type-1 diabetes in January, February and March, for example," Prof Todd said. "Our results suggest that part of the reason for this is heightened inflammation and that gene activity is involved."

Survival advantage

Genes sit on our chromosomes, separated by long stretches of DNA code that regulate when to turn them off or on. Prof Todd said it was hard to tease out precisely what was happening, since many factors influenced an individual's chance of developing a disease. Likewise, diseases and other factors, such as nutrition and stress, could affect how genes function.

Tim Spector, professor of genetic epidemiology at King's College London, said: "Another dimension that could be as important are our gut microbes, which also change between seasons and could be driving these changes because of seasonal changes in diet."

Prof Tim Hubbard, also from King's, said there might be an evolutionary advantage behind the seasonal changes the researchers found.

And Prof Todd said: "In prehistoric humans, these seasonal changes in inflammation would help fight infection." Another seasonal change they saw was in genes linked to metabolism. "Presumably these would help with conserving energy to survive when there is little food and shelter," Prof Todd said.

"In modern society we have warm clothing and heating but we still respond to colder temperatures and shorter days. "But that increase in inflammation could now be a risk factor for diseases of modern life."

The work was funded by the Wellcome Trust and the Juvenile Diabetes Research Foundation.

http://www.eurekalert.org/pub_releases/2015-05/bc-nii050815.php

New insights into the male bias of autism

Male toddlers with autism have significant structural differences in their brains compared to females with the condition, according to research published in the open-access journal Molecular Autism

Male toddlers with autism have significant structural differences in their brains compared to females with the condition, according to research published in the open access journal *Molecular Autism*.

The journal is publishing a special series of articles looking at the links between sex/gender and autism, which reveal additional insights into the role of prenatal sex hormones and the 'female protective effect'.

Autism spectrum conditions are more common in males than in females, with a 2 or 3:1 male to female bias in prevalence consistently found in studies. Why this is the case is still not fully understood.

Guest editor Meng-Chuan Lai from the Autism Research Centre, University of Cambridge, UK, said: "Autism has always been perceived as a condition that occurs more often in males, which means that females are usually underrepresented in research studies. This means there's a risk that the scientific and clinical literature provides a partial, male-based understanding of autism. "But autism is clearly not a 'male condition'. Delineating the role that sex and gender play in the characteristics of autism, across multiple levels, may inform both our ability to identify the condition and lead to a greater understanding of its developmental psychology and biology."[1]

Sex/gender differences in the brain

Researchers from the MIND Institute at University of California, Davis, USA, found sex differences in children with autism when looking at the organization of fibers in the corpus callosum, the largest bundle of nerve fibers in the brain.[2]

The study included 139 three-to-five year olds with autism (112 male/27 female) and 82 typically developing children (53 male/29 female). Using MRI, the researchers studied the pattern of nerve fibers projecting from the corpus callosum to different regions of the brain.

There were clear sex differences in the results. While both males and females with autism had alterations in regions of the corpus callosum connected to the frontal lobe, the pattern of alterations differed between the sexes.

In particular, males with autism had smaller callosal regions connecting to the orbitofrontal cortex, which is involved in emotional processing and reward-related decision-making. In contrast, females with autism had smaller callosal regions connecting to the anterior frontal cortex, which is involved in higher order 'executive function' such as planning.

The study suggests that males and females with autism should be evaluated separately and not assumed to share the same pattern of atypical brain structure. The study also suggests that differences in the corpus callosum are established early in development, before three years of age.

Genes and prenatal sex hormones

In another study, researchers from the George Washington University, USA, found sex differences in the levels of the gene 'RORA' in the brain. RORA regulates many genes linked to autism, including a gene that influences prenatal testosterone levels, a known risk factor for autism.[3]

The team showed that RORA protein levels are higher in the brains of typically developing females compared to typically developing males, providing females with a buffer against RORA deficiency. RORA deficiency has previously been proposed as one factor that may make males more vulnerable to autism.

Female protective effect

Two papers in this new thematic series of the journal shed light on the 'female protective effect' - the theory that there is a mechanism protecting the developing female brain from autism.

Researchers from University of California, Los Angeles, USA, investigated the risk of autism in males and females in over 1,000 families, and the rate at which autism re-occurred in siblings.[4]

The results demonstrated the expected higher rates of autism in males compared to females, but also showed a significantly greater risk of autism for siblings of females with autism, compared to siblings of males with autism.

The researchers say this supports the 'female protective effect' hypothesis because females with autism carry greater genetic load predisposing them to develop the condition, compared to males. This could cause them to overcome the 'female protective effect', although this interpretation of their results awaits testing at the molecular level.

This greater genetic predisposition may run in families and means that siblings of females with autism are more likely to present autism.

A final study, led by University of California, San Francisco, Washington University in St Louis and Yale School of Medicine, USA, analyzed genetic data from over 4,500 families affected by autism. Their work found that no single gene is associated with the female protective effect. The authors conclude that the mechanism of this protection remains unknown, but that multiple genes could play a role.[5]

Joseph Buxbaum, Co-editor in Chief of the journal *Molecular Autism*, said: "We are excited to be publishing such high quality, novel research on the important and previously neglected topic of the roles that sex and gender play in understanding autism."

Simon Baron-Cohen, Co-editor in Chief of the journal, added: "A focus on sex and gender in autism research should help improve the clinical identification of females who may have autism that has gone undiagnosed.

"Research into this topic may also help us understand the complex mix of sex-linked genetic, hormonal, and social factors that contribute to individual differences in social and language development and flexible adaptation to change, as well as autism itself."

1. Editorial Meng-Chuan Lai, Simon Baron-Cohen and Joseph D Buxbaum Understanding autism in the light of sex/gender Molecular Autism 2015 DOI 10.1186/s13229-015-0021-4 http://dx.doi.org/10.1186/s13229-015-0021-4

2. Research article Christine Wu Nordahl, Ana-Maria Iosif, Gregory S Young, Lee Michael Perry, Robert Dougherty, Aaron Lee, Deana Li, Michael H Buonocore, Tony Simon, Sally Rogers, Brian Wandell and David G Amaral Sex differences in the corpus callosum in preschool-aged children with autism spectrum disorder Molecular Autism 2015 DOI 10.1186/s13229-015-0005-4 http://dx.doi.org/10.1186/s13229-015-0005-4

3. Research article Valerie W Hu, Tewarit Sarachana, Rachel M Sherrard and Kristen M Kocher Investigation of sex differences in the expression of RORA and its transcriptional targets in the brain as a potential contributor to the sex bias in autism Molecular Autism 2015 http://www.molecularautism.com/content/6/1/7

4. Research article Donna M Werling and Daniel H Geschwind Recurrence rates provide evidence for sex-differential, familial genetic liability for autism spectrum disorders in multiplex families and twins Molecular Autism 2015 DOI 10.1186/s13229-015-0004-5 http://dx.doi.org/10.1186/s13229-015-0004-5

5. Research article Jake Gockley, A Jeremy Willsey, Shan Dong, Joseph D Dougherty, John N Constantino and Stephan J Sanders The female protective effect in autism spectrum disorder is not mediated by a single genetic locus Molecular Autism 2015 DOI 10.1186/s13229-015-0014-3 http://dx.doi.org/10.1186/s13229-015-0014-3

http://www.eurekalert.org/pub_releases/2015-05/uoia-crd051215.php

College readiness declines when school's focus is improving test scores, study finds

Accountability sanctions have detrimental impact on learning, student morale

CHAMPAIGN, Ill. - Education reform policies that penalize struggling schools for poor standardized test scores may hinder - not improve - students' college readiness, if a school's instructional focus becomes improving its test scores, suggests a new study that explored efforts to promote a college-going culture at one Texas high school.

Published recently in The High School Journal, the case study reveals the unintended consequences of school reform policies, and how these mandates may warp schools' instructional focus and thwart students' academic success.

In 2008, Texas adopted statewide College and Career Readiness Standards that established student performance benchmarks for math, science, reading and geography. Texas also is one of 26 states that require students to pass an exit exam - usually taken during students' junior year - to receive a high school diploma.

Anjalé D. Welton, a professor of educational policy at the University of Illinois, and Montrischa M. Williams, a researcher with the American Institutes for Research, explored the impact that these mandates had at Green High School, a pseudonym the authors used for a school located in a semirural community near a major city in Texas.

Poor academic performance on federal and state accountability tests for three consecutive years had garnered Green High School an "academically unacceptable" rating from the state education agency. As a result, teachers and staff at Green were under pressure to produce improvement within the next year, prompting them to concentrate instructional time and resources on preparing students for the exit exam.

Many teachers revised their curricula to focus on the basic skills emphasized on the exam, and made instructional decisions, such as not assigning homework, that compromised students' college readiness, according to the researchers.

More than half of Green's students were enrolled in some form of intervention for the exit exam during the time Welton and Williams were collecting data. Because so many students were being steered into these interventions, the school eliminated some advanced placement courses due to low enrollment, the researchers discovered.

Some students expressed frustration about the lack of academic rigor in their remaining AP courses, which they linked to inexperienced teachers' lower academic expectations for students.

Students were highly aware of Green's negative academic reputation and told the researchers that they felt "stigmatized" and "humiliated" by it.

A high turnover rate among Green's teaching staff made it difficult for youth to receive the social support that is essential to creating a college-going culture, especially among first-generation college students, the researchers found.

"This school was so focused on meeting the demands of state policy that it was unaware of the toll it was taking on the culture and climate of the school," Welton said. "The goal of standards and assessment is to make students more prepared for the rigors of college, but are schools implementing these measures in a way that

emphasizes college readiness? Are they sending the message that students should go to college, and assisting them in applying and finding financial aid and scholarships? We should be able to do both - hold schools accountable and create a college-going culture."

The community surrounding Green High School had experienced a major demographic shift over the prior decade as urban families relocated to the city's outskirts. However, the researchers observed that school officials and teachers were unprepared to meet the needs of low-income and minority youth, and blamed these students for Green's academic decline.

While Green implemented some promising programs to increase the numbers of graduates going to college, these initiatives reached few students, leaving most youth on their own to figure out how to access college information, according to the study.

Although Welton and Williams' research focused on one school, they believe that other schools across the U.S. are experiencing similar difficulties, suggesting a need to examine the true impact of accountability mandates and help schools develop teaching practices that support students' academic success and postsecondary aspirations.

"Schools with large populations of youth of color and low-income youth are overwhelmingly targeted for reform initiatives, and, as a society, we need to examine how schools become highly minoritized and why they have large numbers of students with various needs," Welton said. "In states such as Texas, people of color are the majority population, and we need to rethink how we label schools for reform purposes."

"Rather than centering performance problems on students and teachers, policymakers should take into consideration the systemic inequities and larger sociopolitical contexts in which schools operate," Williams said. "We also need to be more aware of the impact of labeling schools 'high minority, high poverty' and 'low performing,' because these descriptors convey deficit connotations."

http://www.eurekalert.org/pub_releases/2015-05/gi-srb051215.php

Scientists regenerate bone tissue using only proteins secreted by stem cells

The new strategy is more sustainable and less risky than the current standard therapies

SAN FRANCISCO, CA - Scientists have discovered a way to regrow bone tissue using the protein signals produced by stem cells. This technology could help treat victims who have experienced major trauma to a limb, like soldiers wounded in combat or casualties of a natural disaster. The new method improves on older therapies by providing a sustainable source for fresh tissue and reducing the risk of tumor formation that can arise with stem cell transplants.

The new study, published in Scientific Reports, is is the first to extract the necessary bone-producing growth factors from stem cells and to show that these proteins are sufficient to create new bone. The stem cell-based approach was as effective as the current standard treatment in terms of the amount of bone created.

"This proof-of-principle work establishes a novel bone formation therapy that exploits the regenerative potential of stem cells," says senior author Todd McDevitt, PhD, a senior investigator at the Gladstone Institutes. "With this technique, we can produce new tissue that is completely stem cell-derived and that performs similarly with the gold standard in the field."

Instead of using stem cells themselves, the scientists extracted the proteins that the cells secrete - such as bone morphogenetic protein (BMP) - in order to harness their regenerative power. To do so, the researchers first treated stem cells with a chemical that helped coax them into early bone cells. Next, they mined the essential factors produced by the cells that send the signal to regenerate new tissue. Finally, the researchers delivered these proteins into mouse muscle tissue to facilitate new bone growth.

The current standard method involves grinding up old bones in order to extract the proteins and growth factors needed to stimulate new bone growth - a substance dubbed demineralized bone matrix (DBM). However, this approach has significant restrictions as it relies on bones taken from cadavers, which can be highly variable in terms of tissue quality and how much of the necessary signals they still produce. Moreover, as is the problem in organ donation, cadaver tissue is not always available.

"These limitations motivate the need for more consistent and reproducible source material for tissue regeneration," says Dr. McDevitt, who conducted the research while he was a professor at the Georgia Institute of Technology. "As a renewable resource that is both scalable and consistent in manufacturing, pluripotent stem cells are an ideal solution."

Other researchers on the study include Ken Sutha, Zvi Schwartz, Yun Wang, Sharon Hyzy, and Barbara Boyan from the Gladstone Institutes, Georgia Institute of Technology, and Virginia Commonwealth University.

http://www.eurekalert.org/pub_releases/2015-05/tl-tlt051215.php

The Lancet: Testing hand-grip strength could be a simple, low-cost way to predict heart attack and stroke risk

Weak grip strength is linked with shorter survival and a greater risk of having a heart attack or stroke, according to an international study involving almost 140000 adults from 17 culturally and economically diverse countries [1].

The study, published in The Lancet, also found that grip strength is a stronger predictor of death than systolic blood pressure, and the authors suggest that it could be used as a quick, low-cost screening tool by doctors or other healthcare professionals to identify high-risk patients among people who develop major illnesses such as heart failure and stroke.

Reduced muscular strength, which can be measured by grip strength, has been consistently linked with early death, disability, and illness. But until now, information on the prognostic value of grip strength was limited, and mainly obtained from select high-income countries.

The current study followed 139691 adults aged between 35 and 70 years living in 17 countries from The Prospective Urban-Rural Epidemiology (PURE) study for an average (median) of four years. Grip strength was assessed using a handgrip dynamometer.

The findings show that every 5kg decline in grip strength [2] was associated with a 16% increased risk of death from any cause; a 17% greater risk of cardiovascular death; a 17% higher risk of non-cardiovascular mortality; and more modest increases in the risk of having a heart attack (7%) or a stroke (9%).

These associations persisted even after taking into account differences in other factors that can affect mortality or heart disease such as age, education level, employment status, physical activity level, and tobacco and alcohol use.

A low grip strength was linked with higher death rates in people who develop cardiovascular (eg, heart attack or stroke) and non-cardiovascular diseases (eg, cancer), suggesting that muscle strength can predict the risk of death in people who develop a major illness.

According to lead author Dr Darryl Leong from the Population Health Research Institute, Hamilton Health Sciences and McMaster University, Hamilton, Canada, "Grip strength could be an easy and inexpensive test to assess an individual's risk of death and cardiovascular disease. Further research is needed to establish whether efforts to improve muscle strength are likely to reduce an individual's risk of death and cardiovascular disease." [3]

Writing in a linked Comment, Professor Avan Aihie Sayer from the University of Southampton, Southampton, UK, and Professor Thomas Kirkwood from Newcastle University, Newcastle upon Tyne, UK discuss whether grip strength could be a new biomarker of ageing, writing that, "This is not a new idea, but findings from PURE add support. Loss of grip strength is unlikely to lie on a single final common pathway for the adverse effects of ageing, but it might be a particularly good marker of underlying ageing processes, perhaps because of the rarity of muscle-specific diseases contributing to change in muscle function."

[1] The countries involved were Canada, Sweden, United Arab Emirates, Argentina, Brazil, Chile, Malaysia, Poland, South Africa, Turkey, China, Colombia, Iran, Bangladesh, India, Pakistan, and Zimbabwe.

[2] Grip strength is measured as the force exerted when a subject squeezes an object as hard as possible with their hands.

http://www.eurekalert.org/pub_releases/2015-05/cp-tig050715.php

The infant gut microbiome: New studies on its origins and how it's knocked out of balance

A fecal sample analysis of 98 Swedish infants over the first year of life found a connection between the development of a child's gut microbiome and the way he or she is delivered.

Babies born via C-section had gut bacteria that showed significantly less resemblance to their mothers compared to those that were delivered vaginally.

The study, which appears May 11 in Cell Host & Microbe's special issue on "The Host-Microbiota Balance," also found nutrition to be a main driver of infant gut microbiome development - specifically the decision to breast-feed or bottle-feed.

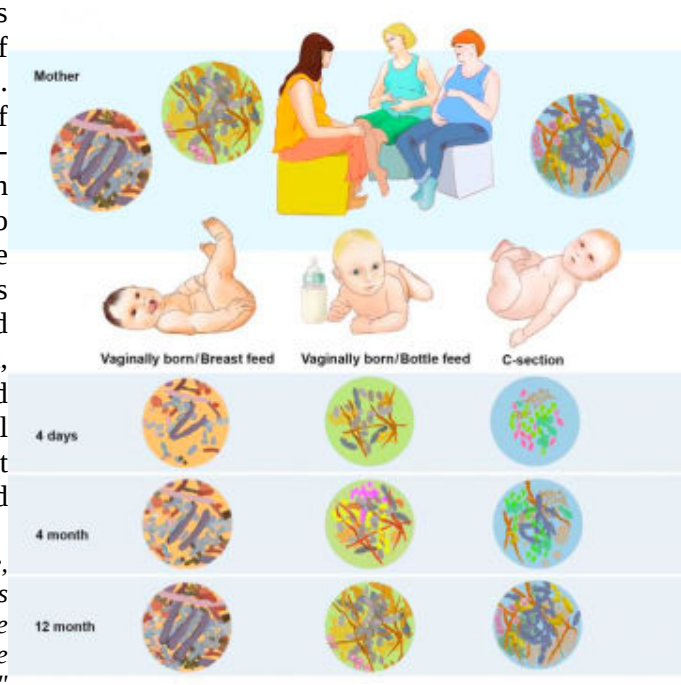
"Our findings surprisingly demonstrated that cessation of breastfeeding, rather than introduction of solid foods, is the major driver in the development of an adult-like microbiota," says lead study author Fredrik Bäckhed of The University of Gothenburg, Sweden. "However, the effect of an altered microbiome early in life on health and disease in adolescence and adulthood remains to be demonstrated."

Gut bacteria are suspected to be a source of nutrients and vitamins for a growing infant. Our intestinal tenants are able to interact with normal cellular processes to, for example, produce essential amino acids. Understanding the role individual gut microbes play in metabolism, immunity, and even behavior is an active area of investigation.

This new study, led by Bäckhed and Jovanna Dahlgren at the University of Gothenburg, Sweden, and Wang Jun at the Beijing Genomics Institute-Shenzhen, China, supports previous observations that most early bacterial colonizers of the gut are derived from the mother. The investigators noted that while C-section babies receive less of their mother's microbes, they are still able to be passed on through the skin and mouth.

Once bacteria take hold in an infant's gut, their populations shift depending on what a child eats. The researchers believe that the cessation of breast-feeding is such a significant moment in microbiome development because certain types of bacteria thrive on the nutrients breast milk provides. Once these nutrients are no longer available, other bacteria emerge that are more commonly seen in adults.

"Our results underscore the role of breast-feeding in the shaping and succession of gut microbial communities during the first year of life," the authors write. "The gut microbiota of children no longer breast-fed was enriched in species belonging to Clostridia that are prevalent in adults, such as Roseburia, Clostrium, and Anaerostipes. In contrast, Bifidobacterium and Lactobacillus still dominated the gut microbiota of breast-fed infants at 12 months."



Cell Host & Microbe, Bäckhed et al.: "Dynamics and Stabilization of the Human Gut Microbiome during the First Year of Life" http://dx.doi.org/10.1016/j.chom.2015.04.004

Bäckhed et al. assessed the gut microbiomes of 98 Swedish mothers and their infants during the first year of life. Cessation of breast-feeding was identified as a major factor in determining gut microbiota maturation, with distinct shifts in signature species being hallmarks of its functional maturation. **Bäckhed et al./Cell Host & Microbe 2015**

The Infant Gut and Antibiotics: Long-Term Effects

Antibiotics account for one quarter of all medications given to children, with a third of prescriptions considered unnecessary. In addition to concerns about antibiotic resistance, these drugs are known to disrupt a child's gut microbiome in ways that a growing amount of evidence suggests may have long-term consequences, including obesity, allergies, and autoimmune diseases.

Based on a review of the literature, biotechnologist Dan Knights, of the University of Minnesota, and colleagues developed a framework for how antibiotics may be acting in the gut to cause these outcomes. In the case of allergies, for example, the use of antibiotics may eradicate key gut bacteria that help immune cells mature. These cells would have been essential for keeping the immune system at bay when confronted with allergens. Even if these bacteria return, the immune system remains impaired.

"The framework presented here links together the existing epidemiological and mechanistic studies on antibiotics and various gut-mediated disease outcomes," the authors write. "Large, integrated studies designed to focus on short- and long-term impact of antibiotics, in terms of both microbiome composition and disease risk, with careful consideration of the factors presented here, will be critical as we move toward an increased understanding of related disease etiologies."

The researchers also developed a diagnostic test that can calculate the developmental age of a baby's gut microbiome relative to healthy babies. A similar test could be used by pediatricians to identify and potentially treat infants more than a month behind normal development.

Cell Host & Microbe, Vangay et al.: "Antibiotics, Pediatric Dysbiosis, and Disease" http://dx.doi.org/10.1016/j.chom.2015.04.006

The Gut Microbiome's Role in Asthma

The search for answers in the medical mystery around the recent increase in asthma prevalence, especially for children up to age four, has led researchers to consider changes in the gut and airway microbiome as a contributing environmental factor in the development of this treatable, but uncomfortable, condition.

Susan Lynch and Kei E. Fujimura of the University of California San Francisco present the latest research in mice exploring this relationship, especially how specific types of bacteria alter the presence of different immune cells. Though still an emerging body of work, they believe it is evidence that manipulation of the airway/gut microbiome at an early age could lead to new strategies to prevent or manage asthma.

Cell Host & Microbe, Fujimura et al.: "Microbiota in Allergy and Asthma and the Emerging Relationship with the Gut Microbiome" http://dx.doi.org/10.1016/j.chom.2015.04.007

http://www.eurekalert.org/pub_releases/2015-05/ru-rsh051315.php

Research shows how antibodies produce vaccine-like effect against tumors

Two antibody-binding receptors on immune cells are key to killing tumors and creating a memory of them

The problem with traditional cancer treatments is that their effects don't always last: Stop the therapy and the disease may return. That's why antibody therapy - which not only kills tumors, but also appears to train the body's own defenses to recognize them - has such promise. New research at Rockefeller University, published May 11 in Cell, shows how this happens, with the destruction of tumor cells prompting a patient's immune system to form immunological memory that can suppress the same tumor should it try to return.

"Our experiments using lymphoma, a type of blood cell cancer, uncovered a two-step process that revolves around two receptors found on different types of immune cells, linking those cells to antibodies. In this way, these so-called Fc receptors act as crucial intermediaries," says Jeffrey Ravetch, Theresa and Eugene M. Lang Professor and head of the Leonard Wagner Laboratory of Molecular Genetics and Immunology. "These findings suggests ways current anticancer antibody treatments might be improved, as well as combined with other immune system stimulating therapies to help cancer patients," Ravetch says.

Antibody-based therapies, in which patients receive immune proteins that target specific proteins, called antigens, produced by their tumors, have been available for about two decades. Previous work in the lab has shown that these antitumor antibodies bind to Fc receptors on activated immune cells, prompting those immune cells to kill the tumor. However, it was unknown which Fc receptor was involved, or how the tumor killing led the immune system to generate memory T cells against these same antigens, in case the tumor producing them should return.

Ravetch and first author David DiLillo, a postdoc in the lab, broke down the process by injecting lymphoma cells that expressed the antigen CD20 into mice with immune systems engineered to contain human Fc receptors. When these mice received antibodies that targeted CD20, they all survived. Three months later, most of the same mice survived being challenged again with the same lymphoma or a different one that also expressed CD20. Mice not treated with antibodies, or those that received non-CD20 lymphoma the second time around, did not fare well.

Different types of immune cells can express different Fc receptors. So, based on the cells Ravetch and DiLillo thought were involved, they looked to the Fc receptors expressed by cytotoxic, or cell killing, immune cells, that carried out the initial attack on tumors, and the Fc receptors found on dendritic cells, which are crucial to formation of memory T cells.

To test the involvement of these receptors, the researchers altered the therapeutic antibodies delivered to the lymphoma-infected mice so as to change their affinity for these Fc receptors. Then, they looked for changes in the survival rate of the mice after the first challenge with lymphoma, and then again after a second.

When they dissected this process, they found two steps: One Fc receptor, known as FcRIIIA, found on a Pac-Man-like immune cell known as a macrophage, responds to the antibodies, and prompts the macrophage to engulf and destroy the antibody-laden tumor cell. These same antibodies, still attached to tumor antigens, activate a second receptor, FcRIIA, on dendritic cells, which use the antigen to prime T cells. The result was the generation of a T cell memory response that protected the mice against future tumors expressing CD20.

"By engineering the antibodies so as to increase their affinity for both FcRIIIA and FcRIIA, we were able to optimize both steps in this process," DiLillo says. "Current antibody therapies are only engineered to improve the immediate killing of tumor cells, but not the formation of immunological memory. We are proposing that an ideal antibody therapy would be engineered to take full advantage of both steps."

It is important to note that the immunological memory at the center of this study had a significant limitation: It protects only against tumors that express the specific antigen targeted by the antibodies that are administered.

"Because cancer can be highly unpredictable, and can reoccur in altered forms, we think an important next step may be boosting the antitumor immunity by combining antibody therapy with other, new immunological therapies that can, for example, enhance T cell responses," Ravetch says.

http://www.eurekalert.org/pub_releases/2015-05/dci-nbt051215.php

New blood test quickly reveals severity of radiation injury

Test predicts within 24 hours whether radiation exposure will be fatal

Will aid first responders in providing immediate care to those most in need

BOSTON - A novel blood test could greatly improve triage of victims of radiation accidents by rapidly predicting who will survive, who will die, and who should receive immediate medical countermeasures, according to scientists at Dana-Farber Cancer Institute.

In pre-clinical trials, the test was able to reveal within 24 hours whether survivable doses of radiation or doses that caused severe injury to the bone marrow and other organs would eventually prove fatal. Use of such a test, the researchers said, could "facilitate timely medical intervention and improve overall survival of exposed individuals."

Reporting in Science Translational Medicine, the scientists say that, unlike current methods, their blood biomarker test quickly determines the functional impact of radiation rather than simply the dose to which the individual was exposed. Often, the effects of severe radiation exposure develop slowly over weeks or months. Current methods - such as observing when radiation sickness appears - are inexact and don't measure the extent of long-term injury to the bone marrow and other organs.

"After a radiation release, there is currently no way to tell who was exposed and who wasn't, and if someone was exposed, is it lethal or not?" said Dipanjan Chowdhury, PhD, a principal investigator in Dana-Farber's Department of Radiation Oncology, the report's senior author. Drugs that can limit bone marrow damage are available but, to be effective, must be given before the appearance of radiation symptoms.

The need for faster, more definitive predictive tests was highlighted by radiation accidents such as the 2011 reactor meltdown at the Fukushima Daiichi plant in Japan, radiation releases from Chernobyl and Three Mile Island, as well as the potential for terrorist radiologic weapons. Chowdhury and his colleagues undertook the new study with federal funds designated for radiation exposure biomarkers research in the wake of the Fukushima accident.

In a search for such biomarkers, the investigators focused on microRNAs, or miRNAs. These are tiny RNA molecules, first identified about 20 years ago, that help regulate gene activity. They are made in cells, but some miRNAs are found in the bloodstream, and the scientists asked whether varying doses of radiation might cause corresponding changes in miRNA in the blood.

Experiments showed that 68 of 170 miRNAs detected in blood serum changed with radiation exposure, and these were narrowed down to a small number that acted as a "signature" of radiation dose. Mice exposed to two radiation doses, one lethal and one survivable, showed no outward differences for three to four weeks. But using the miRNA signature, the scientists were able to predict within 24 hours which animals would survive.

An indication that the test would work similarly in people came from experiments using mice who received transplants of human bone marrow. The blood test gave the same indication of damage to the human cells as it had in the previous experiments with non-humanized mice. In addition, when the researchers gave the mice a radiation protection drug that "rescued" many of the human cells, the miRNA test results confirmed this protective effect. The scientists noted that the miRNA changes that can be seen at 24 hours after the exposure disappear in a matter of days, so they plan to look for other miRNA signatures that have a longer duration.

First author of the report is Sanket Acharya, a Harvard Medical School graduate student in Chowdhury's laboratory.

The research was supported by a National Institutes of Health R01 grant Al101897-01 to Chowdhury, and grants from the American Cancer Society and other funders.

http://www.eurekalert.org/pub_releases/2015-05/sri-tsi051215.php

TSRI scientists identify interferon beta as likely culprit in persistent viral infections

Interferon beta (IFNβ), has an immune-suppressing effect that can help some viruses establish persistent infections

LA JOLLA, CA - Interferon proteins are normally considered virus-fighters, but scientists at The Scripps Research Institute (TSRI) have found evidence that one of them, interferon beta (IFNβ), has an immune-suppressing effect that can help some viruses establish persistent infections.

The results suggest that drugs blocking IFNβ might one day be used to treat persistent viral infections, which include HIV and hepatitis B and C infections.

"We found that IFNβ is important for the immunosuppressive effect seen in persistent infection, even though it signals through the same receptor used by IFNα proteins, which have very different effects," said TSRI Professor Michael B. A. Oldstone, senior investigator of the study, which appears in the May 13, 2015 issue of Cell Host & Microbe.

Brake or Gas Pedal?

Interferons, discovered nearly 60 years ago, are among the proteins secreted by cells in response to viral invasion. Their known functions include activating T cells, interfering with viral replication and enhancing the presentation of viral proteins to the immune system. They have long been considered essentially antiviral and immune-boosting, and lab-grown IFN type I proteins are used to treat hepatitis C infections and some cancers.

Yet, it is becoming clear that interferons don't simply boost the immune system. In a study reported in Science in 2013, for example, Oldstone and his laboratory found evidence that type I interferon signaling has a strong braking effect on the immune response - a braking effect that may be co-opted by infecting viruses to enhance their survival.

Oldstone notes blockade of type I interferon receptor signaling corrected virus-induced disorganization of secondary lymphoid tissue, allowed migration of T cells in the lymphoid tissue and diminished molecules responsible for aborting virus-specific T cell activity - all leading to restoration of T cell function and control of the viral infection.

For the new study, Oldstone and his team sought to identify whether IFNα or IFNβ was responsible for that braking effect. IFNβ was the prime suspect. In the mouse model of persistent infection, which uses a variant ("clone 13") of the mouse-infecting LCMV virus, IFNβ is produced in the mice at much higher levels than those seen with a non-persistent LCMV variant (ARM 53b). Of the 3,356 amino acids that comprise either LCMV Cl-13 or ARM, these viruses differ only by three amino acids.

One of these is in the LCMV GP-1 spike responsible for binding to the host cell's receptor and entry, while a second is located in the polymerase protein and is associated with enhanced replication of LCMV Cl 13 1.5 to 2 logs more than LCMV ARM in dendritic cells. Moreover, IFNβ has been reported to have anti-inflammatory effects and is used to treat the autoimmune disease multiple sclerosis, although its precise mechanisms of action have been unknown.

Co-Opting the System

The team, including first author Cherie Ng, at the time a research associate in the Oldstone lab, examined mice raised without the gene for IFNβ and normal mice in which IFNβ activity was blocked with a monoclonal antibody.

This experiment showed the LCMV Cl-13-infected mice devoid of IFNβ signaling restored lymphoid architecture and enhanced T-cells primed for attacking LCMV. By day 30 of the infection, the mice also showed a significantly lower viral load in the spleen, liver, lung and bloodstream, compared to mice with intact IFNβ signaling.

By contrast, blocking IFNα with an antibody that neutralizes six subtypes had none of these beneficial effects. Moreover, blocking IFNα activity led to greater viral spread early in the infection. These results implied that, although IFNα and IFNβ signal through the same cellular receptor, IFNα proteins are important in limiting early virus spread, whereas IFNβ is an immunosuppressive molecule.

"Researchers have long hypothesized that interferons evolved many different subtypes not just for the sake of redundancy, but because those subtypes have different biologic roles," said Oldstone. "In the case of IFNβ, that role may be to curb the immune response, thereby preventing excessive damage and autoimmunity due to that immune response."

"LCMV Cl-13 and likely other viruses that persist - and possibly cancers - have learned to co-opt that immunosuppressive function to abort T cell functions required to eliminate them," Oldstone said.

Next steps for Oldstone and his team include determining precisely how the binding of IFNα and IFNβ proteins to the IFN-I receptor differ, how those bindings alter the expression of immune-related genes and what points on the IFNβ pathway could best be targeted with drugs to treat persistent infections and perhaps some cancers.

Other co-authors of the paper, "Blockade of interferon beta, but not interferon alpha, signaling controls persistent viral infection," were Brian M. Sullivan, John R. Teijaro, Andrew M. Lee, Megan Welch and Stephanie Rice of the Oldstone laboratory; and Kathleen C.F. Sheehan and Robert D. Schreiber of Washington University at St. Louis. See http://www.cell.com/cell-host-microbe/home

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http://bit.ly/1bWsN23

Pill of super-protective 'heavy' fat may be key to eternal youth

Bolstering cells with a dose of heavy fat may be the key to curing degenerative diseases. And it may help you hold back the years

13 May 2015 by Jessica Hamzelou

COULD a shiny orange capsule of modified fat help to keep you young? For the first time next month, fats designed to reinforce our cells against age-related damage will be given to people in a clinical trial. The participants have a rare genetic disorder, but if the treatment works for them, it could eventually help us all live longer, more youthful lives, says the scientist behind the work.

Mikhail Shchepinov, director of Retrotope, a biotech company based in Los Altos, California, wants eventually to slow down the ageing process. But he is starting with a related problem – treating the inherited movement disorder Friedreich's ataxia, with which ageing shares a mechanism. They are both caused, in part, by a molecular attack on our cells. Shchepinov's idea is to counteract this assault by reinforcing our cells' defences, slowing the progression of this incurable disease. If it works, it should demonstrate that the approach is also suitable for tackling ageing.

The damage he wants to address is caused by molecules called oxygen free radicals, made when our cells metabolise. Free radicals have unpaired electrons that desperately try to find a partner by tearing electrons off other molecules. This triggers a chain reaction as the denuded atom then does the same to its neighbour.

This chain reaction is particularly dangerous for the fatty acids that form our cell membranes. "They burn like gunpowder until hundreds of thousands are damaged," says Shchepinov. Proteins and DNA also come off badly. Blocking the reaction should prevent the damage, but Shchepinov has a different idea.

He reckons we can protect our cells from free radicals simply by strengthening the bonds between molecules that make up our cell membranes. This can be done by swapping the hydrogen in the fatty acids for a different form known as deuterium. Because deuterium has an extra neutron, it is heavier than hydrogen and forms stronger bonds (see "The skinny on heavy fat").

Enter the modified fat pill. The idea is that substituting some of the fats we normally eat with modified, stronger fats in pill-form should allow us to build stronger cells. To test the idea, Shchepinov and his colleagues developed heavy versions of an omega-6, polyunsaturated fatty acid. "It's not a nutrient – it's a new chemical that is different from the fats you get in your diet," says Retrotope co-founder Robert Molinari, the biochemist who is leading the clinical trial.

The approach works in yeast – samples that metabolised heavy fats appear to be up to 150 times as resistant to the oxidative stress caused by free radicals as those given regular fatty acids.

The next step is to see whether heavy fat can slow the progression of Friedreich's ataxia. This is caused by free radical damage to the nerves responsible for movement and usually means people are wheelchair-bound within 10 to 20 years of symptoms appearing. The idea makes sense, says Corinne Spickett at Aston University in Birmingham, UK. "The underlying chemistry is quite correct – the fats are theoretically less susceptible to attack by free radicals," she says.

The trial launching in June is a safety study. The team will be checking that the doses of heavy fat are well tolerated by 18 people with Friedreich's ataxia. They don't expect problems – even if every cell membrane were made from their modified fatty acids, the total amount of deuterium in the body would still be around four times lower than a dangerous dose.

At first, each volunteer will be given two 1 gram tablets of heavy fat per day. "It looks like a fish oil pill," says Molinari. After a break, the dose will be ramped up, with people taking five tablets, twice a day. Because the heavy fats need to overwhelm the fats we usually get in our food, the volunteers will be placed on a special diet. "They can have olive oil and saturated fats but not polyunsaturated fatty acids," says Shchepinov.

Reverse the damage

Molinari hopes that the treatment will not only halt the progression of the disease, but also improve people's symptoms. By replacing cellular fatty acids with stronger ones, there is a chance of rescuing nerves that are sick, but not dead. "A degree of reversal of damage is possible," he says. "We see improvements in cell experiments – we won't know about the effects in people until we do the trial."

Although a larger trial will be needed to determine any effect on symptoms, the team is hoping to see some hints during the safety study. "The principle is sound, and some beneficial effects of heavy fats have been seen in cells and rodents," says Spickett. "But will this translate to humans? We'll have to see."

Theoretically, heavy fats could also prove useful in other diseases in which free radicals are implicated, such as Parkinson's. A few years ago, Shchepinov and colleagues at the University of Arkansas and the Scripps Research Institute in California, found that a diet rich in heavy fats protected mice against the worst ravages of the mouse equivalent of Parkinson's disease.

And then there's the question of whether a heavy fat pill can slow ageing. "If you can fix oxidative damage then lifespan will be extended," says Shchepinov. "It's the same mechanism."

To get a better idea of its potential, the team plans to run a trial in rodents, lasting around three years. A human trial would be more complicated as it would be incredibly difficult to tease apart the many factors known to play a role in ageing (see "Ageing explained"). "The jury is still out on the free radical theory of ageing," says Mark Cooper at University College London. "Free radicals do contribute to ageing, but there is a massive amount going on – it might not just be down to one thing."

But Shchepinov is sanguine. To him, ageing is just a collection of diseases. If the fatty acids benefit people with these diseases, they will automatically extend lifespan, he says. "Maybe people will live until they are 180 and start dying of something else," he says. "It's a complex approach, but I hope our fatty acids will play a role."

http://www.eurekalert.org/pub_releases/2015-05/cmc-dtf051415.php

Definitive tests for irritable bowel syndrome developed at Cedars-Sinai

New blood tests will speed up diagnosis for the most common GI disorder

LOS ANGELES - Millions of people afflicted by irritable bowel syndrome can now be diagnosed quickly and accurately with two simple blood tests developed by a Cedars-Sinai gastroenterologist. The tests, created by Mark Pimentel, MD, director of the GI Motility Program and Laboratory, confirm when a patient has developed IBS because of food poisoning, a major cause of the disorder.

Toxins produced by bacteria, such as salmonella, can severely harm the digestive system by damaging nerves critical to healthy gut function. The new blood tests identify the presence and amount of specific antibodies reacting to the toxins.

"Having an early diagnosis means patients can avoid years of invasive tests and visits to specialists that often leave them with more questions than answers," he said. "With these new blood tests, many patients will now be able to proceed right to therapy for their condition."

IBS is the most common gastroenterological disorder in the United States, affecting nearly 40 million people. An estimated 10 percent of the world's population suffers from the condition.

The disorder, nearly impossible to diagnose until now, is characterized by a cluster of confounding symptoms that include chronic bloating, abdominal pain, gas, and bouts of relentless diarrhea, constipation, or both. Fatigue and the stress of trying to plan one's life around visits to the bathroom can be debilitating.

A multicenter study validating the accuracy of the new blood tests, "Development and Validation of a Biomarker for Diarrhea-Predominant Irritable Bowel Syndrome in Human Subjects," was published this week in the journal PLOS ONE. Pimentel will also present the research on Sunday, May 17th, at Digestive Disease Week 2015 in Washington, D.C.

Pimentel and fellow researchers studied nearly 3,000 people, comparing IBS patients to those diagnosed with inflammatory bowel disease, celiac disease and those with no GI disease. The blood tests identified the two antibodies associated with IBS -- anti-Cdtb and anti-vinculin -- with greater than 90 percent certainty.

The tests are marketed under the name IBSchek™ and are produced by Commonwealth Laboratories Inc., in Salem, Massachusetts.

"Most IBS patients have been told at one time or another that the disease was psychological, all in their head," said Pimentel. "The fact that we can now confirm

the disease through their blood, not their head, is going to end a lot of the emotional suffering I have seen these patients endure."

For more information on IBS and the new blood test for the disorder, watch this video: ***First Ever Blood Test for IBS***

COI Disclosure: Pimentel receives consulting fees from Commonwealth Laboratories.

Cedars-Sinai has entered into an exclusive license agreement with Commonwealth Laboratories for several patent applications covering the blood tests, developed by Pimentel to detect both anti-CdtB and anti-vinculin antibodies in the diagnosis of irritable bowel syndrome and inflammatory bowel disease.

http://bit.ly/1cGnm86

Alaska is Growing a Plant the Soviet Military Used in Secret Experiments

Golden root, or Rhodiola rosea, is also popular in Siberian folk medicine

By Marissa Fessenden

Alaska manages to grow some of the largest produce in the country, thanks to their long days of summer sun. However, coaxing most crops to grow in such a short season is a challenge. But now, the state is growing plants specially adapted to the north, including a plant called Rhodiola rosea, a succulent from Siberia, reports Sarah Laskow for Atlas Obscura. But before it became cultivated in alaska, the Rhodiola was a military secret secret.

Rhodiola rosea **George McCarthy/CORBIS**

Folk traditions hold that Rhodiola, also called "golden root" and "rose root" fights depression, treats stress and works as an aphrodisiac (especially for women). Dwellers of the Arctic and the Altai Mountains in Siberia enjoy extracting the plants' roots in tea to boost energy. Then, in the 1940s, Russians learned of the root's alleged powers from native people and started studying the plant scientifically. Laskow writes:

"It was considered a Soviet military secret," says Dr. Petra Illig, the founder of ***Alaska Rhodiola Products, a cooperative of Rhodiola farmers. "Most of what was done back then was unpublished and hidden in drawers in Moscow. They used it for the physical and mental performance of their soldiers and athletes." She and other investigators have confirmed that cosmonauts in the country's space program have also experimented with Rhodiola.***

More recently, U.S. scientists have started investigating Rhodiola. They found some evidence that it can increase the lifespan of flies, worms and yeast. While that work is far from telling scientists whether humans would benefit as well, the results were striking. "Nothing quite like this has been observed before," Mahtab Jafari, of the University of California, Irvine, told a reporter for The Siberian Times. He was part of the group that did the work, which they published in PLOS One.

Real proof will have to wait for better studies in humans. However, Stephen Brown, a professor at the University of Alaska, Fairbanks, figured that even if the evidence wasn't perfect, people would be interested in buying Rhodiola extracts. And Alaska would be the perfect place to get a head start on growing the plants. "It's actually an environment that the plant wants to grow in, as opposed to everything else we grow in Alaska," he told Laskow. "It'll grow in the Arctic and sub-Arctic. It wants our long days. It's already coming up out of the ground—and the ground's still frozen."

Right now, only about five acres of Rhodiola have been planted. The herb already fetches a higher price per acre than other crops, such as potatoes. If new studies show some measurable effects — even if the plant just boosts energy — then so much the better for Alaska's potential Rhodiola farmers.

http://www.eurekalert.org/pub_releases/2015-05/aaft-abo051315.php

Additional benefits of measles vaccination revealed

Vaccination against measles also prevents other infectious diseases from taking advantage of peoples' immune systems

Vaccination against measles doesn't just protect people from the measles virus -- it also prevents other infectious diseases from taking advantage of peoples' immune systems after they have been damaged by measles, according to a new study. These findings help to explain why the introduction of measles vaccines prevented so many more deaths than researchers had expected, while highlighting the importance of widespread vaccination campaigns. Michael Mina and colleagues analyzed data from before and after mass measles vaccinations began in England, Wales, the United States, and Denmark. Their results suggest that measles damages the memory of one's immune system so that it forgets how to fight off a wide range of bacterial invaders. Although previous studies have suggested that measles induces a kind of "immune amnesia" for weeks or months after infection, this new study reveals that this measles-induced immune damage can last for two to three years. During that time, individuals who have fought off the measles virus are vulnerable to a slew of opportunistic pathogens, according to the researchers. This population-level analysis shows a correlation between measles incidence and deaths that occur from other infectious diseases in the two to three years following a measles infection. It also suggests that measles vaccinations played a primary role in driving down mortality from other

infectious diseases in all of the high-income countries studied. Taken together, the researchers' findings imply that measles vaccines keep immune systems' memories intact, thereby providing a degree of herd protection against non-measles infections.

Article #16: "Long-term measles-induced immunomodulation increases overall childhood infectious disease mortality," by M.J. Mina; C.J.E. Metcalf; B.T. Grenfell at Princeton University in Princeton, NJ; M.J. Mina at Emory University School of Medicine in Atlanta, GA; C.J.E. Metcalf; B.T. Grenfell at Fogarty International Center, National Institutes of Health in Bethesda, MD; R.L. de Swart; A.D.M.E. Osterhaus at Erasmus University Medical Center in Rotterdam, Netherlands.

http://www.eurekalert.org/pub_releases/2015-05/uotf-ba051315.php

'Hydrogels' boost ability of stem cells to restore eyesight and heal brains

University of Toronto researchers show that engineered 'hydrogels' not only help with stem cell transplantation, but actually speed healing in both the eye and brain

Toronto scientists and engineers have made a breakthrough in cell transplantation using a gel-like biomaterial that keeps cells alive and helps them integrate better into tissue. In two early lab trials, this has already shown to partially reverse blindness and help the brain recover from stroke.

Led by University of Toronto professors Molly Shoichet and Derek van der Kooy, together with Professor Cindi Morshead, the team encased stem cells in a "hydrogel" that boosted their healing abilities when transplanted into both the eye and the brain. These findings are part of an ongoing effort to develop new therapies to repair nerve damage caused by a disease or injury.

Conducted through the U of T's Donnelly Centre for Cellular and Biomolecular Research, their research was published in today's issue of Stem Cell Reports, the official scientific journal of the International Society for Stem Cell Research.

Stem cells hold great therapeutic promise because of their ability to turn into any cell type in the body, including their potential to generate replacement tissues and organs. While scientists are adept at growing stem cells in a lab dish, once these cells are on their own--transplanted into a desired spot in the body--they have trouble thriving. The new environment is complex and poorly understood, and implanted stem cells often die or don't integrate properly into the surrounding tissue.

Shoichet, a bioengineer who recently won the prestigious L'Oreal-UNESCO for Women in Science Award, and her team created the hydrogel several years ago as a kind of a bubble wrap to hold cells together during transport and delivery into a transplant site. "This study goes one step further, showing that the hydrogels do more than just hold stem cells together; they directly promote stem cell survival and integration. This brings stem-cell based therapy closer to reality" says Shoichet, a professor whose affiliations span the Donnelly Centre, the Department of Chemical Engineering and Applied Chemistry and the Institute of Biomaterials & Biomedical Engineering at U of T.

Partially restoring vision

In addition to examining how the stem cells benefit from life in hydrogels, the researchers also showed that these new cells could help restore function that was lost due to damage or disease.

One part of the Stem Cell Reports study involved the team injecting hydrogel-encapsulated photoreceptors, grown from stem cells, into the eyes of blind mice. Photoreceptors are the light sensing cells responsible for vision in the eye. With increased cell survival and integration in the stem cells, they were able to partially restore vision.

"After cell transplantation, our measurements showed that mice with previously no visual function regained approximately 15% of their pupillary response. Their eyes are beginning to detect light and respond appropriately," says Dr. Brian Ballios, an expert in stem cell biology and regenerative medicine for retinal degenerative disease, who led this part of the study.

Ballios' background as an engineer stimulated his interest in biomaterial-based approaches to therapy in the eye. He recently completed his MD and PhD under the supervision of Shoichet and van der Kooy, and he'll be continuing his medical training as an ophthalmologist, hoping to apply some of his research insights in the clinic one day.

Repairing the brain after strokes

In another part of the study, Dr. Michael Cooke, a postdoctoral fellow in both Shoichet's and Morshead's labs, injected the stem cells into the brains of mice who had recently suffered strokes.

"After transplantation, within weeks we started seeing improvements in the mice's motor coordination," says Cooke. His team now wants to carry out similar experiments in larger animals, such as rats, who have larger brains that are better suited for behavioral tests, to further investigate how stem cell transplants can help heal a stroke injury.

Advancing stem-cell based therapies

Leveraging engineering techniques--such as the design and manufacture of new biomaterials--to develop new stem-cell based therapies using hydrogels has always been on Shoichet's mind."I always think that in engineering our raison d'être is to advance knowledge towards translation," says Shoichet.

Because the hydrogel could boost cell survival in two different parts of the nervous system, the eye and the brain, it could potentially be used in transplants across many different body sites. Another advantage of the hydrogel is that, once it has delivered cells to a desired place, it dissolves and is reabsorbed by the body within a few weeks.

This remarkable material has only two components--methylcellulose that forms a gel and holds the cells together, and hyaluronan, which keeps the cells alive. "Through this physical blend of two materials we are getting the best of both worlds," says Shoichet.

http://www.eurekalert.org/pub_releases/2015-05/b-3op051215.php

30 minutes of physical activity 6 days a week linked to 40 percent lower risk of death in elderly men

Impact on health as good as giving up smoking, suggest researchers

Thirty minutes of physical activity--irrespective of its intensity--6 days a week is linked to a 40% lower risk of death from any cause among elderly men, finds research published online in the British Journal of Sports Medicine.

Boosting physical activity levels in this age group seems to be as good for health as giving up smoking, the findings suggest.

The researchers base their findings on people taking part in the Oslo Study, which invited almost 26,000 men born between 1923 and 1932 for a health check in 1972-3 (Oslo I). Some 15,000 agreed. Their height, weight, cholesterol and blood pressure were all assessed, and they were asked whether they smoked.

They were also asked to respond to a validated survey (Gothenburg questionnaire) on their weekly leisure time physical activity levels.

These were categorised as sedentary (watching TV/reading); light (walking or cycling, including to and from work for at least 4 hours a week); moderate (formal exercise, sporting activities, heavy gardening for at least 4 hours a week); and vigorous (hard training or competitive sports several times a week).

Some 6000 of the surviving men repeated the process in 2000 (Oslo II) and were monitored for almost 12 years to see if physical activity level over time was associated with a lowered risk of death from cardiovascular disease, or any cause, and if its impact were equivalent to quitting smoking. During the monitoring period, 2154 out of the 5738 men who had gone through both health checks died.

The analysis indicated that less than an hour a week of light physical activity was not associated with any meaningful reduction in risk of death from any cause. But more than an hour was linked to a 32% to 56% lower risk.

Less than an hour of vigorous physical activity, on the other hand, was linked to a reduction in risk of between 23% and 37% for cardiovascular disease and death from any cause. The more time spent doing vigorous exercise the lower the risk seemed to be, falling by between 36% and 49%. And men who regularly engaged in moderate to vigorous physical activity during their leisure time lived five years longer, on average, than those who were classified as sedentary.

Factoring in that the risk of death from heart disease/stroke rises with age, made only a slight difference to the results.

Overall, these showed that 30 minutes of physical activity--of light or vigorous intensity--6 days a week was associated with a 40% lower risk of death from any cause. The impact would seem to be as good for health as quitting smoking among this age group, suggest the researchers.

This is an observational study so no definitive conclusions can be drawn about cause and effect, and the researchers point out that only the healthiest participants in the first wave of the study took part in the second wave, which may have lowered overall absolute risk. But the differences in risk of death between those who were inactive and active were striking, even at the age of 73, they suggest.

More effort should go into encouraging elderly men to become more physically active, with doctors emphasising the wide range of ill health that could be warded off as a result, conclude the researchers.

http://www.eurekalert.org/pub_releases/2015-05/ucl-uss050815.php

Unique social structure of hunter-gatherers explained

Sex equality in residential decision-making explains the unique social structure of hunter-gatherers, a new UCL study reveals.

Previous research has noted the low level of relatedness in hunter-gatherer bands. This is surprising because humans depend on close kin to raise offspring, so generally exhibit a strong preference for living close to parents, siblings and grandparents.

The new study, published today in Science and funded by the Leverhulme Trust, is the first to demonstrate the relationship between sex equality in residential decision-making and group composition.

In work conducted over two years, researchers from the Hunter-Gatherer Resilience Project in UCL Anthropology lived among populations of hunter-gatherers in Congo and the Philippines. They collected genealogical data on kinship relations, between-camp mobility and residence patterns by interviewing hundreds of people.

This information allowed the researchers to understand how individuals in each community they visited were related to each other. Despite living in small communities, these hunter-gatherers were found to be living with a large number of individuals with whom they had no kinship ties.

The authors constructed a computer model to simulate the process of camp assortment. In the model, individuals populated an empty camp with their close kin - siblings, parents and children.

When only one sex had influence over this process, as is typically the case in male-dominated pastoral or horticultural societies, camp relatedness was high. However, group relatedness is much lower when both men and women have influence - as is the case among many hunter-gatherer societies, where families tend to alternate between moving to camps where husbands have close kin and camps where wives have close kin.

First author of the study, Mark Dyble (UCL Anthropology), said: "While previous researchers have noted the low relatedness of hunter-gatherer bands, our work offers an explanation as to why this pattern emerges. It is not that individuals are not interested in living with kin. Rather, if all individuals seek to live with as many kin as possible, no-one ends up living with many kin at all."

Many unique human traits such as high cognition, cumulative culture and hyper-cooperation have evolved due to the social organisation patterns unique to humans. Although hunter-gatherer societies are increasingly under pressure from external forces, they offer the closest extant examples of human lifestyles and social organisation in the past, offering important insights into human evolutionary history.

Senior author, Dr Andrea Migliano (UCL Anthropology), said: "Sex equality suggests a scenario where unique human traits such as cooperation with unrelated individuals could have emerged in our evolutionary past".

1.) For more information, copies of the paper, video, images or interview requests please contact Ruth Howells in UCL Media Relations on mob: +44 (0)7990 675 947, email: ruth.howells@ucl.ac.uk

2.) The research paper 'Sex equality can explain the unique social structure of hunter-gatherer bands' is published in Science, embargoed to Thursday 14 May 2015, 19.00 UK Time (14.00 US Eastern)

http://www.eurekalert.org/pub_releases/2015-05/ifpa-aso050715.php

Anti-poverty strategy offers sustained benefit for ultra-poor, says study in Science

A new 6-country study shows a comprehensive approach for the ultra-poor, the approximately 1 billion people who live on less than $1.25 a day, boosted livelihoods, income, and health

NEW HAVEN CT - A new six-country study shows a comprehensive approach for the ultra-poor, the approximately one billion people who live on less than $1.25 a day, boosted livelihoods, income, and health. Published in Science, the research tested the effectiveness of an approach known as the "Graduation model" in six countries by following 21,000 of the world's poorest people for three years. The data show this approach led to large and lasting impacts on their standard of living.

Previous efforts by governments and aid groups to reduce poverty among the ultra-poor have not been proven to work. Addressing this gap, the new study reports on a six-country evaluation of a comprehensive approach that addresses the many challenges of poverty simultaneously.

According to study co-author Dean Karlan of Yale University and the research and policy non-profit Innovations for Poverty Action (IPA): "Being ultra-poor usually means more than just not having an income - like not enough food to eat, no way to save, no information, and low perception of their opportunities to escape their situation," Karlan said.

"We tested an approach that addressed several factors at once, and found significant improvements, even three years after the program did the bulk of the work."

In Ethiopia, Ghana, Honduras, India, Pakistan, and Peru, researchers tracked over 21,000 people to test how much the Graduation approach improved their lives and their families' welfare. The program included six components over a two-year period:

An asset to use to make a living, such as livestock or goods to start an informal store.

Training on how to manage the asset.

Basic food or cash support to reduce the need to sell their new asset in an emergency.

Frequent (usually weekly) coaching visits to reinforce skills, build confidence, and help participants handle any challenges.

Health education or access to healthcare to stay healthy and able to work.

A savings account to help put away money to invest or use in a future emergency.

Borrowing from healthcare research methodology, the researchers used a randomized controlled trial, tracking both people invited to participate in the two-year program and a similar group who was not, to compare how their lives changed up to a year after the program ended.

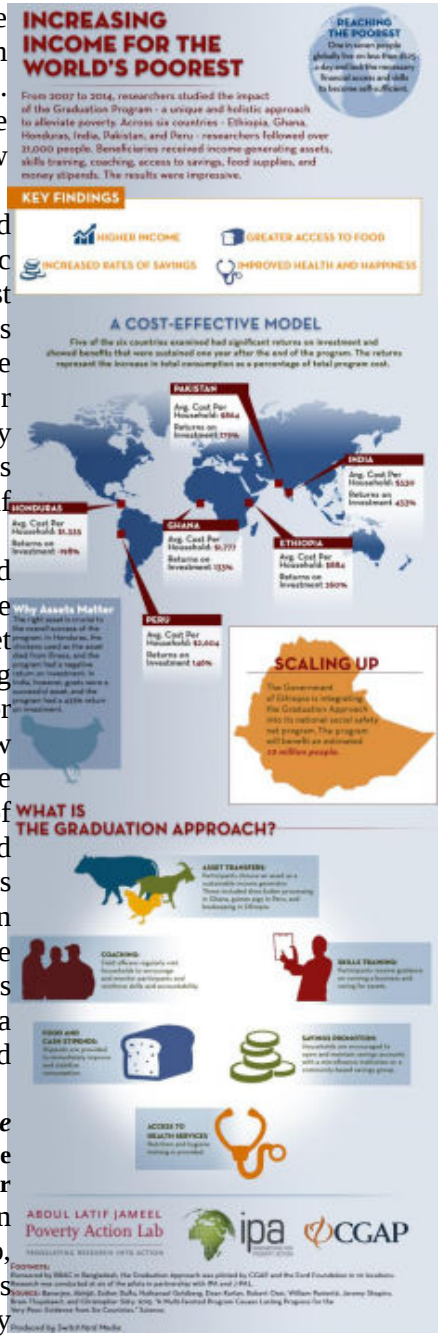
Those in the program group had significantly more assets and savings, spent more time working, went hungry on fewer days, and experienced lower levels of stress and improved physical health.

"Not only is it effective, but it represents a significant return on investment," according to Kate McKee of the Consultative Group to Assist the Poor in Washington, DC, which helped implement the project. "The hope is that we can next learn how NGOs or governments can better integrate this approach into their programs effectively."

The program is cost effective, with positive returns in five of six countries, ranging from 133 percent in Ghana to 433 percent in India. In other words, for every dollar spent on the program in India, ultra-poor households saw $4.33 in long-term benefits.

"The Graduation approach has led to broad improvements in key dimensions of economic and non-economic well-being in most countries where it was tested. Policymakers seeking a program to sustainably improve the lives of the very poor should consider investing in this approach," according to study co-author Esther Duflo of MIT's economics department and Director at the Abdul Latif Jameel Poverty Action Lab (J-PAL).

The government of Ethiopia plans to expand the program to benefit three million people through the country's Productive Safety Net Program, and the program is already being scaled up in Pakistan and India. A key factor for decision-makers using the model is how comprehensive the evaluation was: "The positive results across such a range of different settings is highly encouraging, and gives us substantial confidence that this approach works for individuals, can be an effective strategy for governments, and can be a tremendous guide to improve the livelihoods of poor families," said Frank DeGiovanni, a director at the Ford Foundation, which helped build and fund the effort.



The Graduation approach is designed to help the billion people living on $1.25/day or less. **The Consultative Group to Assist the Poor**

According to Innovations for Poverty Action Executive Director Annie Duflo, "Governments, aid organizations, and donors have been looking for something backed by real evidence showing it can help the poorest of the world, and this Graduation approach does exactly that."

Banerjee, Abhijit, Esther Duflo, Nathanael Goldberg, Dean Karlan, Robert Osei, William Parienté, Jeremy Shapiro, Bram Thuysbaert, and Christopher Udry. 2015. "A Multi-faceted Program Causes Lasting Progress for the Very Poor: Evidence from Six Countries." Science.

http://www.eurekalert.org/pub_releases/2015-05/nfwc-nrr050815.php

New research reveals first warm-blooded fish

Heated blood makes opah a high performance predator that swims faster, sees better

New research by NOAA Fisheries has revealed the opah, or moonfish, as the first fully warm-blooded fish that circulates heated blood throughout its body much like mammals and birds, giving it a competitive advantage in the cold ocean depths.

The silvery fish, roughly the size of a large automobile tire, is known from oceans around the world and dwells hundreds of feet beneath the surface in chilly, dimly lit waters. It swims by rapidly flapping its large, red pectoral fins like wings through the water.

Fish that typically inhabit such cold depths tend to be slow and sluggish, conserving energy by ambushing prey instead of chasing it. But the opah's constant flapping of its fins heats its body, speeding its metabolism, movement and reaction times, scientists report in the journal Science.

NOAA Fisheries biologist Nick Wegner holds an opah caught during a research survey off the California Coast. **NOAA Fisheries/Southwest Fisheries Science Center**

That warm-blooded advantage turns the opah into a high-performance predator that swims faster, reacts more quickly and sees more sharply, said fisheries biologist Nicholas Wegner of NOAA Fisheries' Southwest Fisheries Science Center in La Jolla, Calif., lead author of the new paper.

"Before this discovery I was under the impression this was a slow-moving fish, like most other fish in cold environments," Wegner said. "But because it can warm its body, it turns out to be a very active predator that chases down agile prey like squid and can migrate long distances."

Gills show unusual design

Wegner realized the opah was unusual when a coauthor of the study, biologist Owyn Snodgrass, collected a sample of its gill tissue. Wegner recognized an unusual design: Blood vessels that carry warm blood into the fish's gills wind

around those carrying cold blood back to the body core after absorbing oxygen from water.

The design is known in engineering as "counter-current heat exchange." In opah it means that warm blood leaving the body core helps heat up cold blood returning from the respiratory surface of the gills where it absorbs oxygen. Resembling a car radiator, it's a natural adaptation that conserves heat. The unique location of the heat exchange within the gills allows nearly the fish's entire body to maintain an elevated temperature, known as endothermy, even in the chilly depths.

"There has never been anything like this seen in a fish's gills before," Wegner said. "This is a cool innovation by these animals that gives them a competitive edge. The concept of counter-current heat exchange was invented in fish long before we thought of it."

The researchers collected temperature data from opah caught during surveys off the West Coast, finding that their body temperatures were regularly warmer than the surrounding water. They also attached temperature monitors to opah as they tracked the fish on dives to several hundred feet and found that their body temperatures remained steady even as the water temperature dropped sharply. The fish had an average muscle temperature about 5 degrees C above the surrounding water while swimming about 150 to 1,000 feet below the surface, the researchers found.

While mammals and birds typically maintain much warmer body temperatures, the opah is the first fish found to keep its whole body warmer than the environment.

A few other fish such as tuna and some sharks warm certain parts of their bodies such as muscles, boosting their swimming performance. But internal organs including their hearts cool off quickly and begin to slow down when they dive into cold depths, forcing them to return to shallower depths to warm up.

Warmth provides competitive edge

Satellite tracking showed opah spend most of their time at depths of 150 to 1,300 feet, without regularly surfacing. Their higher body temperature should increase their muscle output and capacity, boost their eye and brain function and help them resist the effects of cold on the heart and other organs, Wegner said.

Fatty tissue surrounds the gills, heart and muscle tissue where the opah generates much of its internal heat, insulating them from the frigid water.

Other fish have developed limited warm-bloodedness (known as regional endothermy) to help expand their reach from shallower waters into the colder depths. But the opah's evolutionary lineage suggests that it evolved its warming mechanisms in the cold depths, where the fish can remain with a consistent edge over other competitors and prey. Recent research has found distinctive differences among opah from different parts of the world, and Wegner said scientists are now interested in comparing warm-blooded features among them.

"Nature has a way of surprising us with clever strategies where you least expect them," Wegner said. "It's hard to stay warm when you're surrounded by cold water but the opah has figured it out."

NOAA research surveys off California have caught more opah in recent years, but biologists are not sure why. Current conditions may be favoring the fish, or their population may be growing. Opah are not usually targeted by fishermen off California but local recreational anglers and commercial fisheries occasionally catch the species. The opah's rich meat has become increasingly popular in seafood markets.

"Discoveries like this help us understand the role species play in the marine ecosystem, and why we find them where we do," said Francisco Werner, director of the Southwest Fisheries Science Center. "It really demonstrates how much we learn from basic research out on the water, thanks to curious scientists asking good questions about why this fish appeared to be different."

http://www.eurekalert.org/pub_releases/2015-05/uota-erd051415.php

Earthquakes reveal deep secrets beneath East Asia

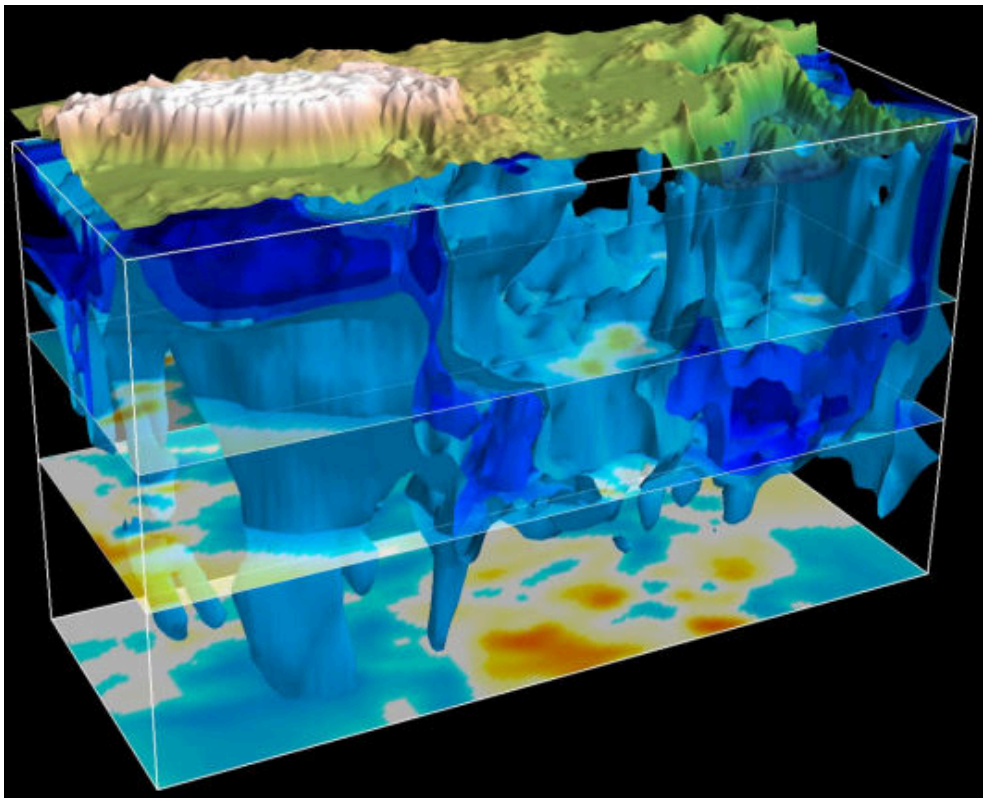
XSEDE Campus Champions, Stampede and Lonestar4 supercomputers of TACC help create 3-D images deep underground

A new work based on 3-D supercomputer simulations of earthquake data has found hidden rock structures deep under East Asia. Researchers from China, Canada, and the U.S. worked together to publish their results in March 2015 in the American Geophysical Union Journal of Geophysical Research, Solid Earth.

The scientists used seismic data from 227 East Asia earthquakes during 2007-2011, which they used to image depths to about 900 kilometers, or about 560 miles below ground.

Notable structures include a high velocity colossus beneath the Tibetan plateau, and a deep mantle upwelling beneath the Hangai Dome in Mongolia. The researchers say their line of work could potentially help find hidden hydrocarbon resources, and more broadly it could help explore the Earth under East Asia and the rest of the world.

"With the help of supercomputing, it becomes possible to render crystal-clear images of Earth's complex interior," principal investigator and lead author Min Chen said of the study. Chen is a postdoctoral research associate in the department of Earth Sciences at Rice University. Chen and her colleagues ran simulations on the Stampede and Lonestar4 supercomputers of the Texas Advanced Computing Center through an allocation by XSEDE, the eXtreme Science and Engineering Discovery Environment funded by the National Science Foundation.



Three-dimensional high velocity structures beneath East Asia from 50 km to 1000 km depth viewed from the southeast. Surface topography with vertical exaggeration is superimposed for geographic references. Isosurfaces of high velocity anomalies in percent referenced to a one-dimensional earth model (STW105) at each depth are plotted from 1% to 4% with 1% interval. Three cut planes show shear wave velocity maps at 410 km, 660 km, and 1000 km depths. The highest elevations represent the Himalayas and the Tibetan Plateau. **Min Chen, Rice University**

"We are combining different kinds of seismic waves to render a more coherent image of the Earth," Chen said. "This process has been helped by supercomputing power that is provided by XSEDE."

"What is really new here is that this is an application of what is sometimes referred to as full waveform inversion in exploration geophysics," study co-author Jeroen Tromp said. Tromp is a professor of Geosciences and Applied and Computational Mathematics, and the Blair Professor of Geology at Princeton University.

In essence the application combined seismic records from thousands of stations for each earthquake to produce scientifically accurate, high-res 3-D tomographic images of the subsurface beneath immense geological formations.

XSEDE provided more than just time on supercomputers for the science team. Through the Campus Champions program, researchers worked directly with Rice XSEDE champion Qiyou Jiang of Rice's Center for Research Computing and with former Rice staffer Roger Moye, who used Rice's DAVinCI supercomputer to help Chen with different issues she had with high performance computing." "They are the contacts I had with XSEDE," Chen said.

"These collaborations are really important," said Tromp of XSEDE. "They cannot be done without the help and advice of the computational science experts at these supercomputing centers. Without access to these computational resources, we would not be able to do this kind of work."

Like a thrown pebble generates ripples in a pond, earthquakes make waves that can travel thousands of miles through the Earth. A seismic wave slows down or speeds up a small percentage as it travels through changes in rock composition and temperature. The scientists mapped these wave speed changes to model the physical properties of rock hidden below ground.

Tromp explained that the goal for his team was to match the observed ground-shaking information at seismographic stations to fully numerical simulations run on supercomputers. "In the computer, we set off these earthquakes," says Tromp. "The waves ripple across southeast Asia. We simulate what the ground motion should look like at these stations. Then we compare that to the actual observations. The differences between our simulations and the observations are used to improve our models of the Earth's interior," Tromp said. "What's astonishing is how well those images correlate with what we know about the tectonics, in this case, of East Asia from surface observations."

The Tibetan Plateau, known as 'the roof of the world,' rises about three miles, or five kilometers above sea level. The details of how it formed remain hidden to scientists today. The leading theory holds that the plateau formed and is maintained by the northward motion of the India plate, which forces the plateau to shorten horizontally and move upward simultaneously.

Scientists can't yet totally account for the speed of the movement of ground below the surface at the Tibetan Plateau or what happened to the Tethys Ocean that once separated the India and Eurasia plates. But a piece of the puzzle might have been found.

"We found that beneath the Tibetan plateau, the world's largest and highest plateau, there is a sub-vertical high velocity structure that extends down to the bottom of the mantle transition zone," Chen said.

The bottom of the transition zone goes to depths of 660 kilometers, she said. "Three-dimensional geometry of the high velocity structure depicts the lithosphere beneath the plateau, which gives clues of the fate of the subducted oceanic and the continental parts of the Indian plate under the Eurasian plate," Chen said.

The collision of plates at the Tibetan Plateau has caused devastating earthquakes, such as the recent 2015 Nepal earthquake at the southern edge of where the two plates meet. Scientists hope to use earthquakes to model the substructure and better understand the origins of these earthquakes.

To reach any kind of understanding, the scientists first grappled with some big data, 1.7 million frequency-dependent traveltime measurements from seismic waveforms. "We applied this very sophisticated imaging technique called adjoint tomography with a key component that is a numerical code package called SPECFEM3D_GLOBE," Chen said. Specifically, they used SPECFEM3D GLOBE, open source software maintained by the UC Davis Computational Infrastructure for Geodynamics. "It uses parallel computing to simulate the very complex seismic waves through the Earth," Chen said.

Even with the tools in place, the study was still costly. "The cost is in the simulations of the wave propagation," says Tromp. "That takes hundreds of cores for tens of minutes at a time per earthquake.

As you can imagine, that's a very expensive proposition just for one iteration simulating all these 227 earthquakes." In all, the study used about eight million CPU hours on the Stampede and Lonestar4 supercomputers.

"The big computing power of supercomputers really helped a lot in terms of shortening the simulation time and in getting an image of the Earth within a reasonable timeframe," said Chen. "It's still very challenging. It took us two years to develop this current model beneath East Asia. Hopefully, in the future it's going to be even faster."

Three-D imaging inside the Earth can help society find new resources, said Tromp. The iterative inversion methods they used to model structures deep below are the same ones used in exploration seismology to look for hidden hydrocarbons.

"There's a wonderful synergy at the moment," Tromp said. "The kinds of things we're doing here with earthquakes to try and image the Earth's crust and upper mantle and what people are doing in exploration geophysics to try and image hydrocarbon reservoirs."

"In my point of view, it's the era of big seismic data," Chen said. She said their ultimate goal is to make everything about seismic imaging methods automatic and accessible by anyone to better understand the Earth.

It sounded something like a Google Earth for inside the Earth itself. "Right, exactly. Assisted by the supercomputing systems of XSEDE, you can have a tour inside the Earth and possibly make some new discoveries." Chen said.

The science team for this study included Min Chen and Fenglin Niu of Rice University; Qinya Liu of the University of Toronto; Jeroen Tromp of Princeton University; and Xiufen Zheng of the Institute of Geophysics, China Earthquake Administration, Beijing, China. The National Science Foundation (US) provided the study funding.

The DAVinCI supercomputer is administered by Rice's Ken Kennedy Institute for Information Technology and supported by the National Science Foundation. The researchers also thank Kiran Thyagaraja, Franco Bladilo, and Kim Andrews for their assistance with work on DAVinCI.

http://bit.ly/1bXJ8DG

Scientists Are Stopping Malaria With Viagra

Viagra can help boost the spleen's ability to filter out infected blood cells

By Erin Blakemore

With over 584,000 deaths due to malaria each year, fighting the mosquito-transmitted disease is a major world health priority. Now, reports *Popular Science*'s Alexandra Ossola, there's a new ally in the fight against malaria — Viagra.

A new study shows that Viagra can increase the spleen's ability to filter malaria from the blood. Ossola explains that once *Plasmodium falciparum*, the parasite that causes malaria, hits the human body, it "spends one very important [developmental] stage in human red blood cells found in bone marrow." These blood cells are soft and malleable, which allows them to elude the blood-filtering spleen, which looks for firm or dead blood cells instead.

By bypassing the spleen's filtering abilities, malaria is able to spread through the blood. But researchers were able to put a stop to that process with Viagra when they learned that the enzyme inhibitor that gives the pill its popular effects stiffens infected blood cells, too. In the lab, they used an artificial spleen to filter infected, Viagra-stiffened blood cells — and learned that they were "less likely to circulate through the spleen."

This isn't the first time Viagra has been found to have effects that have nothing to do with the bedroom. For example, doctors now use the drug to treat pulmonary arterial hypertension (high blood pressure between the heart and the lungs) and altitude sickness.

Will malaria eventually make its way to that list? Researchers hope so. "This discovery could help find new ways to stop the spread of malaria in a population," the team said in a release.

http://www.medscape.com/viewarticle/844692

New Agent Active in Refractory Metastatic Colorectal Cancer

A novel agent, TAS-102 (Taiho Oncology), modestly improved survival in patients with metastatic colorectal cancer, but more important, it was active in patients who were heavily pretreated and refractory to standard therapies.

Roxanne Nelson, RN

Findings from the phase 3 RECOURSE trial, initially presented last year at the World Congress on Gastrointestinal Cancer, were published in the May 14 issue of the *New England Journal of Medicine*.

In RECOURSE, patients treated with TAS-102 experienced what the researchers describe as a "clinically relevant" prolongation of overall survival in essentially all treatment subgroups, compared with placebo.

Median overall survival was significantly better in the TAS-102 group than in the placebo group (7.1 vs 5.3 months), and the hazard ratio (HR) for death in the TAS-102 group was 0.68 ($P < .001$).

But more important, the compound showed activity in a population in which about half the patients had just finished treatment with a fluoropyrimidine, such as 5-fluorouracil (5-FU) or capecitabine (*Xeloda*), but had failed to benefit.

"These patients experienced a survival benefit when they were given TAS-102, and this confirms what was seen in the laboratory — that TAS-102 is acting in an independent and different manner than the fluoropyrimidines," said lead author Robert J. Mayer, MD, faculty vice president for academic affairs, medical oncologist, and colorectal cancer researcher at the Dana-Farber Cancer Institute in Boston. "In this heavily pretreated group, there was an effect on outcomes," he told *Medscape Medical News*. The effect was "not only in survival, but in delaying disease progression and in delaying the time for symptoms to develop and for ECOG performance status to change."

"This is a modest prolongation of survival, but it is showing that the drug is acting in a different manner. It will undoubtedly lead to opportunities in the very near future to compare TAS-102 with a fluoropyrimidine at an earlier stage in the course of treatment," Dr. Mayer explained.

The "benefit in survival is very convincing, and occurs across subgroups," said Anthony J. Olszanski, RPh, MD, director of early clinical drug development at the Fox Chase Cancer Center in Philadelphia.

"The survival curves separated early, and the hazard ratio is quite favorable, revealing that treatment with TAS-102 led to a 32% risk reduction in death, compared with placebo, in this population of heavily pretreated individuals," he told *Medscape Medical News*. "This trial established that heavily pretreated patients refractory to 5-FU benefit from TAS-102, as depicted by a robust but modest improvement in overall survival. This benefit came at the price of manageable toxicity."

Induces Response in Refractory Patients

TAS-102 is an orally administered combination of trifluridine, which is a thymidine-based nucleic acid analogue, and tipiracil hydrochloride, which is a thymidine phosphorylase inhibitor. When it was initially studied in Japan, it showed promise in patients with colorectal cancer. This led to small early clinical trials in the United States, which showed that TAS-102 is active in the treatment of refractory disease.

Dr. Mayer and colleagues subsequently conducted their phase 3 trial to evaluate the efficacy and safety of TAS-102 in patients from 13 countries, including Australia, Japan, the United States, and some European countries. All 800 patients had metastatic colorectal cancer that was refractory to all standard therapies, including fluoropyrimidine, oxaliplatin, irinotecan, bevacizumab. In addition, patients with wild-type *KRAS* tumors were refractory to cetuximab or panitumumab.

Study participants were randomly assigned in a 2:1 ratio to receive TAS-102 or placebo. The primary end point was overall survival. More patients in the TAS-102 group than in the placebo group were still alive at 6 months (58% vs 44%) and at 12 months (27% vs 18%). And fewer patients in the TAS-102 group experienced disease progression or death (88% vs 94%).

Median progression-free survival was longer in the TAS-102 group than in the placebo group (2.0 vs 1.7 months; HR, 0.48; $P < .001$).

Of the study participants, 760 were evaluated for tumor response (502 in the TAS-102 group and 258 in the placebo group). A partial response was achieved by eight patients in the TAS-102 group, and a complete response was achieved by one patient in the placebo group. This translated to objective response rates of 1.6% in the TAS-102 group and 0.4% in the placebo group ($P = .29$).

When assessed at least 6 weeks after randomization, more patients in the TAS-102 group than in the placebo group achieved disease control, defined as a complete or partial response or stable disease (44% vs 16%; $P < .001$).

Overall, adverse events of grade 3 or higher occurred more frequently in the TAS-102 group than in the placebo group (69% vs 52%). The most common clinically significant events associated with TAS-102 were neutropenia, which occurred in 38% of those treated, and leukopenia, which occurred in 21%. In addition, 4% of patients in the TAS-102 group developed febrile neutropenia, and one death was related to TAS-102. Also more common in the TAS-102 group than in the placebo group were nausea of grade 3 or higher (2% vs 1%), vomiting (2% vs <1%), and diarrhea (3% vs <1%).

Use at Earlier Stage?

The next step will be to study TAS-102 in combination with other agents, and at an earlier stage in the course of the disease, Dr. Mayer explained.

Dr. Olszanski said he agrees that this is a feasible direction for the compound. "In this study, TAS-102 led to stabilization of disease in a heavily pretreated population. In an earlier setting, it could plausibly lead to increased responses," he noted.

"It clearly works through a different mechanism than 5-FU, and further studies at an earlier disease stage will be necessary before it will supplant 5-FU use," Dr. Olszanski added. "This study, as well as others, suggests that TAS-102 works even in patients resistant to 5-FU. TAS-102 works through a mechanism of action not previously exploited in the treatment of colorectal cancer and, as such, will likely become a welcome addition to the current armamentarium of treatment choices for patients."

The study was funded by Taiho Oncology–Taiho Pharmaceutical. Dr. Mayer has disclosed no relevant financial relationships. Several of his coauthors report relationships with industry, including the manufacturer, as detailed in the publication.

N Engl J Med. 2015;372:1909-1918. Abstract

http://www.eurekalert.org/pub_releases/2015-05/nsij-abb051315.php

Aging baby boomers, childless and unmarried, at risk of becoming 'elder orphans'

22 percent of Americans over age 65 currently or at risk to remain unsupported, vulnerable while elderly, says new research for AGS Meeting

Great Neck, NY - With an aging Baby Boomer population and increasing numbers of childless and unmarried seniors, nearly one-quarter of Americans over age 65 are currently or at risk to become "elder orphans," a vulnerable group requiring greater awareness and advocacy efforts, according to new research by a North Shore-LIJ geriatrician and palliative care physician.

A case study and literature review by Maria Torroella Carney, MD, chief of geriatric and palliative medicine at the North Shore-LIJ Health System, zeroes in on staggering data on the prevalence and risks of a newly coined terminology of a vulnerable population, "elder orphans."

"We have a sense that this will be a growing population as society ages and life expectancy increases, and our government and society need to prepare how to advocate for this population," said Dr. Carney, senior author of the research, which was completed in collaboration with colleagues from the health system and Hofstra North Shore-LIJ School of Medicine.

"There is potentially no structure to address this population as this population is hidden right before us," added Dr. Carney, who calls the group elder orphans because they are aging alone and unsupported, with no known family member or designated surrogate to act on their behalf. "Our goal is to highlight that this is a vulnerable population that's likely to increase, and we need to determine what community, social services, emergency response and educational resources can help them." An abstract of Dr. Carney's paper is scheduled for presentation at The American Geriatrics Society's 2015 Annual Scientific Meeting, which will take place in Washington, DC, from May 15-17.

Dr. Carney and her team highlighted the case of "HB," a 76-year-old man living alone who presented at North Shore University Hospital in Manhasset, NY, after a failed suicide attempt for a multi-disciplinary approach to his pain and suffering. With his only existing family across the country in California, HB's case was complicated and prolonged by delirium, unclear decision-making capacity and lack of social support. He was discharged to a nursing facility for likely eventual long-term placement. A literature search and review estimating the prevalence of elder orphans and their risks was done using Google Scholar, PubMed, CINAHL, and Health Reference databases.

U.S. Census data from 2012 showed that about one-third of Americans aged 45 to 63 are single, a 50% increase from 1980; nearly 19% of women aged 40 to 44 have no children, as compared to 10% in 1980. Additionally, the University of Michigan's Health and Retirement Study (HRS) indicated that 22% of people over age 65 currently are, or at risk to become, elder orphans. This group is vulnerable to a wide range of negative outcomes that include functional decline, mental health issues and premature death, Dr. Carney said.

"This is a population that can utilize expensive healthcare resources because they don't have the ability to access community resources while they're well but alone," she said. "If we can provide earlier social services and support, we may be able to lower high healthcare costs or prevent the unnecessary use of expensive healthcare. With greater awareness and assessment of this vulnerable population, we can then come up with policies to impact and manage better care for them."

http://www.eurekalert.org/pub_releases/2015-05/uoth-urq051515.php

UTHealth research: Grass plants can transport infectious prions

Grass plants can bind, uptake and transport infectious prions

HOUSTON - Grass plants can bind, uptake and transport infectious prions, according to researchers at The University of Texas Health Science Center at Houston (UTHealth). The research was published online in the latest issue of Cell Reports.

Prions are the protein-based infectious agents responsible for a group of diseases called transmissible spongiform encephalopathy, which includes bovine spongiform encephalopathy (mad cow disease) in cattle, scrapie in sheep, variant Creutzfeldt-Jakob disease in humans and chronic wasting disease (CWD) in deer, elk and moose. All are fatal brain diseases with incubation periods that last years.

CWD, first diagnosed in mule deer in Colorado in the late 1960s, has spread across the country into 22 states, according to the Centers for Disease Control and Prevention (CDC), including the counties of El Paso and Hudspeth in Texas. In northeastern Colorado and southeastern Wyoming, the disease is endemic. Soto's team sought to find out why.

"There is no proof of transmission from wild animals and plants to humans," said lead author Claudio Soto, Ph.D., professor of neurology at UTHealth Medical School and director of the UTHealth George and Cynthia W. Mitchell Center for Alzheimer's Disease and Other Brain Related Illnesses. "But it's a possibility that needs to be explored and people need to be aware of it. Prions have a long incubation period."

Soto's team analyzed the retention of infectious prion protein and infectivity in wheat grass roots and leaves incubated with prion-contaminated brain material and discovered that even highly diluted amounts can bind to the roots and leaves. When the wheat grass was consumed by hamsters, the animals were infected with the disease. The team also learned that infectious prion proteins could be detected in plants exposed to urine and feces from prion-infected hamsters and deer.

Researchers also found that plants can uptake prions from contaminated soil and transport them to different parts of the plant, which can act as a carrier of infectivity. This suggests that plants may play an important role in environmental prion contamination and the horizontal transmission of the disease.

To minimize the risk of exposure to CWD, the CDC recommends that people avoid eating meat from deer and elk that look sick or test positive for CWD. Hunters who field-dress deer in an affected area should wear gloves and minimize handling of the brain and spinal cord tissues.

"This research was done in experimental conditions in the lab," Soto said of the next step. "We're moving the research into environmental contamination now."

First author of the paper, "Grass Plants Bind, Retain, Uptake and Transport Infectious Prions," is post-doctoral researcher Sandra Pritzkow, Ph.D. Co-authors from UTHealth are Rodrigo Morales, Ph.D.; Fabio Moda, Ph.D.; and Uffaf Khan. Co-authors from the Prion Research Center at the College of Veterinary Medicine and Biomedical Sciences, Colorado State University, are Glenn C. Telling, Ph.D.; and Edward Hoover, D.V.M., Ph.D.

The study was supported in part by grants from the National Institutes of Health (P01AI077774, R01NS049173, R01NS078745 and R01NS061902).

http://www.eurekalert.org/pub_releases/2015-05/uod-cq051415.php

Corporate greed

Research tracks relationships between CEO greed and company performance

That gut feeling many workers, laborers and other underlings have about their CEOs is spot on, according to three recent studies in the Journal of Management, the Journal of Management Studies and the Journal of Leadership and Organizational Studies that say CEO greed is bad for business.

But how do you define greed? Are compassionate CEOs better for business? How do you know if the leader is doing more harm than good? And can anybody rein in the I-Me-Mine type leader anyway?

University of Delaware researcher Katalin Takacs Haynes and three collaborators - Michael A. Hitt and Matthew Josefy of Texas A&M University and Joanna Tochman Campbell of the University of Cincinnati - have chased such questions for several years, digging into annual reports, comparing credentials with claims and developing useful definitions that could shed more light on the impact of a company's top leader on employees, business partners and investors.

They test the assumption that self-interest is a universal trait of CEOs (spoiler alert: it's alive and well), show that too much altruism can harm company performance, reveal the dark, self-destructive tendencies of some entrepreneurs and family-owned businesses and provide a way to measure and correlate greed, arrogance and company performance.

"We tried to look at what we think greed is more objectively," said Haynes, who was recently promoted to associate professor of management in UD's Alfred Lerner College of Business and Economics. "What we're trying to do is clean up some of the definitions and make sure we're all talking about the same concepts."

In their studies, researchers offer plenty of evidence that some leaders are insatiable when it comes to compensation. How much is too much? They don't put a number on that. But they do add plenty of nuance to the question and point to a mix of motivations that goes beyond raw greed.

"It's not for us to judge what too much is for anybody else," said Haynes, "but we can see when the outcome of somebody's work is the greater good, and when it is not just greed that is operating in them."

Greed seems all too apparent to many workers. The recent recession left millions without jobs and many companies sinking into a sea of red. At the same time, though, stunning bonuses and other perks were landing in the laps of people at the helm. Haynes, who joined the UD faculty in 2011, has found the range of pay within companies an intriguing question, too.

"Why is it that in some companies there is a huge difference between the pay of the top executive and the average worker or the lowest-paid employee and in

other companies the pay is a lot closer?" she said. Many a minimum-wage worker, making $15,080 per year, has wondered that, and so have those in the middle class, who may work a year to make what some CEOs make in a day.

But if you make more than anyone else does that mean you're greedy?

The question is more complicated than water-cooler conversations might suggest. And Haynes and her collaborators go to the data for answers, leaving emotion, indignation and cries for justice to others. They leave others to correlate the data with names, too. Instead, they offer definitions and analytical tools that add clarity, allow for apples-to-apples comparisons and shed new light on how a leader's objectives shape company performance.

"It's possible that high pay is perfectly deserved because of high contributions, high skill sets," Haynes said, "and just because somebody doesn't have high pay doesn't mean they aren't greedy."

The marks of greed are found elsewhere - in a reporting category that tracks "other" compensation and perquisites, in the pay rates of other top executives, in compensation demands during times of company stress, for example.

Haynes' studies included interviews (with anonymity assured), publicly reported data, written surveys, essays and a review of published information and interviews with CEOs.

The studies also examined managerial hubris and how it differs from self-confidence. "Hubris is an extreme manifestation of confidence, characterized by preoccupation with fantasies of success and power, excessive feelings of self-importance, as well as arrogance," researchers wrote.

"Say I'm a stunt driver and I have jumped across five burning cars before with my car," Haynes said. "I'm pretty confident I can do that - and maybe even six. Say I'm not a stunt driver. To say I could jump through six burning cars would be arrogance. And if I drag you to go with me, it could be criminal."

Risk aversion can harm a company. But risk for short-term gain without thought of the company's future is a sign of greed.

"Some CEOs take risks and it will pay off," she said. "They will have reliable performance and we can forecast that. We know their track record. Others take foolish risks not based on their previous performance."

Such risks may be especially prevalent among young entrepreneurs, who underestimate the resources needed to help a startup succeed and fail to recognize that more than money is at stake.

"While financial capital is an important concern with these behaviors, the effects on human and social capital are often overlooked, despite the fact that they are highly critical for the success and ultimate survival of entrepreneurial ventures," the researchers wrote.

Generally, researchers found that greed is worse among short-term leaders with weak boards. The good news, Haynes said, is that strong corporate governance can rein in CEO greed and keep both self-interest and altruism in proper balance. And that is where the greatest success is found.

"Overall, we conclude that measured self-interest keeps managers focused on the firm's goals and measured altruism helps the firm to build and maintain strong human and social capital," researchers wrote.

http://www.eurekalert.org/pub_releases/2015-05/ddw-chc051315.php

Curing hepatitis C could yield huge economic benefit

New research estimates $3.2 billion annual productivity savings in US and 5 European countries

Washington, DC - While a new generation of safer, more effective oral medications to treat hepatitis C patients may cost tens of thousands of dollars for a 12-week regiment, investing in these new therapies could generate savings estimated at more than $3.2 billion annually in the U.S. and five European countries, according to a new study (abstract 228) released today at Digestive Disease Week® (DDW) 2015. These savings would have a significant economic impact on society.

The higher cure rate and lessened side-effects of treating patients with an all-oral combination of ledipasvir and sofosbuvir (LDV/SOF) results in greatly reduced absenteeism and improved workplace productivity that can translate into enormous benefit, according to the new economic model used by researchers at Inova Fairfax Medical Campus, VA.

"From a clinical standpoint, we've long known about the devastating health impacts that chronic hepatitis C has on a patient," said Zobair Younossi, MD, chairman of the department of medicine at Inova and lead researcher on the study. "But given the significant side-effects previously associated with treating the disease, notably fatigue and neuropsychiatric side effects, we were interested in looking at the impact of new treatments on patients' ability to work, and in a broader sense, how this effects employers and overall economies."

Researchers used data collected from more than 1,900 chronic hepatitis C patients treated with LDV/SOF, which has a cure rate of between 94 and 99 percent with minimal side effects. Older traditional treatments that included interferon and ribavirin were less effective and caused a variety of side effects, including fatigue, as well as flu-like symptoms, depression and lowered blood cell counts.

Patients from the U.S. and Europe filled out questionnaires called the "Work Productivity and Activity Index - Specific Health Problems During Clinical Trials of LDV/SOF." The retrospective study tabulated reported absenteeism, as well as what researchers called "presenteeism," a measure of how productive an individual actually is while at work.

The researchers then built an economic model to estimate work productivity gains associated with curing genotype-1 chronic hepatitis C patients using LDV/SOF. The models were created for the U.S. and five European countries -- France, Germany, Italy, Spain and the United Kingdom (EU-5). The results indicated that reduced absenteeism and increased productivity would total approximately $2.67 billion for the U.S. and $556 million for the EU-5.

Dr. Younossi stressed that while these preliminary results are encouraging, he plans to conduct further research to examine data outside of the clinical trial setting in order to evaluate the real-world consequences of a hepatitis C cure on work productivity and associated economic gains. He believes that researchers are beginning to see the bigger picture when it comes to the impact of hepatitis C, which can cause severe liver damage and other long-term health effects called the "extrahepatic manifestations of the hepatitis C virus."

"Chronic hepatitis C is more than just a problem for the patient -- it has a ripple effect that impacts society at large. While previous reports have found the cost of these drugs as certainly significant, the long term benefits of curing patients with hepatitis C makes this a worthwhile investment. We must begin to look at chronic diseases, such as hepatitis C, from every angle, which should inspire progress in developing more tolerable and effective cures," added Dr. Younossi.

This study was funded through a grant provided by Gilead Sciences, Inc. For more information about featured studies, as well as a schedule of availability for featured researchers, please visit http://www.ddw.org/press. Faculty disclosures can be found online at http://www.ddw.org/DDW_Disclosure_Index.pdf.

http://www.eurekalert.org/pub_releases/2015-05/ats-rau050815.php

Regular aspirin use may slow progression of early emphysema

Regular use of aspirin may help slow the progression of early emphysema, according to new research presented at the 2015 American Thoracic Society International Conference.

ATS 2015, DENVER -- "Other than smoking cessation and avoidance, there are no known methods for reducing the risk of developing emphysema," said researcher Carrie Aaron MD, of the Columbia University Medical Center in New York. "In our large general population sample, we found that regular aspirin use (three or more days per week) was associated with a slower progression of percent emphysema on computed tomography (CT) scans over 10 years."

The study, which was motivated by findings of pulmonary vascular involvement in emphysema and the importance of platelet function in other vascular diseases, included 4,471 individuals participating in the Multi-Ethnic Study of Atherosclerosis Lung Study. The percentage of lung volume with emphysematous features (percent emphysema) was assessed on up to 4 CT scans performed over approximately 10 years of follow-up. Spirometry, a measure of expiratory airflow, was performed in 81% of study subjects.

Of the 4,471 study subjects, 21% (921) used aspirin regularly, 55% were ever-smokers, and 25% of those with spirometry had results indicating airflow obstruction. Regular aspirin use was associated with a significantly slower progression of percent emphysema over ten years, when compared to those who did not use aspirin, even after adjustment for a number of potential confounding factors, including age, sex, race/ethnicity, cigarettes/day, pack-years, and hypertension. Results were consistent in propensity score analyses, performed to minimize effects of confounding by indication. Similar reductions in the rate of progression of percent emphysema were seen among ever-smokers, and greater reductions were observed among individuals with spirometric evidence of airflow obstruction.

"Our study found that persons taking aspirin regularly had a slower progression of emphysema over 10 years compared to those who did not, and that this difference was not explained by many factors that we believe affect progression of emphysema." said Dr. Aaron. "The findings might suggest that regular aspirin use may slow the progression of subclinical emphysema, perhaps through effects on platelet activation or inflammation."

** Please note that numbers in this release may differ slightly from those in the abstract. Many of these investigations are ongoing; the release represents the most up-to-date data available at press time.*

Abstract 69159 ***Aspirin Use and Longitudinal Progression of Percent Emphysema on CT: The MESA Lung Study*** *C.P. Aaron1, J.E. Schwartz1, E.A. Hoffman2, R. Tracy3, J.H.M. Austin4, L.J. Smith5, D.R. Jacobs6, K.E. Watson7, R.G. Barr1;1Columbia University - New York, NY/US, 2University of Iowa - Iowa City, IA/US, 3University of Vermont - Colchester, VT/US,4Columbia University - New York/US, 5Northwestern University - Chicago, IL/US, 6University of Minnesota - Minneapolis, MN/US,7UCLA - Los Angeles, CA/US*

http://www.bbc.com/news/health-32755065

Cystic fibrosis drug offers hope to patients

A "groundbreaking" cystic fibrosis therapy could profoundly improve patients' quality of life, say doctors.

By James Gallagher Health editor, BBC News website

Patients often die before their 40s as mucus clogs and damages their lungs and leaves them prone to infection.

A major trial on 1,108 patients, in the New England Journal of Medicine, showed a combination of drugs could bypass the genetic errors that cause the disease and may increase life expectancy.

The Cystic Fibrosis Trust said it could "improve the lives of many".

One in every 2,500 babies in the UK has cystic fibrosis.

Errors in sufferers' DNA - inherited from their parents - damage the microscopic machinery that controls salt and water levels in the linings of the lungs.
The result is a thick mucus that inexorably damages the lungs.
Antibiotics help prevent infection and drugs can loosen the mucus, but nothing deals with the fundamental problem for most patients.
The combination of drugs - lumacaftor and ivacaftor - were designed to repair that microscopic machinery.
The trial showed that those patients given the cocktail for 24 weeks had better lung function.
Cystic fibrosis also affects the mucus lining in the gut so the doctors were pleased to see the patients also gained weight in the trial.

'Fundamental treatment'

Prof Stuart Elborn, who led the European part of the trial from Queen's University Belfast, told the BBC News website: "This is very exciting and it really demonstrates that we can correct the basic defects in cystic fibrosis.
"This is likely to become a fundamental treatment for cystic fibrosis.
"Starting in children may prevent the disease process developing if we correct the basic defect early in life.
"Will this improve survival for people with cystic fibrosis? We would anticipate it would have a really good chance of doing that, but we don't know for sure yet."
There are however, many types of error in the DNA that can culminate in cystic fibrosis.
This treatment combination should work on around half of patients, while one of the drugs on its own corrects a small proportion of errors.
New treatments are still required for the remaining patients.

'Groundbreaking'

Susanna McColley, professor of paediatrics at Northwestern University, said these were "groundbreaking findings" that showed the future of treating cystic fibrosis.
She told the BBC: "For subjects I've cared for, they felt better in ways that are not necessarily measurable.
"One young woman said, and this is a direct quote, her CF 'is not a problem'."
Janet Allen, the director of research at the Cystic Fibrosis Trust charity, said: "These results open up a new front in the fight against cystic fibrosis and this combination therapy looks set to be an important additional treatment option that could improve the lives of many.
"As this leading edge of science continues to be explored and better understood, we are hopeful that a future of personalised medicines is increasingly within reach."
The therapy is being examined by regulators around the world.

http://www.eurekalert.org/pub_releases/2015-05/bumc-sve051515.php

Study validates effectiveness of genomic test for lung cancer detection

May lead to safer, less costly testing

Boston - A new test co-developed by a Boston University School of Medicine (BUSM) researcher will allow patients suspected of having lung cancer to be subjected to fewer and less-invasive tests to determine if they have the disease.
"We are seeing an increase in the number of lesions suspicious for lung cancer found on chest imaging of current and former smokers. In the past, these patients have been subjected to invasive tests when traditional bronchoscopy tests prove inconclusive. Today's announcement provides physicians and patients with an additional piece of scientifically reliable information to consider when determining their next diagnostic step," said senior author Avi Spira, MD, MSc, professor of medicine, pathology and bioinformatics at BUSM.
Researchers have found that a genomic biomarker can accurately determine the likelihood of a lung lesion being malignant. The findings that appear online in the New England Journal of Medicine are from two large, prospective, multicenter studies called Airway Epithelium Gene Expression in the Diagnosis of Lung Cancer (AEGIS) I and II. These findings will allow physicians to confidently identify patients who are at low probability for having lung cancer thus sparing them from costly and risky procedures.

The Impact

"While the test itself is simple, the science behind it is remarkable," added Spira who also is the Alexander Graham Bell Professor in Health Care Entrepreneurship at BUSM. Previous work by Spira found that the pattern of gene activity in cells lining the upper respiratory tract can identify cancer that is developing deeper in the lung. "The ability to test for molecular changes in this 'field of injury' allows us to rule out the disease earlier without invasive procedures. Conceptually, this may have significant implications for other diseases."

Study Details

The study involved 639 patients (298 in AEGIS I and 341 in AEGIS II) at 28 sites in the United States, Canada and Ireland who were undergoing bronchoscopy, a common nonsurgical procedure to assess lung lesions for cancer. Using airways cells collected by the bronchoscopy, the researchers found this genomic test, when evaluated with the bronchoscopy, had a combined sensitivity of 97 percent for detecting lung cancer, compared to 75 percent for bronchoscopy alone.
"This study validates the effectiveness of the bronchial genomic biomarker among those undergoing bronchoscopy in two independent groups. We found that it has

high sensitivity across different sizes, locations, stages and cell types of lung cancer," added Spira. "The combination of the biomarker and bronchoscopy has a sensitivity of 96 percent and 98 percent in the AEGIS-1 and AEGIS-2 groups, respectively."

An estimated 250,000 patients undergo a bronchoscopy for suspected lung cancer each year with approximately 40 percent producing non-diagnostic results. This can lead to invasive procedures such as transthoracic needle biopsy or surgical lung biopsy that are risky and expensive. "In intermediate risk patients with a non-diagnostic bronchoscopy, a negative genomic test warrants consideration of a more conservative diagnostic approach that could reduce unnecessary invasive testing in patients without lung cancer. We hope to improve the diagnostic work up for lung cancer by reducing patient anxiety, performing fewer unnecessary procedures and ultimately saving valuable healthcare resources and money," Spira said.

This study was co- led by Gerard Silvestri, MD, MS, from the Medical University of South Carolina and Anil Vachani, MD, MS, from the University of Pennsylvania School of Medicine. Funding for this study was provided by Allegro Diagnostics Corp., NIH 1R44CA139803, and NIH/NCI U01 CA152751 as part of the Early Detection Research Network (EDRN).

DISCLOSURE:

Dr. Spira reports personal fees from Allegro Diagnostics, Inc., personal fees from Veracyte, Inc., grants from NIH/NCI EDRN U01 CA152751, grants from DOD DECAMP W81XWH-11-2-0161, during the conduct of the study; personal fees from Allegro Diagnostics, Inc., personal fees from Veracyte, Inc., outside the submitted work. In addition, Dr. Spira has a patent 11/918,558: Diagnostic for lung disorders using class prediction licensed to Allegro Diagnostics, Inc., a patent 12/414,555: Multifactorial methods for detecting lung disorders licensed to Allegro Diagnostics, Inc., and a patent Detection methods for disorders of the lung licensed to Allegro Diagnostics, Inc.

http://www.bbc.com/news/uk-england-london-32772132

Rat droppings, urine and arsenic found in fake beauty items

The toxic chemicals can cause such as irritation, swelling, rashes and burns

Police are warning people about fake beauty products after substances such as rat droppings, human urine and arsenic were found in seized goods.

Make-up, perfume and sun cream are among the phony items being highlighted by the City of London Police. It said lab tests showed counterfeit products also had toxic chemicals like arsenic, mercury and cyanide. The campaign also warns about fake electrical beauty goods that could cause electrocution.

The force said in the UK it is estimated at least £90m is spent every year on fake goods. Counterfeit beauty products in particular are becoming increasingly common and easily available on the internet.

Police said laboratory tests have shown fake perfume often contains poisonous chemicals including cyanide and even human urine. Phony cosmetics such as eyeliner, mascara, lip gloss and foundation have been found to contain toxic levels of chemicals and harmful substances such as arsenic, mercury and lead.

All of these can cause allergic reactions, such as skin irritation, swelling, rashes and burns as well as leaving the person with longer term health problems.

A City of London spokesman said counterfeit make-up is often produced in unhygienic factories and there have been cases where rats' droppings and poison have also been found in them.

Det Supt Maria Woodall, who oversees the Police Intellectual Property Crime Unit at City of London Police, said it had suspended more than 5,500 websites selling fake luxury branded goods as well as seizing more than £3.5m worth of phony products. She also said customers' payment and personal details had been stolen to make other purchases. "Beauty products are meant to enhance your features. However, the fakes can in fact do quite the opposite," she added.

"Our general rule is - if it seems too good to be true then it probably is."