http://bit.ly/2s7IFLX

Research reveals new insights into why the heart does not repair itself

Previously unknown connection between processes keeps the heart from repairing itself

Heart muscle is one of the least renewable tissues in the body, which is one of the reasons that heart disease is the leading cause of death for both men and women in the United States, according to the Centers for Disease Control and Prevention. Inspired by the idea of helping the heart repair itself, researchers at Baylor College of Medicine and the Texas Heart Institute have studied pathways known to be involved in heart cell functions and discovered a previously unknown connection between processes that keep the heart from repairing itself. This finding, published in the journal Nature, opens the possibility of developing strategies that will promote heart cell renewal in the future.

"We are investigating the question of why the heart muscle doesn't renew," said senior author Dr. James Martin, professor and Vivian L. Smith Chair in Regenerative Medicine at Baylor College of Medicine. "In this study, we focused on two pathways of cardiomyocytes or heart cells; the Hippo pathway, which is involved in stopping renewal of adult cardiomyocytes, and the dystrophin glycoprotein complex (DGC) pathway, essential for cardiomyocyte normal functions.

We are also interested in studying mutations in DGC components because patients with these mutations have a muscle wasting disease called muscular dystrophy.

Previous work had hinted that components of the DGC pathway may somehow interact with members of the Hippo pathway. In this study, Martin and colleagues studied the consequences of this interaction in animal models. The researchers genetically engineered mice to lack genes involved in one or both pathways, and then determined the ability of the heart to repair an injury. These studies showed for the first time that dystroglycan 1, a component of the DGC pathway, directly binds to Yap, a part of the Hippo pathway, and that this interaction inhibited cardiomyocyte proliferation.

"The discovery that the Hippo and the DGC pathways connect in the cardiomyocyte and that together they act as 'brakes' or stop signals to cell proliferation opens the possibility that by disrupting this interaction one day it might be possible to help adult cardiomyocytes proliferate and heal injuries caused by a heart attack, for example," Martin said.

Another long-term application of this discovery could be to improve cardiac function in children with muscular dystrophy.

"Patients with muscular dystrophy can have severe reduction in cardiac function," Martin said. "Our findings may help to design medicines to slow down cardiac decline in muscular dystrophy by stimulating cardiomyocyte proliferation. In order to do that, we need more research to understand cardiomyocyte growth control pathways in greater detail."

Other contributors to this work include Yuka Morikawa, Todd Heallen, John Leach and Yang Xiao.

This project was supported in part by an Intellectual and Developmental Disability Research Center grant (1U54 HD083092) from the Eunice Kennedy Shriver National Institute of Child Health & Human Development; the Mouse Phenotyping Core at Baylor College of Medicine with funding from the National Institutes of Health (U54 HG006348); and grants from the National Institutes of Health (DE 023177, HL 127717, HL 130804, and HL 118761) and the Vivian L. Smith Foundation. Support was also provided by the Transatlantic Network of Excellence Award LeDucq Foundation Transatlantic Networks of Excellence in Cardiovascular Research 14CVD01 and the American Heart Association Scientist Development Grant 16SDG26460001.

http://bit.ly/2r5UsKP

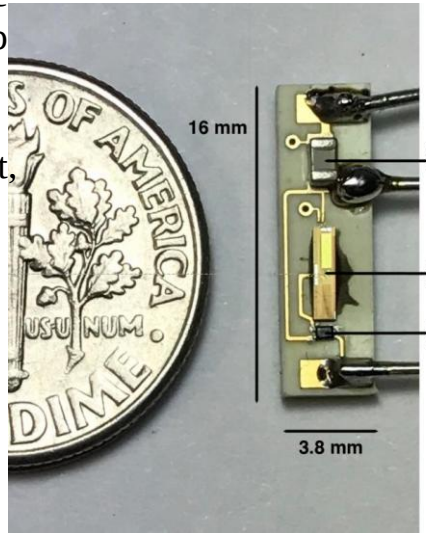
Texas team debuts battery-less pacemaker

Rice University, Texas Heart Institute researchers test microwave-powered device

HOUSTON - A wireless, battery-less pacemaker that can be implanted directly into a patient's heart is being introduced by researchers from Rice University and their colleagues at the Texas Heart Institute (THI) at the IEEE's International Microwave Symposium (IMS) in Honolulu June 4-9.

The pacemaker designed by the Rice lab of electrical and computer engineering professor Aydin Babakhani harvests energy wirelessly from radio frequency radiation transmitted by an external battery pack. In the prototype presented at IMS, the wireless power transmitter can be up to few centimeters away.

Pacemakers use electrical signals to prompt the heart to keep a steady beat, but they've traditionally not been implanted directly into a patient's heart. Instead, they're located away from the heart, where surgeons can periodically replace their onboard batteries with minor surgery; their electrical signals are transmitted to the heart via wires called "leads."



The internal components of a battery-less pacemaker introduced this week by Rice University and the Texas Heart Institute. The pacemaker can be inserted into the heart and powered by a battery pack outside the body, eliminating the need for wire leads and surgeries to occasionally replace the battery. **Rice Integrated Systems and Circuits/Rice University**

Some of the common problems with this arrangement are complications related to the leads, including bleeding and infection. Babakhani said Rice's prototype wireless pacemaker reduces these risks by doing away with leads.

He said other recently introduced lead-less pacemakers also mitigate some of these complications, but their form factors limit them to a single heart chamber and they are unable to provide dual-chamber or biventricular pacing. In contrast, battery-less, lead-less and wirelessly powered microchips can be implanted directly to pace multiple points inside or outside the heart, Babakhani said.

"This technology brings into sharp focus the remarkable possibility of achieving the 'Triple Crown' of treatment of both the most common and most lethal cardiac arrhythmias: external powering, wireless pacing and -- far and away most importantly -- cardiac defibrillation that is not only painless but is actually imperceptible to the patient," said Dr. Mehdi Razavi, director of clinical arrhythmia research and innovation at THI and an assistant professor at Baylor College of Medicine, who collaborated with Babakhani on development and testing of the new pacemaker.

The chip at the system's heart is less than 4 millimeters wide and incorporates the receiving antenna, an AC-to-DC rectifier, a power management unit and a pacing activation signal. A capacitor and switch join the chip on a circuit board that is smaller than a dime. The chip receives power using microwaves microwaves in the 8 to 10 gigahertz electromagnetic frequency spectrum.

The frequency of the pacing signals produced by the pacemaker can be adjusted by increasing or decreasing power transmitted to the receiving antenna, which stores it until it reaches a predetermined threshold. At that point, it releases the electrical charge to the heart and begins to fill again.

The team successfully tested the device in a pig and demonstrated it could tune the animal's heart rate from 100 to 172 beats per minute.

A short paper describing the device will be released at the conference. The paper's authors are Babakhani and Yuxiang Sun of Rice; Brian Greet, David Burkland and Razavi of Baylor College of Medicine and THI; and Mathews John of THI.

Babakhani said the invention has prompted new collaborations among the Texas Medical Center institutions as well as the University of California at San Diego. The team is further developing its technology in collaboration with Farshad Raissi, a cardiac electrophysiologist and assistant professor of medicine at UCSD, Rice's Behnaam Aazhang, the J.S. Abercrombie Professor of Electrical and Computer Engineering, and Rice's Joseph Cavallaro, professor of electrical and computer engineering and of computer science.

This news release can be found online at http://news.rice.edu/2017/06/05/texas-team-debuts-battery-less-pacemaker-2/

http://bit.ly/2rF3qWA

Herbal Tea Linked to Man's Psychosis in Unusual Case

A man in Italy who had developed psychosis — meaning he lost touch with reality — did so after consuming an herbal tea made with St. John's wort, according to a recent report of this case.

By Agata Blaszczak-Boxe, Contributing Writer | June 5, 2017

The man's condition improved after he received treatment for his psychosis, his doctors wrote in the report.

"St. John's wort (Hypericum perforatum) has been known for centuries for its therapeutic properties, and its efficacy as an antidepressant has been confirmed by a growing body of evidence," the doctors who treated the man, at the hospital AUSL Modena in Italy, wrote in their report. But the herb's "availability without prescription, as an over-the-counter medication, raises some concern regarding its clinical management and unsupervised administration to individuals with" mental health risks, they wrote.

Although there is evidence showing that the herb may reduce depression symptoms in the short term, there is no evidence of its effectiveness when it comes to long-term outcomes, said Dr. Eugene Grudnikoff, a psychiatrist at South Oaks Hospital in Amityville, New York, who was not involved in the new report. There is no evidence showing that using the herb may lead to fewer hospitalizations of patients with depression, fewer suicide attempts or suicides, or better quality of life for people with depression, Grudnikoff told Live Science.

The case in Italy involved a 25-year-old man who was admitted to the hospital after two of his friends, who accompanied him to the hospital, told the doctors that he had been acting strangely in the past few days. The man behaved as if he were under the influence of an illegal drug, the friends said. The doctors examined the patient and observed that he was having speech problems and was experiencing episodes of paranoid thinking and delusions. For example, the man believed that other people could read his mind.

The man also told his doctors he had been feeling weak and had been going through what he called "a period of distress," according to the report, published May 15 in the Journal of Medical Case Reports.

But the man's blood test results were normal, and he did not have any neurological issues. The doctors diagnosed him with a condition called schizophreniform disorder — a type of mental disorder that involves psychosis. They gave him antipsychotic medications to treat his symptoms, and two weeks after his admission, his condition improved and he went home.

Over the next three months, the man visited the local community mental health service as part of his follow-up treatment. During one of these visits, he said that he had experienced a previous psychotic episode, about nine months prior to the psychotic episode for which the authors of the new report had treated him. That earlier episode coincided with the man's abuse of marijuana, the researchers wrote. The man had seen a specialist to treat his symptoms, and that specialist prescribed an antipsychotic for him, but the man refused to take it. However, he stopped using marijuana and felt better, he said.

About three months prior to being admitted to the hospital for his latest psychotic episode, the man had started feeling weak and exhausted, and had severe stomach pain. Over time he began feeling so weary that he quit his job. He eventually saw a doctor, who determined that the man had numerous stomach erosions and an infection of Helicobacter pylori — a type of bacteria known to cause stomach ulcers.

But the man refused to take the medication that the doctor prescribed to treat those symptoms. Instead, he decided to self-medicate with tea made with St. John's wort. The man said he had been drinking four cups of the tea per day until he was admitted to the hospital for his most recent psychotic episode.

It is impossible to determine with certainty whether the tea caused the man's psychotic episode, the doctors wrote. But the herbal tea "could have played a determinant role in the onset" of the man's symptoms,

they wrote. That's because previous research has shown that some of its compounds may interact with systems in a person's body that are involved in regulating mood.

Moreover, a few other case reports, including one published in 2004 in the journal Human Psychopharmacology: Clinical & Experimental, have implicated the herb as a potential contributor to psychosis and other psychiatric symptoms.

http://bit.ly/2s01n7q

Japan's largest complete dinosaur skeleton discovered

72 million year-old dinosaur skeleton is largest ever found in Japan

The complete skeleton of an 8-meter-long dinosaur has been unearthed from marine deposits dating back 72 million years at Japan's northern island of Hokkaido, making it the largest dinosaur skeleton ever found in Japan, according to researchers.

The bones of the dinosaur Mukawaryu which have been cleaned so far. These likely represent more than half of the bones the dinosaur had. **Hokkaido University**

Excavations to uncover a fossilized duck-billed dinosaur (Hadrosauridae) in the Hobetsu district of Mukawa Town have been underway since 2013. It is the third time a complete skeleton of a Hadrosaurid from a marine stratum has ever been discovered, according to the research team from Hokkaido University and Hobetsu Museum in Mukawa.

Hadrosaurids, or duck-billed dinosaurs, were common herbivores during the Late Cretaceous Period (about 100 million to 66 million years ago) and thrived on the Eurasian, North and South American continents as well as at Antarctica.

Complete hadrosaur skeletons have been unearthed on these continents, but it is extremely rare for a complete skeleton of a land dinosaur to be discovered in a marine stratum.

In 1936, a complete hadrosaur skeleton was unearthed from a marine stratum in Sakhalin and named Nipponosaurus by Professor Takumi Nagao of Hokkaido Imperial University (predecessor of Hokkaido University).

It had been the only such fossilized dinosaur from a marine stratum that was assigned a name. The latest discovery of the fossilized skeleton, nicknamed "Mukawaryu" (Mukawa dragon), represents the third such discovery in the world, including a complete skeleton of an undescribed specimen.

If a complete skeleton is defined as a skeleton containing more than 50 percent of the bones, Mukawaryu represents the second complete dinosaur skeleton unearthed in Japan after Fukuivenator, a 2.5-meter carnivore from the Early Cretaceous Period (about 145 million to 100 million years ago) discovered in Katsuyama City, Fukui Prefecture. Mukawaryu is the first complete skeleton of a herbivore from the Late Cretaceous Period and from a marine stratum in Japan.

Dr. Yoshitsugu Kobayashi of the research team said "We first discovered a part of the fossilized Mukawaryu skeleton in 2013, and after a series of excavations, we believe we have cleaned more than half of the bones the dinosaur had, making it clear that it is a complete skeleton."

There are more than 50 kinds of dinosaurs in the hadrosaurid dinosaurs, which is grouped into two groups: uncrested (Hadrosaurinae) and crested members (Lambeosaurinae).

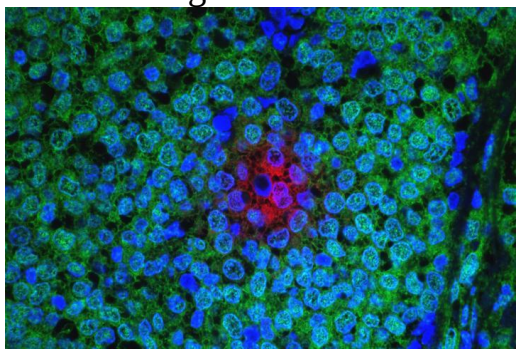
"Although Mukawaryu has some characteristics of both groups, our preliminary analysis indicated it might belong to the Hadrosaurinae. Further cleaning of the fossils and detailed research should make it clearer which group the Mukawaryu skeleton belongs to," says Kobayashi.

http://bit.ly/2sXF4MQ

Cancer cells send signals boosting survival and drug resistance in other cancer cells

Cancer cells appear to communicate to other cancer cells, activating an internal mechanism that boosts resistance to common chemotherapies

Researchers at University of California San Diego School of Medicine report that cancer cells appear to communicate to other cancer cells, activating an internal mechanism that boosts resistance to common chemotherapies and promotes tumor survival. The findings are published online in the June 6 issue of Science Signaling.



In this image of a human breast tumor, a cluster of malignant cells that have become resistant to chemotherapy are shown in red. **Image courtesy of NCI**

Six years ago, Maurizio Zanetti, MD, professor in the Department of Medicine at UC San Diego School of Medicine and a tumor immunologist at Moores Cancer Center at UC San Diego Health, published a paper in PNAS suggesting that cancer cells exploit an internal mechanism used by stressed mammalian cells, called the unfolded protein response (UPR), to communicate with immune cells, notably cells derived from the bone marrow, imparting them with pro-tumorigenic characteristics.

The UPR is activated in response to unfolded or misfolded proteins accumulating in the endoplasmic reticulum (ER) -- an organelle that carries out several metabolic functions in the cells and the site where proteins are built, folded and sent for secretion. The UPR can often decide cell death or survival.

In their new paper, Zanetti and colleagues say cancer cells appear to take the process beyond just affecting bone marrow cells, using transmissible ER stress (TERS) to activate Wnt signaling in recipient cancer cells. Wnt is a cellular signaling pathway linked to carcinogenesis in many types of cancer.

"We noticed that TERS-experienced cells survived better than their unexperienced counterparts when nutrient-starved or treated with common chemotherapies like bortezomib or paclitaxel," said Jeffrey J. Rodvold, a member of Zanetti's lab and first author of the study. "In each instance, receiving stress signals caused cells to survive better. Understanding how cellular fitness is gained within the tumor microenvironment is key to understand cooperativity among cancer cells as a way to collective resilience to nutrient starvation and therapies."

When cancer cells subject to TERS were implanted in mice, they produced faster growing tumors.

"Our data demonstrate that transmissible ER stress is a mechanism of intercellular communication," said Zanetti. "We know that tumor cells live in difficult environments, exposed to nutrient deprivation and lack of oxygen, which in principle should restrict tumor growth. Through stress transmission, tumor cells help neighboring tumor cells to cope with these adverse conditions and eventually survive and acquire growth advantages."

Importantly, he said the research may explain previous findings by other groups showing that individual tumor cells within a uniform genetic lineage can acquire functionally different behaviors in vivo. In other words, some cells acquire greater fitness and extended survival -- another way to generate intra-tumor heterogeneity, which currently represents one of the major obstacles to cancer treatment. This implies that mutations peppered throughout the cancer genome of an individual are not the only source of intra-tumor heterogeneity.

Zanetti said researchers and physicians need to consider these changing cellular dynamics in the tumor microenvironment in developing both a better understanding of cancer and more effective treatments.

Co-authors include: Kevin T. Chiu, Nobuhiko Hiramatsu, Julia K. Nussbacher, Valentina Galimberti, Navin R. Mahadevan, Karl Willert, and Jonathan H. Lin, all at UC San Diego.

http://bit.ly/2qZEv4V

Take a coffee or tea break to protect your liver

New study indicates that drinking even a few cups a day may prevent hardening of the liver, reports the Journal of Hepatology

Amsterdam, The Netherlands - Chronic liver diseases rank as the 12th cause of death worldwide and many of these disorders are associated with unhealthy lifestyles. Conversely, a healthier lifestyle can help prevent or reverse liver disease. Liver-related mortality is closely related to the development of cirrhosis, the final consequence of progressive fibrosis, i.e. scarring of the liver resulting from chronic inflammation. According to a new study published in the Journal of Hepatology, researchers found that drinking coffee and herbal tea may protect against liver fibrosis, estimated as the degree of liver stiffness, which is high in extensive scarring of the liver. Because these beverages are popular, widely available, and inexpensive, they could have the potential to become important in the prevention of advanced liver disease.

"Over the past decades, we gradually deviated towards more unhealthy habits, including a sedentary lifestyle, decreased physical activity, and consumption of a 'Happy Diet'," explains lead author Louise J. M. Alferink, MD, of the Department of Gastroenterology and Hepatology, Erasmus MC University Medical Centre, Rotterdam, The Netherlands, "This Happy Diet, also known as the Western diet, is typically rich in unhealthy foods including processed foods lacking nutrients and artificial sugars. This has led not only to an obesity epidemic, but also to a rapid increase in the prevalence of non-alcoholic fatty liver disease (NAFLD), which is due to extensive accumulation of fat in the liver and resembles alcoholic liver disease in people who do not exceed two drinks a day of alcohol. In this context, examining accessible and inexpensive lifestyle strategies that have potential health benefits, such as coffee and tea consumption, is a viable approach to finding ways to halt the rapid increase of liver disease in developed countries."

Sarwa Darwish Murad, MD, PhD, principal investigator of the study and hepatologist at the Erasmus MC University Medical Center, continues "There is quite some epidemiological, but also experimental data suggesting that coffee has health benefits on liver enzyme elevations, viral hepatitis, NAFLD, cirrhosis, and liver cancer. Beyond the liver, coffee has been demonstrated to be inversely associated with overall mortality in the general population. The exact mechanism is unknown but it is thought that coffee exerts anti-oxidant effects. We were curious to find out whether coffee consumption would have a similar effect on liver stiffness measurements in individuals without chronic liver disease."

Data was gathered on 2,424 participants of the Rotterdam study, a large population-based cohort study including participants 45 years or older living in a suburb of Rotterdam, The Netherlands. All participants underwent an extensive physical work-up, including data collection for anthropometrics, blood sampling, hepatological imaging using abdominal ultrasound and Fibroscan®, which quantitatively measures liver stiffness. In addition, they completed an externally validated 389-item Food Frequency Questionnaire, which included detailed information on coffee and tea consumption.

Coffee and overall tea consumption was divided into three categories: none, moderate (>0-3 cups per day), and frequent (?3). Tea consumption was categorized by herbal, green, or black tea and further into none (0) or any (>0) consumption.

Investigators found that frequent coffee consumption was significantly associated with lower odds of high liver stiffness values (?8 kPa as proxy for liver fibrosis), i.e. less scarring of the liver, independent of lifestyle, metabolic, and environmental traits. When they looked at the whole range of liver stiffness values, they found that both frequent coffee and any herbal tea consumption, even in small amounts, were significantly associated with lower liver stiffness values. Finally, while no direct association was found between either coffee or tea and the presence of fat accumulation in the liver (NAFLD) per se, the

effect of coffee on lowering the liver stiffness was significant in both the group with and without liver fat. The authors therefore concluded that frequent coffee and herbal tea seem to have beneficial effects on preventing liver scarring even before overt liver disease has developed. However, some caution in the interpretation of the results is necessary, as underlined in an accompanying editorial by Salvatore Petta, MD, PhD, of the Section of Gastroenterology and Hepatology, Di.Bi.M.I.S., University of Palermo, Italy, and Giulio Marchesini, MD, of the Department of Medical and Surgical Sciences (DIMEC), "Alma Mater" University, Bologna, Italy., In fact, the study included only an elderly Caucasian population and there were few participants in the no-coffee or no-tea control groups, which limit a straightforward conclusion about the effect of coffee and tea on the liver.. The amount of tea consumed was generally low, making estimation of any protective effect difficult. Further, they note that more than 100 components are present in coffee and tea, including polyphenols and caffeine, which are contained in both beverages in very different and variable amounts.

Hence, when asked "Should we add regular coffee and tea breaks to our daily life? Dr. Petta's and Dr. Marchesini's conclusion is, "Before this policy can be recommended, prospective studies are needed to identify the optimum amounts and the type(s) of coffee and tea leading to more favorable liver outcomes."

http://bit.ly/2s3da52

Covfefe aside, late-night tweets are bad news

Nocturnal Twitter use links to poor performance, according to basketball-player study.

Beth Mole - 6/7/2017, 6:50 AM

However amusing the typos, staying up to share 140 character quips can throw you off your game the next day—whether that's going to your 9-to-5, playing on an NBA team, or, you know, running the free world.

According to preliminary data from a study of 112 professional basketball players and 30,000 of their tweets, nocturnal Twitter usage linked to poor performance in next-day games. After tweeting between 11pm and 7am, players scored on average one fewer point and saw a 1.7-percent drop in their shooting accuracy than they did in games that did not follow late-night or early-morning tweeting. The Twitter-fatigued players also saw their playing time drop by two minutes.

The findings, reported this week at the annual meeting of the Associated Professional Sleep Societies in Boston, suggest that the after-hours Twitter usage points toward sleep deprivation.

"While experimental studies have shown the impact of sleep deprivation on performance, this study uses big data to provide interpretable results on real-world performance of basketball players," lead researcher Jason Jones, a sociologist at Stony Brook University in New York, said in a statement.

The study harvested tweets from seven playing seasons, from 2009 to 2016. The researchers only included tweet-night games in the same time zone as the player's home to avoid complicating factors, such as jet-lag. In the future, the researchers plan to analyze other player statistics, including assists, defensive rebounds, turnovers, and player fouls. They'll also continue mining Twitter for sleep-related data.

"Twitter is currently an untapped resource for late-night behavior data that can be used as a proxy for not sleeping," Jones added. "We hope this will encourage further studies making use of time-stamped online behavior to study the effects of sleep deprivation on real-world performance."

http://bit.ly/2rSUnY6

Many good years after heart bypass surgery -- but something happens after 10 years

The probability of continuing your life following bypass surgery is close to being the same as for the population in general - once a

patient has completed the procedure. But a study from Aarhus, Denmark, shows that mortality increases after 8-10 years.

The probability of continuing your life following bypass surgery is close to being the same as for the population in general - once the patient has completed the procedure itself. But a register study from the Department of Clinical Epidemiology at Aarhus University, Denmark, shows that mortality increases after 8-10 years.

The prognosis following heart bypass surgery is both good and has improved over the past three decades. In fact, the survival rate for bypass patients who make it through the first month after the operation is close to that of the population in general. But 8-10 years after a heart bypass operation, mortality increases by 60-80 per cent. This is new and important knowledge for the doctors who monitor these patients.

This is the main conclusion of a comprehensive national register-based study that sheds light on the thirty-year prognosis following a heart bypass operation, which has just been published by the Department of Clinical Epidemiology under the Department of Clinical Medicine at Aarhus University. The basis for the study is all of the approx. 51,000 Danish patients who have undergone surgery in the period 1980 - 2009. They have subsequently been correlated with a control group of 500,000 people of the same age and gender drawn at random from the general population.

"The study shows that the rate of survival has improved over the last three decades, so that the probability of continuing your life following bypass surgery is close to being the same as in the general population. This holds true providing that the patient has successful surgery and for the eight-ten years after the surgery. However, after this point the prognosis changes," says medical doctor and PhD student Kasper Adelborg from the Department of Clinical Epidemiology.

Kasper Adelborg is the primary author of the publication 'Thirty-Year Mortality After Coronary Artery Bypass Graft Surgery. A Danish Nationwide Population-Based Cohort Study', which has recently been published in the American journal Circulation: Cardiovascular Quality and Outcomes.

The study shows that ten-year-survivors have an increased mortality of between 60 and 80 per cent when compared with the general population. This may be due to the fact that the disease is progressive and that the atherosclerosis or hardening of the arteries increases, or that the implanted material begins to fail.

"Our register study covers all patients who underwent bypass surgery throughout the last decades throughout Denmark, and there will naturally be differences in the prognosis from patient to patient. So the clinicians who are in contact with the patients should therefore assess their prognosis individually - and there are special reasons to do this after the initial eight -ten years, as we now know that 'something' happens," says Kasper Adelborg about the perspectives of the study, which is currently being tweeted all over the world - and which has triggered a personal email to Kasper Adelborg from the journal's chief editor, who is impressed by the possibilities for studying long-term prognosis following heart bypass surgery using high quality data.

"Of course, this has to do with the fact that we in Denmark have unique opportunities to link register information from the registries. When we work with a control group of half a million Danes, we have the possibility of directly comparing the prognosis for a 55-year-old man who has undergone bypass surgery with a 55-year-old man who has not had surgery from the control group," explains Kasper Adelborg.

"It may be that we see this as an obvious correlation to make in Denmark, but the fact is that we in Denmark keep such good track of our citizens that many other countries envy us. In other places such as the US, it is not possible to simply extract information about when people have undergone surgery or died. This is information which is not centrally registered and which can therefore be lost if, for example, someone moves to a different region or state," says Kasper Adelborg.

In addition to the new knowledge about a special 'period of attention' 8-10 years after the bypass surgery, the first month is particularly critical.

Within the first 30 days after bypass surgery, patients have an increased risk of dying in connection with the operation, which is not in itself new.

"It is well-known that there are risks associated with a complicated operation in the heart, but fortunately mortality in connection with the surgery itself is quite low. What is new is that we have precise figures for the prognosis, including the long-term prognosis for patients who have undergone bypass surgery, compared with the rest of the population," says Kasper Adelborg.

The research results - more information:

- Type of study: National register-based cohort study

- Authors: Kasper Adelborg and Henrik Toft Sørensen

- Financing: The study is supported by the PROgram for Clinical Research INfrastructure (PROCRIN)

http://bit.ly/2s3h8us

Red onions pack a cancer-fighting punch, study reveals

University of Guelph researchers are the first to discover Ontario-grown red onions have the strongest cancer-fighting power

The next time you walk down the produce aisle of your grocery store, you may want to reach for red onions if you are looking to fight off cancer.

In the first study to examine how effective Ontario-grown onions are at killing cancer cells, U of G researchers have found that not all onions are created equal.

Engineering professor Suresh Neethirajan and PhD student Abdulmonem Murayyan tested five onion types grown in Ontario and discovered the Ruby Ring onion variety came out on top.

Onions as a superfood are still not well known. But they contain one of the highest concentrations of quercetin, a type of flavonoid, and Ontario onions boasts particularly high levels of the compound compared to some parts of the world.

The Guelph study revealed that the red onion not only has high levels of quercetin, but also high amounts of anthocyanin, which enriches the scavenging properties of quercetin molecules, said Murayyan, study's lead author.

"Anthocyanin is instrumental in providing colour to fruits and vegetables so it makes sense that the red onions, which are darkest in colour, would have the most cancer-fighting power."

Published recently in Food Research International, the study involved placing colon cancer cells in direct contact with quercetin extracted from the five different onion varieties.

"We found onions are excellent at killing cancer cells," said Murayyan. "Onions activate pathways that encourage cancer cells to undergo cell death. They promote an unfavourable environment for cancer cells and they disrupt communication between cancer cells, which inhibits growth." The researchers have also recently determined onions are effective at killing breast cancer cells. "The next step will be to test the vegetable's cancer-fighting powers in human trials," said Murayyan.

These findings follow a recent study by the researchers on new extraction technique that eliminates the use of chemicals, making the quercetin found in onions more suitable for consumption.

Other extraction methods use solvents that can leave a toxic residue which is then ingested in food, said Neethirajan.

"This new method that we tested to be effective only uses super-heated water in a pressurized container," he said. "Developing a chemical-free extraction method is important because it means we can use onion's cancer-fighting properties in nutraceuticals and in pill form."

While we can currently include this superfood in salads and on burgers as a preventative measure, the researchers expect onion extract will eventually be added to food products such as juice or baked goods and be sold in pill form as a type of natural cancer treatment.

http://bbc.in/2saEXBm

'First of our kind' found in Morocco

Fossils of early humans found in North Africa show Homo sapiens emerged at least 100,000 years earlier than previously recognised

By Pallab Ghosh Science correspondent, BBC News, Paris

The idea that modern people evolved in a single "cradle of humanity" in East Africa some 200,000 years ago is no longer tenable, new research suggests. Fossils of five early humans have been found in North Africa that show *Homo sapiens* emerged at least 100,000 years earlier than previously recognised. It suggests that our species evolved all across the continent, the scientists involved say. Their work is published in the journal Nature.

The shape of a Jebel Irhoud skull (L) is almost identical to ours (R)

Prof Jean-Jacques Hublin, of the Max Planck Institute (MPI) for Evolutionary Anthropology in Leipzig, Germany, told me that the discovery would "rewrite the textbooks" about our emergence as a species. "It is not the story of it happening in a rapid way in a 'Garden of Eden' somewhere in Africa. Our view is that it was a more gradual development and it involved the whole continent. So if there was a Garden of Eden, it was all of Africa."

Prof Hublin was speaking at a news conference at the College de France in Paris, where he proudly showed journalists casts of the fossil remains his team has excavated at a site in Jebel Irhoud in Morocco. The specimens include skulls, teeth, and long bones.

Earlier finds from the same site in the 1960s had been dated to be 40,000 years old and ascribed to an African form of Neanderthal, a close evolutionary cousin of *Homo sapiens*.

But Prof Hublin was always troubled by that initial interpretation, and when he joined the MPI he began reassessing Jebel Irhoud. And more than 10 years later he is now presenting new evidence that tells a very different story.

The latest material has been dated by hi-tech methods to be between 300,000 and 350,000 years old. And the skull form is almost identical to modern humans. The few significant differences are seen in a slightly more prominent brow line and smaller brain cavity.

Prof Hublin's excavation has further revealed that these ancient people had employed stone tools and had learned how to make and control fire. So, not only did they look like *Homo sapiens*, they acted like them as well. Until now, the earliest fossils of our kind were from Ethiopia (from a site known as Omo Kibish) in eastern Africa and were dated to be approximately 195,000 years old.

"We now have to modify the vision of how the first modern humans emerged," Prof Hublin told me with an impish grin.

Before our species evolved, there were many different types of primitive human species, each of which looked different and had its own strengths and weaknesses. And these various species of human, just like other animals, evolved and changed their appearance gradually, with just the occasional spurt. They did this over hundreds of thousands of years.

By contrast, the mainstream view has been that *Homo sapiens* evolved suddenly from more primitive humans in East Africa around 200,000

years ago; and it is at that point that we assumed, broadly speaking, the features we display now. What is more, only then do we spread throughout Africa and eventually to the rest of planet. Prof Hublin's discoveries would appear to shatter this view.

Jebel Irhoud is typical of many archaeological sites across Africa that date back 300,000 years. Many of these locations have similar tools and evidence for the use of fire. What they do not have is any fossil remains.

Because most experts have worked on the assumption that our species did not emerge until 200,000 years ago, it was natural to think therefore that these other sites were occupied by an older, different species of human. But the Jebel Irhoud finds now make it possible that it was actually *Homo sapiens* that left the tool and fire evidence in these places.

A selection of the stone tools recovered by Prof Hublin's team. The Jebel Irhoud individuals not only looked like us they did things typical of Homo sapiens **Mohammed Kamal, MPI EVA Leipzig**

"We are not trying to say that the origin of our species was in Morocco - rather that the Jebel Irhoud discoveries show that we know that [these type of sites] were found all across Africa 300,000 years ago," said MPI team member Dr Shannon McPhearon.

Prof Chris Stringer from the Natural History Museum in London, UK, was not involved in the research. He told BBC News: "This shows that there are multiple places in Africa where *Homo sapiens* was emerging. We need to get away from this idea that there was a single 'cradle'."

And he raises the possibility that *Homo sapiens* may even have existed outside of Africa at the same time: "We have fossils from Israel that are probably the same age and they show what could be described as proto-*Homo sapiens* features."

Prof Stringer says it is not inconceivable that primitive humans who had smaller brains, bigger faces, stronger brow ridges and bigger teeth - but who were nonetheless *Homo sapiens* - may have existed even earlier in time, possibly as far back as half a million years ago. This is a startling shift in what those who study human origins believed not so long ago.

"I was saying 20 years ago that the only thing we should be calling *Homo sapiens* are humans that look like us. This was a view that *Homo sapiens* suddenly appeared in Africa at some point in time and that was the beginning of our species. But it now looks like I was wrong," Prof Stringer told BBC News.

http://bit.ly/2sK95Aw

Home blood pressure monitors inaccurate 70 percent of the time: Study

What to watch out for when choosing and using your own device

Seventy per cent of readings from home blood pressure monitors are unacceptably inaccurate, which could cause serious implications for people who rely on them to make informed health decisions, new UAlberta research reveals.

"High blood pressure is the number one cause of death and disability in the world," said medical researcher Jennifer Ringrose, who led the research study. "Monitoring for and treating hypertension can decrease the consequences of this disease. We need to make sure that home blood pressure readings are accurate."

Ringrose and her team tested dozens of home monitors and found they weren't accurate within five mmHg about 70 per cent of the time. The devices were off the mark by 10 mmHg about 30 per cent of the time.

The findings are extremely relevant given millions of patients are asked to monitor their blood pressure through a device at home and

report the results back to their doctor. The researchers say steps can be taken to minimize inaccurate readings.

"Compare the blood pressure machine measurement with a blood pressure measurement in clinic before exclusively relying upon home blood pressure readings," advised Ringrose. "What's really important is to do several blood pressure measurements and base treatment decisions on multiple readings. Taking home readings empowers patients and is helpful for clinicians to have a bigger picture rather than just one snapshot in time."

Study co-author Raj Padwal, a UAlberta professor of medicine, added that no one should have drugs started or changed based on one or two measurements taken at a single point in time unless the measurements are clearly elevated.

In 2015 Canadian guidelines were updated to endorse greater use of home blood pressure monitoring. The guidelines recommend 28 measurements over one week for home devices.

The study examined the results of 85 patients. The researchers compared the results of the volunteers' home monitors with the gold standard--two observers taking several blood pressure measurements simultaneously, blinded to one another, with a third person ensuring agreement between both observers' readings.

While the average difference between the home monitors and the gold standard measurements was acceptable, the majority of individual devices demonstrated clinically-relevant inaccuracy. The team also found that readings were more inaccurate in men than in women. They believe there are many factors that could account for their findings.

"Arm shape, arm size, the stiffness and age of blood vessels, and the type of blood pressure cuff are not always taken into account when a blood pressure machine is designed and validated," said Padwal. "Individual differences, such as the size, age and medical background of the person using the blood pressure monitor are also contributing factors."

The researchers say it's difficult to determine precisely why the inaccuracies are occuring in home monitors because they don't have access to the various formulas the devices use to determine blood pressure--information which is considered proprietary and kept secret by the manufacturer. They believe a greater effort needs to be made among industry and academia to develop more highly accurate devices in the future.

The study was published in the American Journal of Hypertension.

http://bit.ly/2s3zjAe

Type of sugar may treat atherosclerosis, mouse study shows

Trehalose triggers cellular housekeeping in artery-clogging plaque

Researchers have long sought ways to harness the body's immune system to treat disease, especially cancer. Now, scientists have found that the immune system may be triggered to treat atherosclerosis and possibly other metabolic conditions, including fatty liver disease and type 2 diabetes.

Studying mice, researchers at Washington University School of Medicine in St. Louis have shown that a natural sugar called trehalose revs up the immune system's cellular housekeeping abilities. These souped-up housecleaners then are able to reduce atherosclerotic plaque that has built up inside arteries. Such plaques are a hallmark of cardiovascular disease and lead to an increased risk of heart attack.

The study is published June 7 in Nature Communications.

"We are interested in enhancing the ability of these immune cells, called macrophages, to degrade cellular garbage -- making them super-macrophages," said senior author Babak Razani, MD, PhD, an assistant professor of medicine.

Macrophages are immune cells responsible for cleaning up many types of cellular waste, including misshapen proteins, excess fat droplets and dysfunctional organelles -- specialized structures within cells.

"In atherosclerosis, macrophages try to fix damage to the artery by cleaning up the area, but they get overwhelmed by the inflammatory nature of the plaques," Razani explained. "Their housekeeping process gets gummed up. So their friends rush in to try to clean up the bigger mess and also become part of the problem. A soup starts building up -- dying cells, more lipids. The plaque grows and grows."

In the study, Razani and his colleagues showed that mice prone to atherosclerosis had reduced plaque in their arteries after being injected with trehalose. The sizes of the plaques measured in the aortic root were variable, but on average, the plaques measured 0.35 square millimeters in control mice compared with 0.25 square millimeters in the mice receiving trehalose, which translated into a roughly 30 percent decrease in plaque size. The difference was statistically significant, according to the study.

The effect disappeared when the mice were given trehalose orally or when they were injected with other types of sugar, even those with similar structures.

Found in plants and insects, trehalose is a natural sugar that consists of two glucose molecules bound together. It is approved by the Food and Drug Administration for human consumption and often is used as an ingredient in pharmaceuticals. Past work by many research groups has shown trehalose triggers an important cellular process called autophagy, or self-eating. But just how it boosts autophagy has been unknown.

In this study, Razani and his colleagues show that trehalose operates by activating a molecule called TFEB. Activated TFEB goes into the nucleus of macrophages and binds to DNA. That binding turns on specific genes, setting off a chain of events that results in the assembly of additional housekeeping machinery -- more of the organelles that function as garbage collectors and incinerators.

"Trehalose is not just enhancing the housekeeping machinery that's already there," Razani said. "It's triggering the cell to make new machinery. This results in more autophagy -- the cell starts a degradation fest. Is this the only way that trehalose works to enhance autophagy by macrophages? We can't say that for sure -- we're still testing that. But is it a predominant process? Yes."

The researchers are continuing to study trehalose as a potential therapy for atherosclerosis, especially since it is not only safe for human consumption but is also a mild sweetener. One obstacle the scientists would like to overcome, however, is the need for injections. Trehalose likely loses its effectiveness when taken orally because of an enzyme in the digestive tract that breaks trehalose into its constituent glucose molecules. Razani said the research team is looking for ways to block that enzyme so that trehalose retains its structure, and presumably its function, when taken by mouth.

This work was supported by grants from the National Institutes of Health (NIH), grant numbers K08 HL098559 and R01 HL125838; the Washington University Diabetic Cardiovascular Disease Center and Diabetes Research Center, grant number P30 DK020579; The Foundation for Barnes-Jewish Hospital; and the Wylie Scholar Award from the Vascular Cures Foundation.

Sergin I, Evans TD, Zhang X, Bhattacharya S, Stokes CJ, Song E, Ali S, Dehestani B, Holloway KB, Micevych PS, Javaheri A, Crowley JR, Ballabio A, Schilling JD, Epelman S, Weihl CC, Diwan A, Fan D, Zayed MA, Razani B. Exploiting macrophage autophagy-lysosomal biogenesis as a therapy for atherosclerosis. Nature Communications. June 7, 2017.

http://bit.ly/2r97RBJ

Looking at terror attacks 'per capita' should make us rethink beliefs about levels of risk and Muslims

In the fight against terrorism, seemingly easy conclusions may be drawn too quickly.

Michael Jetter Lecturer in Economics, University of Western Australia
David Stadelmann Chair of Development Economics, Bayreuth University

Recent events in London, Manchester and elsewhere highlight that Western societies are vulnerable to terrorist attacks – and political decision-makers need to find solutions.

Two key questions to consider are:

1. ***How likely are you to fall victim to terrorism?***
2. ***What increases or decreases that likelihood?***

Our natural way of thinking about the first question should be similar to considering crime (murder or robbery, for instance), mortality

(infant mortality at birth, or cancer), car accidents, or other threats. And the salient point is not so much the total number of murders in a large country, but rather the total number in relation to the size of the population.

Put simply, we should consider the number of affected people on a per-capita basis – that is, murder rates, or mortality rates.

For example, from a policy perspective, it makes sense that ten murders in a populous country like China (which has 1,371,000,000 citizens) would be much less significant than ten murders in a tiny country like Liechtenstein, with its 37,000 citizens.

Terror per capita vs total terror

However, when it comes to terrorism, almost all the knowledge that drives policy decisions comes from studies analysing the total number of terror casualties in a given country and year. India is a good example. It ranks fourth on the list of terror-prone countries since 1970, with 408 deaths from terrorism in an average year.

But the average Indian need not be particularly worried about terrorism. The country is home to 1.27 billion people, and terrorism kills only one in 2,500,000 people – or 0.0000004% of the population – per year, once we translate total terror deaths to terror deaths per capita. The likelihood of dying from crime or in a road accident is far higher. India ranks only 82nd in the world when we compare terrorism victims per capita.

So, although India has a relatively high number of terrorist attacks, an individual's likelihood of dying in such an attack is minimal – because India has such a large population.

Once we switch from focusing on total terror deaths (or attacks) per country to terror deaths per capita, relevant conclusions about what drives terrorism change dramatically. And thus potential policy reactions also change when focusing on terror deaths per capita.

Democracy, Muslims and terrorism

A somewhat baffling conclusion from a long list of research articles states that terrorism is more likely to emerge in democracies, rather than non-democracies. This idea is difficult to reconcile with our intuition of democracy giving people political (and usually religious) freedom – so why should we see terrorism in such free countries?

It turns out that once we analyse terror per capita, democratic nations are less likely to witness terrorism. Again, take India, a large democracy that, at first glance, suffers a lot from terrorism. But, in per-capita terms, terrorism becomes less important.

Another popular belief states that countries with a sizeable Muslim population – such as Pakistan, Indonesia, Bangladesh or Nigeria – are experiencing more terrorism than non-Muslim countries. This is true when looking at the total numbers of deaths.

But that result is also overturned once we consider terror per capita. A larger share of Muslims in a given country relates to marginally less terrorism. Pakistan (202 million people), Indonesia (258 million), Bangladesh (156 million) and Nigeria (186 million) all feature exceptionally large populations. This result is informative for the current policy debate. More caution is needed before classifying certain countries as more prone to terrorism based on their religion.

Another – admittedly simplistic – way of considering the link between Islam and terrorism comes from comparing the share of terror attacks conducted by Muslim groups with the share of the world population identifying as Muslim. If Muslims were more likely to be terrorists, we should expect the latter figure to be lower.

Approximately 23% of the world population identifies as Muslim. But, since September 11, Islamist groups have conducted about 20% of terrorist attacks worldwide. Thus, terrorist attacks are – historically and today – less likely to be conducted by a Muslim than by a non-Muslim group.

Where to go from here?

Our results suggest it may be time to rethink the way we approach terrorism.

On an average day, terrorists kill 21 people worldwide. On that same average day, natural or technological disasters kill 2,200 people – or

more than 100 times as many. The likelihood of dying at the hands of a terrorist is comparable to the odds of drowning in one's own bathtub. This does not mean we should be afraid of bathtubs, nor does it mean terrorism is not among the problems that need to be solved with a high priority.

Rather, in the fight against terrorism, seemingly easy conclusions may be drawn too quickly – and we should not forget other matters that affect people's lives far more than terrorism does.

Disclosure statement

David Stadelmann previously received funding from the Germand Research Foundation (DFG). He is a research fellow at CREMA – Center for Research in Economics, Management and the Arts (Switzerland), an ordinary member of the Walter Eucken Institut (Germany) and a reserarch fellow at QuBE – Queensland Behavioural Economics Group (Australia). David Stadelmann has no conflict of interest and if readers look at the article, there should be no suspicion of any ulterior interest apart from helping to improve the world.

Michael Jetter does not work for, consult, own shares in or receive funding from any company or organisation that would benefit from this article, and has disclosed no relevant affiliations beyond the academic appointment above.

http://bit.ly/2r5uCSY

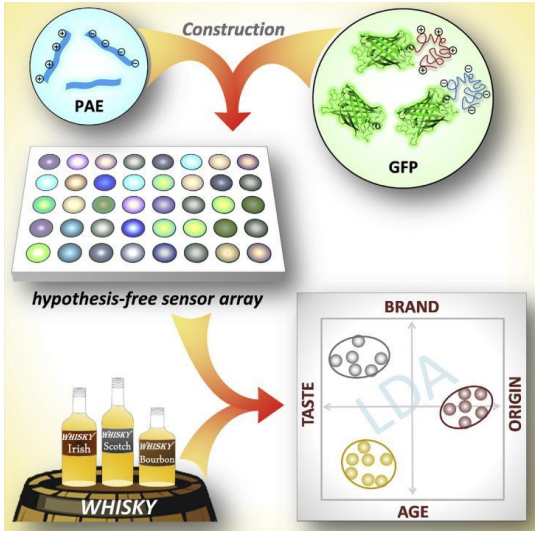
Researchers use a synthetic 'tongue' to sort out whiskies

Artificial sensor array or can detect whether two nearly identical whisky samples are a match

Whiskies may differ in taste and smell, but they are so similar in chemical composition that most analyses can't tell two closely related brews apart. In the journal Chem on June 8, researchers introduce an artificial sensor array or "tongue" that can detect whether two nearly identical whisky samples are a match. The sensor arrays can also identify some of the whiskies' key qualities, such as malt status, age, and country of origin.

A master whisky distiller can tell these spirits apart, but at the chemical level, whisky brands contain many of the same molecules. Their complexity also makes it difficult to tease them apart given that plant matter, such as malts and trace flavors such as citrus, contains so many different elements. "One of the things I was interested in was 'how closely related can two analytes be so that you still can tell them apart?' and for that, whiskies are absolutely fantastic," says senior co-author Uwe Bunz, an organic chemist at Heidelberg University.

Each sensor array is made up of a series of solutions each containing a unique glowing sophisticated dye. When the researchers add a droplet of whisky into the solutions, the whisky causes a slight change in the brightness of each chemical's glow. When Bunz and his colleagues use a machine called a plate reader to measure the subtle changes in fluorescence, they can find a signature pattern for each whisky.



This visual abstract shows a three-element sensor array system that can discriminate age, blend status, country of origin, and elements of taste in whiskies. **Jinsong Han et al./Chem 2017**

"If you have 3, 4, or 5 elements on the tongue, you get 3, 4, or 5 different intensity changes, and these intensity changes form a pattern. And the pattern is unique," he says. "Each single polymer's response to the whisky would not be very useful, but if you combine them, they form a really unique pattern."

The sensor array looks nothing like a traditional tongue, but it operates on some of the same principles, Bunz argues. "Our human tongue consists of 6 or 7 different receptors -- sweet, salty, bitter, sour, umami, and hotness -- and they're able to identify food by differential reactions of those elements," he says. "The combination of differential receptors gives you an overall taste impression of what you eat."

Unlike traditional chemical techniques such as mass spectrometry, which break down a mixture into the individual chemicals that make it up, these synthetic "tongues" respond to the overall mixture. "If someone put in a small amount of poison or something, you could not

discriminate that," says Bunz. They don't know exactly which components of the whisky are reacting with the various glowing polymers, but they've noticed patterns that seem to correlate with whisky age, malt status (single or double), and country of origin.

These synthetic "tongues" can highlight similarities between whiskies, but they can't identify an unknown whisky from scratch, he says. "You start with a sample that you know is the real McCoy. Then you look at another sample, and you can say whether it's the same sample or it's not." In other words, these tongues would be great for spotting counterfeits of expensive luxury whiskies.

What works well for whisky could work well for other beverages and even for biological materials, which are also complex mixtures. "What you can do for whiskies, you could in principle be able to do for other consumer goods," says Bunz. "You could do it yourself in a kitchen, assuming you had a plate reader and the right conjugated polymers and knew what polymer to look for. In principle, everyone could do this."

This work has supported by the China Scholarship Council.

Chem, Han et al.: "A hypothesis-free sensor array discriminates whiskies for brand, age and taste" http://www.cell.com/chem/fulltext/S2451-9294(17)30174-2

http://bit.ly/2rqBnAT

Comets may have delivered significant portions of Earth's xenon

A new study suggests that roughly 22% of the element xenon found in Earth's atmosphere may have come from comets.

The finding -- shedding light on a decades-long mystery about the source for some of this gas on Earth -- could be important for understanding comets' contribution of other materials, such as water, to our planet, as well. Xenon is the heaviest stable noble gas. It has nine different isotopes (essentially "weights"), which scientists can trace through the cosmos and use to determine its origins. Yet, models of xenon's origin on Earth require an additional unknown source which has been unidentified for decades. Between May 14 and 31, 2016, an important clue about a xenon source was uncovered in data collected by the Rosetta spacecraft, as it carried out a series of low-altitude orbits around comet 67P/Churyumov-Gerasimenko. Upon analyzing the spectrometry data, Bernard Marty et al. found that the xenon leaking from 67P appears to have been trapped within the cometary ice since before the solar system formed. What's more, the isotopic signature of this cometary xenon closely mirrors the signature of the xenon on Earth derived from a previously unknown source. The authors discuss several other possibilities for how the mysterious isotopic signature of xenon came to be on Earth, but ultimately rule these out. They propose that a substantial portion of atmospheric xenon on Earth - roughly 22% - was delivered by comets.

http://bit.ly/2rM5TWU

OU astrophysicist identifies composition of Earth-size planets in TRAPPIST-1 system

Six of seven planets consistent with an Earth-like composition

A University of Oklahoma post-doctoral astrophysics researcher, Billy Quarles, has identified the possible compositions of the seven planets in the TRAPPIST-1 system. Using thousands of numerical simulations to identify the planets stable for millions of years, Quarles concluded that six of the seven planets are consistent with an Earth-like composition. The exception is TRAPPIST-1f, which has a mass of 25 percent water, suggesting that TRAPPIST-1e may be the best candidate for future habitability studies.

The lighter green indicates optimistic regions of the habitable zone and the darker green denotes more conservative limits. **University of Oklahoma**

"The goal of exoplanetary astronomy is to find planets that are similar to Earth in composition and potentially habitable," said Quarles. "For

thousands of years, astronomers have sought other worlds capable of sustaining life."

Quarles, a researcher in the Homer L. Dodge Department of Physics and Astronomy, OU College of Arts and Sciences, collaborated with scientists, E.V. Quintana, E. Lopez, J.E. Schlieder and T. Barclay at NASA Goddard Space Flight Center on the project. Numerical simulations for this project were performed using the Pleiades Supercomputer provided by the NASA High-End Computing Program through the Ames Research Center and at the OU Supercomputing Center for Education and Research.

TRAPPIST-1 planets are more tightly spaced than in Kepler systems, which allow for transit timing variations with the photometric observations. These variations tell the researchers about the mass of the planets and the radii are measured through the eclipses. Mass and radius measurements can then infer the density. By comparing the Earth's density (mostly rock) to the TRAPPIST-1 planets, Quarles can determine what the planets are likely composed of and provide insight into whether they are potentially habitable.

TRAPPIST-1f has the tightest constraints with 25 percent of its mass in water, which is rare given its radius. The concern of this planet is that the mass is 70 percent the mass of the Earth, but it is the same size as the Earth. Because the radius is so large, the pressure turns the water to steam, and it is likely too hot for life as we know it. The search for planets with a composition as close to Earth's as possible is key for finding places that we could identify as being habitable. Quarles said he is continually learning about the planets and will investigate them further in his studies.

TRAPPIST-1 is a nearby ultra-cool dwarf about 40 light-years away from Earth and host to a remarkable planetary system consisting of seven transiting planets. The seven planets are known as TRAPPIST 1b, c, d, e, f, g and h. For more information about TRAPPIST-1, visit https://exoplanets.nasa.gov/trappist1.

"Plausible Compositions of the Seven TRAPPIST-1 Planets Using Long-term Dynamical Simulations," was published in the Astrophysical Journal Letters. Funding for this project was provided by NASA Goddard Space Flight Center and University of Oklahoma. For more information, contact Quarles at bquarles@ou.edu.

http://bit.ly/2rWNTr9

Report looks at liver cancer, fastest-growing cause of cancer deaths in US

Significant disparities persist despite availability of effective interventions

A new report provides an overview of incidence, mortality, and survival rates and trends for liver cancer, a cancer for which death rates have doubled in the United States since the mid-1980s, the fastest rise of any cancer in the U.S. The report appears in CA: A Cancer Journal for Clinicians, and says differences in major risk factors as well as inequalities in access to care have led to significant racial disparities in liver cancer mortality.

The American Cancer Society estimates that liver cancer will account for about 41,000 new cancer cases and 29,000 cancer deaths in the United States in 2017. It is the fifth leading cause of cancer death in men and the eighth leading cause of cancer death in women. About 1.0 percent of men and women will be diagnosed with liver cancer in their lifetimes.

The report notes that liver cancer incidence has been rising in the U.S. since at least the mid-1970s, a trend that is expected to continue through at least 2030. One major factor contributing to the increase is a higher rate of hepatitis C virus (HCV) infection among baby boomers (born between 1945 through 1965). Among this age group, HCV prevalence is approximately 2.6%, a rate 6-fold greater than that of other adults. A rise in obesity and type II diabetes over the past several decades has also likely contributed to the trend. Other risk factors include alcohol, which increases liver cancer risk by about 10% per drink per day, and tobacco use, which increases liver cancer risk by approximately 50%.

Despite improvements in liver cancer survival in recent decades, only one in five patients survives five years after diagnosis.

The report identifies substantial disparity in liver cancer death rates by race/ethnicity, ranging from 5.5 per 100,000 in non-Hispanic whites to

11.9 per 100,000 in American Indians/Alaska Natives. There are also wide disparities by state, with the lowest death rates in North Dakota (3.8 per 100,000), and the highest in the District of Columbia (9.6 per 100,000).

The report says the wide racial and state disparities in liver cancer mortality reflect differences in the prevalence of major risk factors and, to some extent, inequalities in access to high-quality care. "However, most liver cancers are potentially preventable," write the authors. "Interventions to curb the rising burden of liver cancer and reduce racial/ethnic and geographic disparities should include the targeted application of existing knowledge in prevention, early detection, and treatment, including improvements in [hepatitis B virus] vaccination, screening and treatment of HCV, maintaining a healthy body weight, access to high-quality diabetes care, prevention of excessive alcohol drinking, and tobacco control.

Article: Disparities in Liver Cancer Occurrence in the United States by Race/Ethnicity and State, CA Cancer J Clin 2017: doi: 10.3322/caac.21402.

http://bit.ly/2rcuQvC

Breast cancer risk reduced in women with diabetes who take low-dose aspirin

18% reduced breast cancer risk for women who used low-dose aspirin compared to those who did not

New Rochelle - A new study of nearly 149,000 women with diabetes over 14 years showed an overall 18% reduced breast cancer risk for women who used low-dose aspirin compared to those who did not. The study design and results are published in an article in Journal of Women's Health, a peer-reviewed publication from Mary Ann Liebert, Inc., publishers. The article is available free on the Journal of Women's Health website until July 8, 2017.

In the article entitled "Low-Dose Aspirin Reduces Breast Cancer Risk in Women with Diabetes: A Nationwide Retrospective Cohort Study in Taiwan," Yi-Sun Yang, MD, PhD, Chien-Ning Huang, MD, PhD, and coauthors from Chung Shan Medical University Hospital and Hung Kuang University, Taichung, Taiwan, defined low-dose aspirin use as intake of 75-165 mg daily. The researchers reported that a high cumulative dose of aspirin over the 14-year study period reduced breast cancer risk by 47%, whereas low and medium cumulative doses did not reduce risk.

"Women with type 2 diabetes have an increased risk of breast cancer, and these results suggest that the same low-dose aspirin that many of these women take to prevent cardiovascular disease may also help reduce their risk of breast cancer," says Susan G. Kornstein, MD, Editor-in-Chief of Journal of Women's Health, Executive Director of the Virginia Commonwealth University Institute for Women's Health, Richmond, VA, and President of the Academy of Women's Health.

http://bit.ly/2sNWwEx

FDA Asks Drug Company to Pull Painkiller in First

First time the federal agency has requested a drug company voluntarily stop selling a medication

By Sara G. Miller, Staff Writer | June 8, 2017 06:30pm ET

The U.S. Food and Drug Administration (FDA) announced today (June 8) that it has requested that Endo Pharmaceuticals, a drug company, remove the opioid painkiller Opana ER from the drug market.

This is the first time that the federal agency has requested that a drug company voluntarily stop selling a medication because of the risk of abuse that the drug carries, the FDA said in a statement. If the company does not choose to do so voluntarily, the FDA will force the issue by withdrawing its approval for the drug.

Opana ER **Rich Pedroncelli/AP**

The request was made after the FDA determined that injecting the drug, which is one way of abusing it, was linked to outbreaks of disease, including HIV and hepatitis C.

"The abuse and manipulation of reformulated Opana ER by injection has resulted in a serious disease outbreak," Dr. Janet Woodcock, the director of the FDA's Center for Drug Evaluation and Research, said in a statement.

In March, an advisory committee of independent experts voted 18 to eight that the benefits of the drug no longer outweighed its risks.

"When we determined that the product had dangerous and unintended consequences, we made a decision to request its withdrawal from the market," Woodcock said. "This action will protect the public from further potential for misuse and abuse of this product."

Opana ER (oxymorphone hydrochloride) was first approved by the FDA in 2006 for use by people with moderate or severe chronic pain. The extended-release formulation of the medication allowed for a continuous release of the drug into the body.

The drug was reformulated in 2012 in an attempt to make the medication more difficult for people to abuse; specifically, the drug makers sought to make it difficult for users to snort or inject the drug. Although the reformulated drug was approved, the FDA later determined that this change did not "meaningfully reduce abuse." The agency said that it would not allow the company to label the drug with language describing its potentially abuse-deterring properties, the statement said.

An FDA review of available data on the drug found that the way people abuse the medication had shifted significantly after its reformulation, changing from snorting to injection. The increase in injection of Opana ER has been linked to outbreaks of HIV and hepatitis C, two viruses that can be transmitted through syringes. There have also been cases of a serious blood disorder called thrombotic microangiogpathy linked to the abuse of the drug.

The FDA has previously requested that companies remove opioid painkillers from the market; however, in those cases it was not because of the risk of abuse that the drug carried. In 2010, for example, the FDA recommended that drug companies stop selling the opioid pain reliever propoxyphene, but this was done because the agency determined that the drug was dangerous for heart health.

In addition, the FDA said it will continue to look at the risks versus the benefits of all other opioid painkillers on the market and take further action if needed.

"We are facing an opioid epidemic — a public health crisis, and we must take all necessary steps to reduce the scope of opioid misuse and abuse," FDA commissioner Dr. Scott Gottlieb said in the statement. "We will continue to take regulatory steps when we see situations where an opioid product's risks outweigh its benefits, not only for its intended patient population but also in regard to its potential for misuse and abuse."

http://nyti.ms/2rOscuX

Cancer Drug Proves to Be Effective Against Multiple Tumors

Results so striking that the FDA already has approved the drug

By GINA KOLATA JUNE 8, 2017

The 86 cancer patients were a disparate group, with tumors of the pancreas, prostate, uterus or bone.

One woman had a cancer so rare there were no tested treatments. She was told to get her affairs in order.

Still, these patients had a few things in common. All had advanced disease that had resisted every standard treatment.

All carried genetic mutations that disrupted the ability of cells to fix damaged DNA. And all were enrolled in a trial of a drug that helps the immune system attack tumors.

The results, published on Thursday in the journal Science, are so striking that the Food and Drug Administration already has approved

the drug, pembrolizumab, brand name Keytruda, for patients whose cancers arise from the same genetic abnormality.

It is the first time a drug has been approved for use against tumors that share a certain genetic profile, whatever their location in the body. Tens of thousands of cancer patients each year could benefit.

"This is absolutely brilliant," said Dr. José Baselga, physician in chief at Memorial Sloan Kettering Cancer Center in New York, which has just hired the study's lead investigator, Dr. Luis A. Diaz Jr.

After taking pembrolizumab, 66 patients had their tumors shrink substantially and stabilize, instead of continuing to grow.

Among them were 18 patients whose tumors vanished and have not returned.

There was no control group, which meant the results had to be absolutely compelling to be convincing. The study started in 2013 and is funded by philanthropies; the drugmaker's only role was to supply the drug. The study is continuing.

The drug, made by Merck, is already on the market for select patients with a few types of advanced lung, melanoma and bladder tumors. It is expensive, costing $156,000 a year. A test for the mutations targeted by the drug is already available, too, for $300 to $600.

Just 4 percent of cancer patients have the type of genetic aberration susceptible to pembrolizumab. But that adds up to a lot of patients: as many as 60,000 each year in the United States alone, the study's investigators estimated.

Clinicians have long been accustomed to classifying cancers by their location in the body — patients are diagnosed with lung cancer, for example, or brain cancer.

Yet researchers have been saying for years that what matters was the genetic mutation causing the tumors. At first, they were certain they would be able to cure cancers with drugs that zeroed in on the mutations, wherever the tumors were lodged.

But cancers were more complicated than that, said Dr. Drew M. Pardoll, director of the Johns Hopkins Bloomberg-Kimmel Institute and an author of the new paper.

A mutation that appeared in half of all melanomas, for example, turned out to be rare in other cancers. And even when scientists pinpointed that mutation in 10 percent of colon cancers, the drug that worked for melanoma patients did not work for other cancer patients.

"It was a great dream," Dr. Pardoll sighed.

The new study was based on a different idea. The immune system can recognize cancer cells as foreign and destroy them. But tumors deflect the attack by shielding proteins on their surface, making them invisible to the immune system.

Pembroluzimab is a new type of immunotherapy drug known as a PD-1 blocker, which unmasks the cancer cells so that the immune system can find and destroy them.

The drug is the happy result of a failed trial. A nearly identical drug, nivolumab, was given to 33 colon cancer patients, and just one showed any response — but his cancer vanished altogether.

What was special about that one patient? Dr. Diaz, a geneticist at Johns Hopkins until now, and lead author of the new study, found the answer: a genetic mutation that prevented the tumor from repairing DNA damage.

As a result, the man's cancer cells contained a plethora of mutated genes, which produced thousands of strange-looking proteins on the surfaces of the cells.

Once the tumor's cloaking mechanism was short-circuited by the drug, the man's immune system had no trouble targeting the foreign proteins on the cancer cells.

That led to the idea for the Dr. Diaz's new study. He and his colleagues sought patients whose tumors had the same genetic defect, which can arise in any of four genes in a pathway that repairs damaged DNA. They gave these patients a PD-1 blocker and were surprised by the results.

The drug's effects have been so durable that the investigators do not know how long the results should be expected to persist or how long these patients might expect to survive. That kind of result, Dr. Baselga said, "is insane."

One patient in the study, Adrienne Skinner, 60, of Larchmont, N.Y., had an extraordinarily rare and deadly cancer, ampullary cancer, that arises at the end of the bile duct. There is no standard treatment, and the prognosis is dire.

Her doctors scheduled her for a drastic surgery that removes part of the pancreas, part of the small intestine, and the gall bladder. But her surgeon canceled the operation when he discovered her cancer had invaded her liver. She tried chemotherapy instead — six months of one kind, then six months of another. Neither worked.

Then she qualified for Dr. Diaz's clinical trial at Johns Hopkins. On April 15, 2014, Ms. Skinner had her first dose of the drug.

In July, her doctor inserted an endoscope for another biopsy. He turned to Ms. Skinner and said, "If someone hadn't told me you have ampullary cancer, I would not have known." The tumor was gone.

The trial involved giving patients the drug for two years, so Ms. Skinner continued to take the drug as a sort of insurance. Last year, she stopped, and her cancer has not returned.

"In effect, I was cured within months," she said. "I have a great life."

But even this promising trial has left a thread dangling: Why didn't all of the patients respond?

There is now a fervid search for the answer. "Multiple labs are looking like crazy," Dr. Balsega said.

http://bit.ly/2t8wnj2

Infants born preterm may lack key lung cells later in life

Potential explanation provided for preterm infants' added susceptibility to lung diseases later in their lives

Mice born into an oxygen-rich environment respond worse to the flu once fully grown due to an absence of certain lung cells, a discovery that provides a potential explanation for preterm infants' added susceptibility to influenza and other lung diseases later in their lives, according to new research from the University of Rochester Medical Center (URMC).

The research, published in the April issue of the American Journal of Respiratory Cell and Molecular Biology, focuses on alveolar type II cells, which help to rebuild lung tissue after damage. When newborn mice are exposed to extra oxygen at birth -- which causes their lungs to respond and develop similarly to those of preterm infants -- they end up with far fewer of these cells once they reach adulthood.

Once exposed to influenza virus as adults, these mice then developed a much more severe disease than mice born in a traditional oxygen environment.

"We don't know if this is exactly what happens in preterm infants," said Michael O'Reilly, Ph.D., Professor of Pediatrics, Environmental Medicine, and Oncology at URMC. "But we do know that there's a direct correlation between the loss of these cells and an inferior response to lung disease, and we do know that there's something about that early oxygen-rich environment that causes a mouse to respond poorly to viral infection later in life. So this helps connect those dots."

O'Reilly, who studies the developmental origins of lung disease, hopes to now pursue research on the life cycle of alveolar type II cells. The cells are abundant in the lungs of healthy infants, as they are responsible for producing pulmonary surfactant, a vital compound for the developing lung. As the lungs mature after birth, some of these cells may be pruned away.

In theory, the lungs of premature infants take this process too far, pruning too many type II cells.

"Right now, we don't really understand the biology of that," said O'Reilly. "But once we do, that opens the door to exploring a potential treatment."

Min Yee, technical associate in O'Reilly's research group, was the article's lead author. In addition to O'Reilly, William Domm, Ph.D., Robert Gelein, Karen Bentley, Matthew Kottman, M.D., Paige Lawrence, Ph.D., Patricia Sime, M.D., were co-authors on the study.

http://bit.ly/2rOf3SJ

Bird caught in amber 100 million years ago is best ever found

100-million-year-old amber from Myanmar contains head, neck, wing, tail and feet of a hatchling

By Michael Le Page

Insects are not the only creatures that got stuck in amber during the time of the dinosaurs. Bits of ancient birds and dinosaurs have been found too – and now the most complete bird yet has been found.

A 100-million-year-old chunk of amber found in Myanmar contains the head, neck, wing, tail and feet of a hatchling. It was just a few days old when it fell into a pool of sap oozing from a conifer tree.

Lida Xing, Jingmai K. O'Connor, Ryan C. McKellar, Luis M. Chiappe, Kuowei Tseng, Gang Li, Ming Bai

"It's the most complete and detailed view we've ever had," says Ryan McKellar of the Royal Saskatchewan Museum, Regina, in Canada, a member of the team that described the find. "Seeing something this complete is amazing. It's just stunning."

Reconstruction **Cheung Chung Tat**

While it looks as if the actual skin and flesh of the bird are preserved in the amber, it's basically a very detailed impression of the animal, McKellar says. Studies of similar finds show the flesh has broken down into carbon – and there's no usable DNA, fans of Jurassic Park will be disappointed to learn.

The amber does preserve some of the feather colours – but in this case they are not terribly exciting, McKellar admits. "They were little brown jobbies."

The unfortunate youngster belonged to a group of birds known as the 'opposite birds' that lived alongside the ancestors of modern birds and appear to have been more diverse and successful – until they died out with the dinosaurs 66 million years ago.

Close up of the wing **Ming BAI**

Previous fossil finds and a couple of wings preserved in amber suggest that opposite birds hatched with flight feathers, ready to fend for themselves.

The new find adds to this evidence, as the hatchling had a full set of flight feathers and was growing tail feathers – but oddly it mostly lacked body feathers rather than being covered in down like today's hatchlings. They probably hatched on the ground and climbed into trees, says McKellar, making them particularly likely to get stuck in sap.

Xing Lida

In appearance, opposite birds likely resembled modern birds, but they had a socket-and-ball joint in their shoulders where modern birds have a ball-and-socket joint – hence the name. They also had claws on their wings, and jaws and teeth rather than beaks – but at the time the hatchling lived, the ancestors of modern birds had not yet evolved beaks either.

The amber containing the bird was collected by a museum in China several years ago. When it realised what it had, the museum contacted Lida Xing of the China University of Geosciences in Beijing, who led the team that described the find.

Why the opposite birds died out while the ancestors of modern birds survived is not clear, but the lack of parental care may have played a part. Most modern birds require parental care – the brush turkey of Australia (which is no relation to American turkeys) is one of the few exceptions.

Journal reference: Gondwana Research, DOI: 10.1016/j.gr.2017.06.001

http://bit.ly/2t8eKjd

Boy Dies Days After Swimming: What Is 'Dry Drowning'?

A 4-year-old boy in Texas died recently, nearly a week after he went swimming, from what his parents were told was "dry drowning." But what exactly does this mean?

By Rachael Rettner, Senior Writer | June 9, 2017 06:07pm ET

The boy, Frankie Delgado, was playing in the waters of the Galveston Bay when he was knocked down by a wave, according to CNN. Initially, the boy seemed all right. But the next day, he began vomiting and having diarrhea. Nearly a week later, the boy said he had shoulder pain, and later, during a nap, he stopped breathing. Although he was rushed to the hospital, doctors were unable to resuscitate him, CNN reported.

Doctors said they found fluid in Frankie's lungs and around his heart, and they told his parents that he died of "dry drowning," according to CBS affiliate KHOU-TV. However, the official cause of his death has not been released by the county coroner.

Dry drowning occurs when, after being submerged in water, a person's vocal cords experience a spasm and close, making it difficult to breathe, said Dr. Mike Patrick, an emergency-medicine physician at Nationwide Children's Hospital in Columbus, Ohio, who was not involved in the boy's care.

When this happens, the body's response is to send fluid to the lungs to try to open up the vocal cords. But this can lead to excess fluid in the lungs — a condition called pulmonary edema. Symptoms of dry drowning usually start within an hour after a person is submerged in water, Patrick said.

Another uncommon way people can drown some time after being submerged in water is called "secondary drowning." In this case, water dilutes or washes out the lungs' surfactant, a slippery substance that's needed to prevent lung sacs from sticking together and collapsing, Patrick told Live Science.

Without the surfactant, the lung sacs start to stick together, and the body can't properly exchange carbon dioxide and oxygen, Patrick said. This causes the same shock response as dry drowning — the body sending fluid to the lungs — resulting in pulmonary edema. Symptoms of secondary drowning usually start within 24 hours after a person is submerged in water, he said.

Both dry drowning and secondary drowning are rare, Patrick said, affecting only about 5 percent of kids who have a "near-drowning" experience, in which they are submerged in water and have trouble breathing but are revived.

Doctors recommend that, if a child is submerged in water, parents should keep a close eye on the child for 24 hours following the submersion. If the child experiences respiratory symptoms such as difficulty breathing, wheezing, coughing or chest discomfort, they should get the child medical attention right away, said Patrick, who also hosts the parent-advice podcast PediaCast.

Delgado's family has set up a GoFundMe account to help with expenses for his funeral. "There are no words to describe how heartbroken we are over the passing of Baby Frankie," the page says. "He was loved by so many people … the world lost a beautiful soul."

http://bit.ly/2tbx9vD

Home monitoring of blood sugar did not improve glycemic control after 1 year

Self-monitoring of blood glucose levels in type 2 diabetes patients did not improve glycemic control or health-related quality of life

Self-monitoring of blood glucose levels in patients with type 2 diabetes who are not treated with insulin did not improve glycemic control or health-related quality of life after one year in a randomized trial, results that suggest self-monitoring should not be routine in these patients, according to a new study published by JAMA Internal Medicine. The study is being presented at the American Diabetes Association 77th Scientific Sessions.

Many patients with type 2 diabetes not treated with insulin regularly perform self-monitoring of blood glucose (SMBG), although the value of that practice has been debated.

Katrina E. Donahue, M.D., M.P.H., and Laura A. Young, M.D., Ph.D., of the University of North Carolina at Chapel Hill, and coauthors conducted a trial in 15 primary care practices in North Carolina with 450 patients with non-insulin-treated type 2 diabetes. The patients were an average of 61 years old, had had diabetes for an average of eight years, and 75 percent were performing SMBG at baseline.

The patients were assigned to one of three groups: those who performed no SMBG, those who performed once-daily SMBG, and those who performed once-daily SMBG but received enhanced feedback messages delivered through their blood glucose meters.

The study measured hemoglobin A1c levels (a measure of longer-term blood sugar control) across all three groups and health-related quality of life after one year.

According to the results, there were no differences in glycemic control or health-related quality of life after one year between patients who performed SMBG compared with those who didn't.

Attrition in the SMBG monitoring groups could explain why some improvements were initially seen in hemoglobin A1c levels in the early months that weren't significant at 12 months, according to the study. The study also did not determine the effectiveness of SMBG in certain clinical situations, such as when a new medication is started or when a dose is changed.

The authors warn the results do not apply to patients with diabetes treated with insulin.

"Based on these findings, patients and clinicians should engage in dialogue regarding SMBG with the current evidence suggesting that SMBG should not be routine for most patients with non-insulin-treated T2DM [type 2 diabetes mellitus]," the article concludes.

For more details and to read the full study, please visit the For The Media website. (doi:10.1001/jamainternmed.2017.1233)

http://bit.ly/2r9zGpB

Germany to test face recognition software in terror fight

Germany will trial the facial recognition software Berlin's Suedkreuz station this summer, using volunteers

Germany will start testing facial recognition software at a Berlin train station this summer which could help police identify and locate terror suspects more quickly, a minister said Saturday.

Interior Minister Thomas de Maiziere said the software would be tested with volunteers at Berlin's Suedkreuz station, and if successful would be expanded to other locations and also used for a range of criminal investigations.

"We already have video surveillance in train stations, of course. But we aren't able, for example, to put a picture of a terrorist on the run into software that would alert us when he appears in a station," Maiziere said in an interview on the website of the Tagesspiegel newspaper.

"If this software proves reliable, it should be able to be used for serious crimes in other places equipped with surveillance cameras," he said.

The Tagesspiegel report said the new system was unlikely to run into legal obstacles since its use would be limited to targeting suspects, and

so would not infringe upon civil liberties of people not sought in an investigation.

Germany has suffered several terror attacks since last summer, including the deadly assault on a Berlin Christmas market in 2016 by a Tunisian who hijacked a truck and rammed into a crowd, killing 12 people.

The suspect managed to flee by bus then by train, crossing several borders before being shot and killed by police at a train station in Milan.

http://bit.ly/2sSJVA1

Drug costs vary by more than 600% in study of 10 high-income countries

Study shows costs for prescription drugs in 10 high-income countries with universal health care varied by more than 600%

In a study of 10 high-income countries with universal health care, costs for prescription drugs in 6 of the largest categories of primary care medicines varied by more than 600%, according to research published in CMAJ (Canadian Medical Association Journal).

All countries except Canada offered universal coverage of outpatient prescription drugs.

The study looked at data on the volume and daily cost of primary care prescriptions in 10 high-income countries with universal health care: Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Sweden, Switzerland and the United Kingdom. Because of the high cost of pharmaceutical drugs and the lack of universal health care, the United States was not included.

Researchers focused on 6 categories of widely used primary care drugs usually purchased at retail pharmacies rather than hospital pharmacies. These included hypertension treatments, pain medications (nonsteroidal anti-inflammatory drugs as well as opioids), cholesterol-lowering drugs, noninsulin diabetes treatments, gastrointestinal medications and antidepressants. They measured frequency of use of the medications by average number of days of therapy purchased per capita.

Medications for treating high blood pressure accounted for the largest number of days of therapy in all countries.

In the 5 countries with universal, single-payer coverage of prescription medications, the average per-person cost was $77. Average costs were $99 in the 4 countries with universal social insurance for prescription drugs and $158 in Canada, which has a mixed system of private and public financing. Higher costs of drugs and the mix of therapies chosen accounted for most of the cost differences between countries.

"The volume of therapy purchased in Canada was about the same as that in the comparator countries; however, Canadians spent an estimated $2.3 billion more than they would have in 2015 if these primary care treatments had had the same average cost per day in Canada as in the 9 comparator countries combined," writes Dr. Steven Morgan, School of Population and Public Health, University of British Columbia, with coauthors.

"Average expenditures are lower among single-payer financing systems, which appear to promote lower prices and selection of lower-cost treatment options within therapeutic categories," the study authors conclude.

In a related commentary

http://www.cmaj.ca/lookup/doi/10.1503/cmaj.170440, Dr. Joel Lexchin, York University, Toronto, Ontario, writes "Canada is not doing well when it comes to ensuring that its population has access to prescription medications; we can and must get to a better place."

He says that we need universal pharmacare to reduce drug prices so that Canadians are not deterred from taking their medications.

The research study was conducted by researchers from the University of British Columbia, Vancouver, BC; Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, Massachusetts.